

**DEVELOPMENT OF SELF INSTRUCTIONAL PACKAGE
FOR SECONDARY SCHOOL BIOLOGY TEACHERS
FOR THEIR IN-SERVICE LEARNING**

BAIJU K. NATH

**Thesis Submitted for the Degree of
DOCTOR OF PHILOSOPHY
in Education**

**DEPARTMENT OF EDUCATION
UNIVERSITY OF CALICUT
1998**

DECLARATION

I, Baiju. K. Nath, do hereby declare that this study "DEVELOPMENT OF SELF-INSTRUCTIONAL PACKAGE FOR SECONDARY SCHOOL BIOLOGY TEACHERS FOR THEIR IN-SERVICE LEARNING" has not been previously formed the basis for the award of a Degree, Diploma, Title or Recognition.

C.U. Campus

21-3-1998.

A handwritten signature in black ink, appearing to read 'Baiju. K. Nath', written over a horizontal line.

Baiju. K. Nath.

Dr. Ayishabi. T.C.,
Reader in Education,
Dept. of Education,
University of Calicut.

C.U. Campus,
24-3-1998.

CERTIFICATE

I, Dr. Ayishabi. T.C., do hereby certify that this report "DEVELOPMENT OF SELF-INSTRUCTIONAL PACKAGE FOR SECONDARY SCHOOL BIOLOGY TEACHERS FOR THEIR IN-SERVICE LEARNING" is a record of bonafide study and research carried out by Sri. Baiju. K. Nath under my supervision and guidance and that it has not been previously formed the basis for the award of a Degree, Diploma, Title or Recognition.

Ayishabi

Dr. Ayishabi. T.C.

ACKNOWLEDGEMENT

The investigator is deeply indebted to Dr. Ayishabi. T.C., Reader, Department of Education, University of Calicut, for giving expert guidance and extensive help throughout the conduct of this study. Only extreme care and timely directions helped the investigator to take up such an extensive study and lead it to a fruitful completion.

The investigator expresses his greatfulness to Dr. Kamala. S. Pillai, Professor and Head of the Department of Education, University of Calicut, for providing facilities to conduct this study.

The investigator expresses his hearty gratefulness to the experts in the field of Education/Distance education, who had given necessary guidelines for the conduct of this study.

The investigator is extremely indebted to the secondary school biology teachers for becoming subjects for the validation of the package, without which the study could not have been completed.

The investigator expresses his gratitude to the headmasters of Govt. High Schools at Thariyode, Poonur, and Palakkad for providing facilities to conduct the achievement tests of the study.

The investigator is also thankful to the Librarian of Regional Institute of Education, Mysore, who provided facilities to gather valuable information for this study.

The investigator is also grateful to University Grants Commission for providing financial assistance for the conduct of the preliminary part of the study.

C.U. Campus,

21-3-1998.



Baiju. K. Nath

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER	PAGE NOS.
I INTRODUCTION	1 - 16
II THEORETICAL OVERVIEW AND REVIEW OF RELATED LITERATURE	17 - 42
III METHODOLOGY	43 - 100
IV ANALYSIS	101 - 169
V CONCLUSIONS AND SUGGESTIONS	170 - 190
BIBLIOGRAPHY	191 - 205
APPENDICES.	

LIST OF TABLES

Table No.	Name
1.	Weightage to content of Achievement Test I
2.	Weightage to objectives of Achievement Test I
3.	Weightage to Type of Questions of Achievement Test I
4.	Weightage to Content of Achievement Test II
5.	Weightage to Objectives of Achievement Test II
6.	Weightage to Type of Questions of Achievement Test II
7.	Scores and Results of Analysis of Scores on Achievement Tests
8.	Percentage of Teachers in each Grade of Achievement.
9.	Age-wise Distribution of secondary school Teachers
10.	Sex-wise Distribution of secondary school Teachers
11.	Teaching experience of secondary school Teachers
12.	Nature of institution
13.	Location of institution
14.	Effectiveness of SIM to fulfil learner needs
15.	Relevancy of content in the SIM
16.	Depth of content in the SIM
17.	Nature of statement of objectives in the SIM
18.	Arrangement of content and realisation of Objectives
19.	Adequacy of content and realisation of Objectives

20. Correctness of information in the SIM
21. Length of units in the SIM.
22. Suitability of Dividing the content in the SIM.
23. Nature of Arrangement of Units in the SIM.
24. Nature of Continuity of content in the SIM.
25. Nature of Linking of Sections in each Unit.
26. Clarity content in the SIM.
27. Clarity of Explanations in the SIM.
28. Usefulness of Examples in the SIM.
29. Clarity of Diagrams in the SIM.
30. Appropriateness of media of SIM.
31. Style of Presentation of the SIM.
32. Nature of explanations in the SIM.
33. Suitability of structuring of SIM.
34. Number of Learning Activities in the SIM.
35. Relevancy of Learning Activities in the SIM.
36. Suitability of Placing of Learning Activities.
37. Nature of Learning Activities.
38. Interest in the Activities and Exercises in the SIM.
39. Appropriateness of Self-check Questions.
40. Style of Self-check Questions.
41. Difficulty level of Self-check Questions.

42. Adequacy of Cross-references in the SIM.
43. Nature of Directions in the SIM.
44. Difficulty level of Assignment Questions.
45. Appropriateness of Assignment Questions.
46. Style of Assignment Questions.
47. Level of Assignment Questions.
48. Application type questions and interest in learning.
49. Nature of explanations in the SIM.
50. Linking of Explanation with Life.
51. Utilising knowledge of daily life in the SIM.
52. Linking of information in Different units in the SIM.
53. Usefulness of In-text Questions for retention.
54. Usefulness of Summaries for retention.
55. Usefulness of Self-check Questions for retention.
56. Usefulness of Possible answers for retention.
57. Illustrations, Explanations and Retention.
58. Meaningful Presentation and Retention.
59. Application Type Questions and Transfer of Learning.
60. Provision for Transfer of Learning in the SIM.
61. Interest in learning the SIM.
62. Nature of feedback in the SIM.
63. Possible Answers and feedback.

64. Let us Sum Up Sections and feedback.
65. Self-check Questions and Feedback.
66. Usefulness of Assignment Questions.
67. Adequacy of references in the SIM.
68. Suitability of Typography of the SIM.
69. Suitability of Numbering in the SIM.
70. Nature of Headings in the SIM.
71. Nature of Introduction Sections.
72. Simplicity of Introduction Sections in the SIM.
73. Provision for clarification of Doubts through the SIM.
74. Clarity of Directions to change media.
75. Nature of diagrams in the SIM.
76. Correctness of diagrams.
77. Linking of Diagrams with the content.
78. Appropriateness of cover page.
79. Appropriateness of the size of the SIP.
80. Nature of Binding of the SIM.
81. Quality of Paper used for the SIM.
82. Nature of Attachment of Audio Cassette with Print material.
83. Adequacy of words in sentences of the SIM.
84. Suitability of the Type of the SIM.
85. Adequacy of space between lines in the SIM.

86. Adequacy of marginal space in the SIM.
87. Quality of Audio-Cassette in the SIP.
88. Correctness of Content in the Audio-Cassette.
89. Audibility of the Cassette.
90. Adequacy of Length of the Illustrations.
91. Sequencies of steps in the Illustrations.
92. Absence of Unnecessary pauses in the Cassette.
93. Nature of voices in the Audio Cassette.
94. Correctness of pronunciation in the Cassette.
95. Nature of Unwanted Noise in the Audio Cassette.
96. Overall impression of the Audio Cassette.

LIST OF FIGURES

Figure No.	Name
1.	Flow Chart of the Present SIP.
2.	Flow Chart of a Unit in the Present SIP.
3.	Blue Print of Achievement Test I
4.	Blue Print of Achievement Test II

LIST OF APPENDICES

APPENDIX.

- I. B.Ed. Syllabi of different universities.
 - A. University of Calicut.
 - B. Mahatma Gandhi University.
 - C. University of Kerala.
 - D. One year B.Ed. by Regional College of Education.
 - E. Syllabus outline by N.C.E.R.T.
 - F. Integrated B.Sc. Ed. Syllabus by Regional Colleges of Education.
- II. Syllabus Outline for in-service teacher education for secondary school natural science teachers conducted by College of Teacher Education, Calicut.
- III. A. Interview schedule for secondary school biology teachers who had not participated in in-service programme.
 - B. Interview schedule for secondary school biology teachers who had participated in in-service programme.
- IV. A. Summary of Teachers' Responses to Interview Schedule III - A.
 - B. Summary of Teachers' Responses to Interview Schedule III - B.
- V. Proposed Syllabus Outline for the SIP.
- VI. A sample of the SIP used for this study.
- VII. A: Achievement Test I.

B. Scoring Scheme of Achievement Test I.

VIII. A. Achievement Test II.

B. Scoring Scheme for Achievement Test II.

IX. Questionnaire for Secondary School biology teachers.

CHAPTER I

INTRODUCTION

Significance of the Problem

Statement of the Specific Problem at Hand

Title of the Study

Definition of Key Terms

Objectives of the Study

Methodology

Scope and limitations of the study

Organisation of the report

INTRODUCTION

Continuing education is essential for every body in this world ,where knowledge explosion is the pivot . The need for continuing education will vary with different social strata and professional status . The need is all the more pronounced for teachers . The teachers are always in need of up-dating their knowledge in order to prepare their disciples for better living in a rapidly changing world .

In-service education according to Bolam(1980) is "those education and training activities engaged in by primary and secondary school teachers and principals following their initial professional certification and intended mainly or exclusively to improve their professional knowledge, skills, and attitudes in order that they can educate children more effectively" . In- service education is essential for a teacher to realise rapid changes in our culture and its implication for improving the system of education in view of such change.

In service education took its origin in different countries in the later half of nineteenth century . In India fruitfull attempts towards in-service education were made only after independence . Indian university commission (1948) remarked the urgent need of in-service courses. In the view of the commission recommendation the first national conference of principals of training colleges(1950) proposed refresher courses for trained teachers and special course for those who need advanced level,training.

Extension education centres were started functioning in the teacher training colleges during 1955 - 58 period for this purpose. The national council of educational research and training (NCERT) was established in 1961 which acts as a leading agency for further education of teachers.

The education commission (1966) insisted that "the summer institutes has to become an integral part of annual work of universities and schools. Continuing education of teacher needs the support of research. The result of research should flow down to classroom teacher." The national policy on education (1968) pointed out that "teacher education, particularly in-service education should receive due emphasis." The national policy on education (1979) suggested that "the facilities for in-service training will be expanded."

National seminar on teacher education (1984) conducted by NCERT & NCTE viewed that "there is a need for providing in-service education at district level and the NCERT should provide more programmes for in-service education." The national commission of school teachers (1983-85) pointed out the quality of in-service programmes are poor and it is not having clear cut policies. The working group on in-service education of teachers NCERT (1986) pointed out that there is no proper research base for making in-service education more effective.

The new national policy on education (1986) put forth a comprehensive Programme of Action (POA) for in-service education. The POA (1986) emphasises that a great deal of responsibility to conduct in-service education would be given to State Council of Educational Research and Training

(SCERT) . Distance learning materials should be prepared and extended with the help of broad casting agencies .

A centrally sponsored scheme of teacher education was launched in 1987 to conduct orientation about the main priorities and dimensions of national policy on education (1986) and to develop the professional competence of teachers by summer camps of ten days duration.

As per seventh five year plan (1985-1990)" due to huge number of teachers institutionalised in-service education for teachers is difficult and costly . So in- service education could be managed by utilising media and use of correspondence course materials supported by occassional contact".

The POA (1992) contemplated that SCERT should be the nodal agency at state level for co-ordinating teacher training programmes conducted by different agencies . Different agencies such as University Grants Commission (UGC) State Institutes of Education (SIE) State Institutes of Science Education (SISE) institutes of english and other languages, Teachers Organisations, Foreign and International agencies like British council, United States Education foundation in India and UNESCO are also conducting training to impart refresher or orientation courses for the benefit of secondary level teachers.

As per the report of the fifth . All India education survey ,(March 1992) there are 723625 secondary school teachers working in 52560 secondary schools in India. Among the teachers only 6.61 % participated in some form of

in-service education . This shows that a greater majority of teachers do not get opportunity. ~~since education~~. Since in -service education is a continuous process, providing institutionalised in-service education to all the teachers within a limited time is a very difficult task. The revised national policy on education (NPE1992) viewed that "science education at secondary level begins to expose student to the different roles of science . Since training of teachers is a continuous process there is an urgent need for overhauling of both pre-service and in-service teacher training in order to make markable changes in education at the secondary level".

The eighth five year plan (1992-97) envisaged steps for strengthening secondary education by providing in-service education through both institutionalised and distance education mode.

Self instruction based on the principles of distance learning is a worthwhile alternative in this regard . The self-instructional packages not only economise time and cost but also it give provision for self pacing . By realising those facts the investigator decided to developing self - instructional materials in a package . (Here after noted as SIP for self instructional package and SIM for self instructional materials) for the in- service learning of secondary school Biology teachers .

SIGNIFICANCE OF THE PROBLEM

The different aspects of Biology teaching such as instructional strategies, evaluation strategies, the resources of learning, role of media in learning etc are

progressing rapidly. But the research finding and development in these areas do not flow down to teachers at the same rate, because the source for getting information about technopedagogical advancement are very limited and not easily accessible to majority of teachers. There is no system for providing orientation to teachers at regular intervals to let them aware of such advancement. Unfortunately this lead to a gap in knowledge which acts as a major hindrance in the success of teaching. The present study aims to bridge that gap and also to facilitate successful teaching learning process in Biology.

Existing B.Ed syllabi presented by our universities are insufficient to pace with the newer techno-pedagogical advancement. So in-service education is meant for qualitative improvement of teachers, which is the thrust of eighties and nineties. This study is intended to provide in-service learning facilities to the biology teachers at the Secondary level through the S.I.P.

The prevailing system of in-service training of Secondary school teachers is mainly face-to-face, learner passive in nature. The courses may be organised either during vacation or at working sessions. In both these occasions there are difficulties to attend the course, as generally opined by the teachers in-service. The teachers also opined that distance mode of training is more convenient for them. The SIP has marked advantages over the traditional system firstly by its accessibility, secondly because it is self-pacing and thirdly, it can be used when the learner need it. Hence the present study is felt as highly

significant. By realising the need for qualitative improvement of school education, mass orientation courses such as quality improvement programmes (QIP) are conducted by the SCERT in Kerala. But due to the short duration of the course, (usually for five days) only too little content can be covered during the course. It is not enough to evoke a qualitative improvement in teaching. The SIP use in this study consist of detailed information required for improving quality of secondary school biology teaching.

According to NCERT (1997)," there is a growing perception in the country that, during the past three decades, our education system instead of moving closer to the goal of the common school system, has moved further away from it." We can achieve this goal only by providing adequate training for teachers. Since it is possible to provide institutionalised in -service training for all within a limited time, SIM/SIP of this type is the only vital alternative. The new development in education vary with the teaching of the different subjects. Hence different SIM's would be necessary to provide the new informations to the teachers of all subjects. The investigator is a specialist in the teaching of biology only. So he thought of limiting the SIP to biology teachers only.

The strategies of instruction can also vary with the teaching at different levels. So different SIP's should necessarily include strategies appropriate to teachers of different levels. Since secondary level is a thrust area as per policy statement 1986 and its POA in 1990 and 1992, the investigator thought of

limiting the present SIP to Secondary level only.

The changing Scenario of elementary education with the recent directions of DPEP, brought forward novel changes in the instruction and evaluation at the elementary stage. Similar changes have to be made at secondary level also, so as to be hand in hand with the changes at the elementary stage. This study is designed in such a way that it will provide adequate information for bringing of such a change in secondary level biology teaching.

The representatives of secondary level biology teachers, who were interviewed by the investigator emphasised that they need orientation in different aspects of education. The teachers who had participated in in-service training stressed that, courses of short duration are insufficient to pace with the technopedagogical advancement. They demanded for further in-service education with information in more depth. The existing system provides opportunity for a teacher to take part in an in-service programme only once in many years. So the present study is relevant even to those teachers who had participated in an in-service programme. Hence the SIP is doubtlessly worth while.

The biology teachers at secondary level suggested the topics such as planning and analysing biology content, instructional strategies, strategies of evaluation, and preparation and preservation of accessory learning materials, maintenance of class room discipline etc, for detailed discussion in the proposed SIP. The present study proceeds with those suggestions given by the secondary school biology teachers, who are the learner community for the

proposed SIP. Since the SIP is developed on the basis of the needs of the learners, the significance of the study increases to a greater extent.

Since the facilities for in-service education for secondary school biology teachers is very limited, a study of this type becomes highly significant. As the study facilitates self instruction, it would have mass utility with in lesser time and cost.

The investigator could not so far locate any projects done for producing self instructional packages with such a high depth, so as to realise all the needs of teachers in service to get an awareness and practical suggestions of newer techno- pedagogical advancements. Producing such packages is there fore a new venture. Hence the present study is felt highly significant and useful to the target group

STATEMENT OF THE SPECIFIC PROBLEM AT HAND

The present study, thus, focuses on the in-service learning of secondary level biology teachers through distance learning. So the content should be relevant to the needs of secondary level biology teachers and be developed on the basis of the principles of distance learning.

The content selected for the present purpose should include areas where newer development had taken place and should also be able to give a comprehensive and clear picture of biology education at secondary level to the target group. There fore the content areas such as, psychological aspects of secondary level pupils, aspects of planning for teaching biology

at secondary level , pedagogical analysis , strategies of instruction in biology,media and materials useful for teaching biology ,strategies of evaluation, and aspects of class room management should be included in the proposed learning material. (The reason for selecting these content areas is explained in detail under the section procedure in chapter III)

The content mentioned above should be developed in such a way that it can facilitate self pacing and there by self- learning. Principles of text design for self- learning materials should be strictly followed for developing the proposed learning material. Hence the content should be presented in a simple clear and personalised style.

Since the material aims to provide distance-learning, utilisation of appropriate media is essential. The print medium is low cost and highly effective medium in this regard, which is easy to develop duplicate and also to handle. Also, it does not require any hardware as in the case of electronic media. Hence the main part of the material was decided to be developed in the form of printed text. In addition to the print medium, audio medium also can be used as supplementary material, which is also cheap and easy to be produced and used. The audio component, if used in the study can include illustrations of actual practical situations. In the present study the audio medium is necessary to illustrate the instructional strategies explained in the print material. Hence, the print and audio media together were proposed to be used in the study. Hence,the study is envisaged as the developement of a self-Instructional Package.

The effectiveness of the SIP should be validated by administering it on a sample target group, on the basis of the data gathered through appropriate tools. The present study proposed to use achievement tests and questionnaire for data collection. Additions or modifications, if any were to be made on the basis of the data gathered and the SIP was to be produced in the final form.

Keeping the above procedure, the investigator decided to conduct this study with the following title :

TITLE OF THE STUDY :

The study is entitled as " DEVELOPMENT OF SELF INSTRUCTIONAL PACKAGE FOR SECONDARY SCHOOL BIOLOGY TEACHERS FOR THEIR IN-SERVICE LEARNING".

DEFINITION OF KEY TERMS :

The key terms of the study are defined below

Development

According to Good (1973) it is "an extension of basic or applied research through which laboratory findings are reduced to practice". For the present study it means that the knowledge gathered through laboratory findings or by any other means in the fields of pedagogy and distance education will be practically applied in preparing the self instructional package

Instructional package

Self - Instructional package is a package consisting of learning materials designed for providing self instruction , so that the learner can learn the materials by himself . In the present study it means a package consisting of self learning materials in print and audio mode designed to provide self instruction for secondary school biology teachers in service for updating their knowledge of biology teaching.

Secondary School Biology Teachers

This term refers to the teachers teaching biology at the secondary level. Secondary school biology teachers is the target group of the present study.

Service Learning

In the present study it means the learning undertaken by secondary school biology teachers during their professional service as distinct from that of initial training.

OBJECTIVES OF THE STUDY

The following are the objectives of the present study :

To develop self instructional materials in a package with reference to the necessary content to fill up the gaps in the update knowledge of secondary school biology teachers through their in - service learning.

To validate the developed package by ascertaining its effectiveness.

METHODOLOGY

The procedure of the study is given in the following steps :

- a) Analysis of the pedagogical theories to identify the necessary content areas for biology teacher education at secondary level.
- b) Thorough analysis of the prevailing B.Ed syllabi of some universities and to identify the gaps in the content with regard to update knowledge of biology teacher education.
- c) Analysis of the syllabus for in-service education of secondary school biology teachers conducted by college of teacher education.
- d) Interviewing secondary school biology teachers to gather their opinions and suggestions regarding various aspects of in-service education and for the development of self instructional materials for developing the SIP
- e) Preparation of a comprehensive syllabus on the basis of the analysis of pedagogical theories existing B-Ed syllabi, syllabus for in- service education, and the suggestions of the secondary school biology teachers.
- f) The development of self Instructional package (Print and audio media) on the basis of the principles of distance education .
- g) The validation of the developed package by administering it on secondary level biology teachers.

Sample for validating the SIP:

The sample for the validation of SIP was 178 secondary school biology teachers belonging to Kannur, Kozikode , Wayanad and Palakkad districts of Kerala state. They were selected using purposive random sampling technique. Adequate representation was given to the different strata such as Age ,Sex and period of teaching experience, of the subjects, and locale and management of schools.

Methods used for Validation:

The investigator developed two achievement tests and a questionnaire on the basis of the SIP, which were used to gather relevant data about the SIP.

Techniques used for validation;

The effectiveness of the package was to be identified by the following techniques.

1. Estimation of percentage of achievement
2. Estimation of mean percentage of achievement
3. Estimation of error rate and
4. Qualitative analysis of the data gathered by the questionnaire

Opinion of experts in the field of education/distance education also was taken as an index for the effectiveness of the package.

A detailed description of methodology is given in chapter III

SCOPE AND LIMITATIONS OF THE STUDY

The main objective that can be achieved through any SIP, will be giving an awareness of the new knowledge. But if it is prepared on the basis of the principles of distance learning, a positive attitude towards trying out the new knowledge also can be developed. Hence, any distance learning material is to be developed by ensuring the essential activities of a class room teacher in it, so that it would act as a teacher substitute. In order to ensure this, various aspects of the learner such as mental level, motivation, interest in learning, previous knowledge, various aspects of presentation such as, personalised style of presentation, adequate examples and diagrams, and provisions for active learning, feedback, retention and transfer of learning are to be taken care of in any SIM.

The SIP used in the present study also was developed on a similar scientific manner, by utilising the principles of self-learning, and distance learning.

This will help to reduce the loneliness feeling of the learner. Thus it is hoped that the present SIP will inspire the teachers to try out the new knowledge imparted through it. More over the prepared SIP contains a number of practical illustrations, hence it is again hope that the teachers can practice them on their own and achieve the required practical skills.

Usually distance mode instruction provides postal tuition and face- to- face counselling sessions, which are the important components of a total distance education programme, in order to attain complete mastery of the knowledge and skills, and proper developments of a positive attitude.

Since counselling and tutoring are beyond the scope of the present study the investigator has to proceed with the preparation of the SIP by omitting these aspects. Therefore the development of skills and attitudes can not be ensured by the study. Thus it is a major limitation of the study

Owing to lack of enough facilities and money the video medium is not attempted in the study as a part of the SIP.

Inspite of these limitations utmost care is taken by the investigator to develop the SIP as much as effective and valid as possible.

ORGANISATION OF THE REPORT

The report has been presented in Five Chapters

Chapter I deals with the significance of the study, specific problem at hand, title of the

problem, statement of the objectives of the study, brief description of the procedure, and scope and limitations of the study.

Chapter II contains two sections; the theoretical overview of SIM and review of related studies. The theoretical overview describes the theoretical basis of the preparation of SIM. And review of studies relevant to the present study provides the existing practices in the area of the study.

Chapter III describes the Methodology followed to conduct the study, which includes the detailed description of the complete procedure, preparation of SIP, and preparation and administration of tools for validating the SIP.

Chapter IV presents the analysis of data collected through the different tools and the results obtained.

Chapter V concludes the present study. It involves summary, findings, conclusion and suggestions.

CHAPTER - II

THEORETICAL OVERVIEW AND

REVIEW OF RELATED LITERATURE

* Theoretical Overview of SIM

Theoretical basis for SIM

Structuring a SIM

Uses of SIM

* Review of related studies

Studies on Science education

Studies on in-service education

Studies on individualised and
self-learning

* Comments

THEORETICAL OVERVIEW AND REVIEW OF RELATED LITERATURE

This chapter consists of two sections.

They are : A : Theoretical Overview of SIM

B : Review of related studies

The sections are given below.

A. THEORETICAL OVERVIEW OF SIM

The SIMs are widely and commonly used in any type of Distance Education. A variety of media are being utilised to bridge the communicational and educational distance of learners. As the learner is enjoying freedom for independent study, the SIM must necessarily be a substitute for the classroom teacher as far as possible. The design and production of SIM with appreciable quality is a difficult task. Production of SIM is entirely different from the production of traditional type of text books. Since the materials should be designed to avoid the major constraints while learning the subject, certain theories of learning and theories of communication should be used as the adequate base for the production of SIM. The major theories influencing the production of SIM and their implications are given below :-

THEORETICAL BASIS FOR SIM.

The learning theories such as behaviouristic theories (skinner, 1968) cognitive approach (Bruner, 1966) conditions of learning (Gagne, 1974) and classification of learning outcomes (Bloom, 1971) and the communication theories such as mathematical theory (Shannon & Weaver) and Information theory (Shannon & Weaver) have profound implications in developing SIM.

Behaviouristic Theory :

The behaviourism (Skinner, 1968) stresses the connection between stimulus and response in the organism, and learning through this procedure brings change in human behaviour. An organism responds only if it is ready to respond. So a state of mental readiness is essential for any organism to respond as for a stimulus. This mental readiness makes an organism active, both physically and mentally. Thus the response is the result of an active mind. Hence stimulus - response connection leads to learning, the major precondition is that ' the learner must be active '. So active learning is a principle put forth by behaviourists. In order to keep the learner active different techniques are used in the structuring and presentation of the SIM.

The learning ability differs from individual to individual thus the rate of learning also. ' Self - pacing ' for complete learning is another behaviouristic principle influencing the development of SIM. Usually SIM are designed in such a way to facilitate self pacing.

The 'nature of feed back' and reinforcement' are the other two principles of behaviourism, which have implications in the development of SIM. Immediate knowledge of result, and the correctness of an activity done by a learner greatly influence learning by motivating him. So in order to sustain motivation in learning, immediate feed'back and reinforcement are necessary. Thus provisions are given in the SIM to provide feed back and reinforcement through self - check exercises.

Learning through 'small short steps' is another principle put forth by behaviourists. Dividing a material into small steps facilitates the complete learning of the material. A SIM is to be prepared on the basis of this principle also. Hence, each unit of the content should contain different sections for its presentation.

Cognitive approach :

Cognitive approach to learning is concerned with the inner psychological functioning of an individual (Brunner , 1966), According to this approach learning occurs as a result of cognitive operations. There exists a hierarchy in the cognitive process, such as the cognitive processes are restricted to objects and activities subjected to direct experiences at the initial stage, the complexity of cognitive operations then increasing by development to deal with indirect experiences, and finally to symbolic experiences. This aspect of cognitive approach has influenced the presentation of informatin in SIM in the order of increasing complexity.

This theory advocates learning through 'discovery'. Discovery learning is inductive learning in which a learner himself designs any type of learning activity that helps him to learn a material with minimum directions from his teacher leading to generalisations from particular items. The information is revealed to him out of his own learning activities. The discovery learning also promotes intrinsic motivation. Hence it is learning by an individual himself.

Cognitive approach states that learning is directed towards problem solving. That is everytime an individual is confronted with a problem he must have to learn something to solve that problem. Cognitivists suggested that beyond these aspects the feedback of results of one's own actions also influences learning.

So cognitive theory has following implications to the development of SIM. Since learning occurs as a result of information processing the information should be presented in simple terms, helping for using learner's experiences, which should be directed towards problem solving.

The principle of discovery should be followed in the presentation of the SIM. So provision for active involvement of the learner should be made in the material. The nature of sequencing of experiences should be from direct to representative and then to symbolic representative. Provision for reinforcement, feed back and transfer also should be made in the SIM according to the cognitive theory.

Conditions of learning :

According to the view of conditions of learning, learning is a change in human disposition or capability that takes place inside an individual's brain. This theory puts forth hierarchical conditions of learning proceeding from simple to complex. Learning is possible only by moving from the simple phase to the complex phase through all the sequential steps leading towards complexity. That is, the second ^{step can be taken up only after the} accomplishment of the first one. Since all steps are interlinked, it promotes learning by motivating the learner and considering individual differences.

According to Gagne , (1974) the following sequence is potentially effective for self-instruction. Activating motivation, informing the learner of the objective, directing attention, stimulating recall, providing learning guidance, enhancing retention, promoting transfer, and eliciting performance coupled with feed back. The self - instructional materials are designed in such a way that all these steps are sequentially arranged. Since learning proceeds from simple to complex, the material should be presented in such a sequence. The course materials are to be written in such a way to facilitate the linking of knowledge in different units. The scope of continuous assessment in the form of self - check exercises also is suggested by this theory. This theory has implication in the selection of media for the SIM also.

Levels of learning outcomes :

According to the classification ^{of} levels of learning outcomes (Bloom, 1971), there are three domains of learning outcomes such as cognitive affective and psychomotor. Cognitive domain pertains to intellectual abilities and intellectual skills, affective domain deals with emotional development and

psychomotor domain includes physical skills. Each of these domains can be developed using different media. For the development of Cognitive domain print medium is more effective, for affective domain face - to - face interaction is necessary, and for psychomotor domain direct consequences and practice are more suitable. So this theory influences the selection of media of the SIM in relation to which domain is to be developed.

The classification of the three domains gives specific behaviours which help to formulate objectives. Objectives are the basis for any type of instruction. So this approach also has implication in the formulation of objectives of the SIM. The evaluation of learning outcomes also is influenced by this theory.

Mathematical Theory :

This theory was developed by Shannon and Weaver in 1949. According to this theory mediated communication can overtake face - to - face communication in many respects. In face - to - face communication, communicative area may be very small, but in mediated communication, the media used for communication extends the communication area. Communication using electronic media helps the distribution of information to large population within a very limited time. Besides the print material other mass communication technologies such as radio, television, video, computers and satellite technology could be effectively utilised for communication.

The basis of today's communication system depends on this theory. The communication is accurate, fast and wide spread through this non-face - to - face mode. So this theory helps a distance educator to select suitable media for instruction.

Information theory :

This theory originated from mathematical theory. It deals with the nature of messages being communicated through mass communication media.

According to this theory, the content should be relevant to the receiver. Relevancy of the content in the form of message has influence on the selection of content for the SIM.

The message should be encoded in such a way that the receiver can decode it easily. In SIM access devices and directions are given for the easy utilisation of the material.

The feed back from the receiver helps to improve the communication network. The feed back regarding the relevancy, accessibility and media utilised will be helpful to increase the effectiveness of the SIM.

A SIM, therefore, has to be developed on the basis of the theories discussed above in the following structure.

STRUCTURING A SIM.

While structuring a SIM the various theories of learning and communication have implications for the following areas.

1. Presentation of the materials in a simple, clear and concrete manner using appropriate media.
2. Breaking down the whole content to smaller units/sections and presenting them from a simple to complex manner continuously.
3. Identifying the objectives and statement in simple, clear behavioural terms.
4. Motivating learners both externally and internally.
5. Providing adequate learning activities of various types.
6. Facilitating retention.
7. Promoting transfer of learning.
8. Providing feed back.
9. Providing guidance.

So the structuring of a SIM should involve all the above points in the presentation of the content as given below.

Presentation of Material :

' Active learning ' is the basic principle behind self - instructional materials. The SIM will be designed to keep the learner active while learning. The SIM provides thought providing questions and self - check questions to keep the learners active and interacting with the SIM.



The SIM provides individualised instruction and at the same time makes provision for self-pacing. The objectives of each unit of the SIM will be given at the beginning of the unit. This helps the learner to know about what is expected at the successful completion of the unit. The introduction of a unit would provide an orientation of the topic of the unit and also shows the way to proceed through the unit. The SIM will begin with known features and then proceed to complexity. The presentation of the material will utilise all possible previous experiences of the learners and will give enough illustrations for the new material. The informal personalised language used for writing the SIM would doubtlessly be advantageous to learners.

Identifying objectives :

The objectives belonging to different domains are stated in simple, clear behavioural terms to let the learner informed about what he is expected to acquire by the completion of a unit.

Motivating the learner :

The degree of motivation depends on external and internal motivation. In SIMs the size, colour, typography, format, and layout of the material influence external motivation.

The internal motivation depends on the quality of the SIM. It can be achieved by fulfilling learner needs, exploiting their experiences, using interesting exercises, providing adequate feedback, keeping moderate length of units, and use of personalised style of presentation.

Learning activities :

Self-instructional materials provide learning activities of various types such as exercises, assignments and guidance to utilise other useful materials and resources. The exercises of Self-checking type and activity type are provided at the appropriate places of the course materials. The learner could know his progress by comparing the responses to the exercises with their model answers given at the end of the unit. Activity type exercises are used to exploit the previous knowledge of learners and to link it with the new information. Assignments are usually given at the end of units or block, which demand expression of wholistic answers from the unit or block. The assignments have to perform two functions, such as to assess the performance of the learner, and for building purposeful two-way communication. Directions for using additional materials which are relevant to the course will also be given in the SIM so as to provide variety of learning experiences.

Facilities for retention :

Frequent repetitions at appropriate intervals help the retention of what is learnt. Provisions of such repetitions are given in SIM in the form of in-text questions, sub-sectional summaries, and assignments. Adequate number of illustrations and appropriate explanations given in SIM may also help retention.

Provision for transfer of learning :

Provision for transfer of learning can be made in a SIM by directing the learners to identify parallel or similar or dissimilar situations wherever possible. Provision can also be made to apply the acquired information to new situations.

Provisions for feed back :

Immediate feed back is one of the major characteristics of individualised learning. The knowledge of feed back will essentially motivate the learner in further learning. In SIM the following devices are used to provide feed back to the learners. The model answers for self-check exercises serve as a feed back to learners. The sum-up sections in the form of summaries and schematic diagrams, would also serve for this function.

Providing guidance :

The typography, various types of instructions and introduction of the unit provide guidance to learners. This would help to work effectively on course materials without the assistance of anybody and thereby increase the accessibility of the SIM.

Hence, it is evident that the SIM is advantageous in many respects for meaningful learning of the content by the learner himself at his leisure time.

USES OF SIM

Wherever the population size is very large, a SIM is very useful to provide instruction to every member of the population. In the present study also the population of secondary school teachers is fairly large. The resources (money and man power) for educational purpose is very limited. In this sense SIM is very useful to provide mass instruction with minimum time and money. Since the idea behind the SIM is 'providing education at the door step', it is designed according to the needs of the learners, by giving provisions for self-pacing and there by facilitating self-learning. Thus SIM is very useful in universalising and democratising education with minimum expenditure of money and manpower.

The review of literature was done to realise the current practices and developments in this area.

B. REVIEW OF RELATED STUDIES

The review of related studies and literature is an important part of any type of research study. According to Best (1989), review of related literature helps in the following way. " Citing studies that show substantial agreement and those that seem to present conflicting conclusions helps to sharpen and define understanding of existing knowledge in the problem area, provides a back ground for the research project, and makes the reader aware of the status of the issue ".

The Survey of related studies helps the investigator to understand his problem in depth, and it also acts as a guide for further investigation. This is also helpful in the selection of necessary tools for the research. A review of previous studies in the relevant areas of the present study was made. The studies are categorised into the following sections.

- 1) Studies on Science Education.
- 2) Studies on teacher training programmes.
- 3) Studies on in-service education, and
- 4) Studies on individualised learning and self learning.

1) Studies on Science Education :

The studies on science education relevant to this study are reviewed below.

The nature of Science teaching was studied by Parakh (1968), Vaidya (1971) and Nair (1971). The studies revealed the existing nature and status of science teaching in schools. They showed that the teaching of science is mainly through oral, lecture method instead of experimental methods. It is also revealed that the science classrooms are still teacher centered. Science was taught merely to get pass mark in the external examination. So memorisation was the technique used for learning science instead of experimentation and verification.

Mian (1990), Hopper (1982) and Vardhini (1983) studied the effectiveness of modular approach in teaching science. The studies revealed that modules are appropriate for teaching certain topics of science.

Nair (1987), Varghese (1987) and Jose (1987), found out that there is no significant difference in achievement of science due to difference in locale of pupils. But those pupils have high science aptitude found to be high achievers in science.

Sujatha (1987), suggested that, Science aptitude, Science interest and attitude towards science are highly correlated with achievement in biology.

Baby (1989), and Uzhunnan (1989)^{and} Sivaprasad (1988), investigated into the nature of classroom climate required for proper learning of science and concluded that a democratic classroom climate with the co-operation of pupils is highly effective for learning science.

Vijayakumar(1988) analysed the text books of biology, and pointed out that the content is incapable for mastery learning, and to promote creativity and motivation.

Haridasan (1989), Noushad (1989), Mini (1989) and Varghese (1989) studied process outcomes in biology and concluded that problem solving ability is different in different pupils due to difference in the attitude towards problem solving. Process outcomes in biology also is related to attitude towards science and science interest.

Razak (1989) analysed the opinion of teachers and suggested that the biology content at Secondary level is not competent to achieve the desired change in pupils. Provisions for the development of skill, and effective utilisation of leisure time were minimum. The content still makes the classroom,teacher centered.

Rekha (1988) and Panda (1994) analysed the effectiveness of teaching models for instruction and suggested that instruction using different teaching models are effective than conventional methods of teaching in secondary and higher secondary levels. Modules with supplementary materials such as audio presentation was seen more effective than conventional method of ~~method of~~ teaching.

White (1990) studied the professional needs of middle school science teachers and found that there is a need for developing newer techniques of teaching, additional instruction is necessary regarding psychological foundations of

education, preparation of supplementary learning materials and more information is required for recognising and accommodating individual differences.

Conclusion :

Review of the studies on science education given above revealed that many studies made various suggestions for the improvement of science education. But still the present-day science teaching is theoretical. The practical side of the science and its applications are neglected. It is also evident that teaching using newer strategies of instruction have marked advantage over traditional methods, but we rarely put them into practice. The learning environment suitable for science learning is of democratic and pupil - active in nature, but still it is teacher - centered, and oral.

Majority of our science teachers are unaware of the newer developments, in science education, hence a comprehensive in service training involving all these aspects are very essential.

(2) Studies on Teacher Training Programmes:

The studies on teacher training programmes relevant to the present study reviewed are as follows :

Ray (1952), Chohan (1962), Jha (1962), Prashar (1963), Akthar (1965) and Sharma (1995) studied the effectiveness of secondary level teacher training

programmes and its curriculum. The studies revealed that the teacher training programmes were theoretical and their curriculum involved only superfluous aspects unrelated to daily life. The studies emphasised the need of refresher courses for teachers in every five years after completion of their training course.

Chopra (1964) proposed the essential reformations in B.Ed training such as making more emphasis to educational psychology, practical training in educational evaluation, co- curricular activities and for practice teaching.

Sharma (1981) verified the expected behaviour of student teachers who had completed a training course and concluded that the student-teachers do not get a precise idea about what is expected from them as teachers.

Heaton(1988) studied the effects of teacher training on students and teacher performance and revealed that the training had only a short term effect on teachers. But this training was effective to improve pupil performance.

Green (1994) conducted a study on self guided training of teachers for the treatment of pupils with developmental ^{disabilities} through video ~~disabilities~~. The training programme of self guided mode through video medium was found to be effective.

Passi (1994) conducted a case study on the personalised Teacher Education programme. The study revealed that the programme was highly useful for some participants.

Conclusion:

The studies on secondary teacher training programme relevant to the present study are very few. The foregoing review of studies shows that the curriculum followed by many training institutions are superfluous and theoretical and not suitable to be hand in hand with advancement in teacher education. Majority of student teachers do not know what is expected from them as teachers. It is also revealed that the effect of training is not long lasting though it improves pupil's achievement. Training programmes using media, and self learning or personalised style can be utilised for detailed and effective teacher training.

Since the secondary teacher training has many shortcomings, it is essential to conduct in-service education for secondary school teachers, in order to prepare them to meet the newer changes in the field of education.

(3) Studies on In-Service Education :

The studies on in-service teacher education, relevant to the present study are reviewed below:-

History of in-service education in India had been traced by Srivastava (1966) from its origin till date. The study showed that there was a significant improvement in programmes and activities of in-service education. The study also revealed the positive attitude of teachers towards the in-service programmes.

Burrell (1951), Andhra Pradesh SCERT (1990), Sullivan (1981), Butala (1987) and Carroll (1989) studied the effectiveness of in-service programme. The studies gathered information using questionnaire, interview, and observation.

The studies revealed that face-to-face in-service programmes for short duration are not enough to bring forth adequate changes meant by the programme. Studies revealed that supplementary materials such as print outs, nodules, audio and video presentations can be utilised for in-service programmes. The content of the courses, was also inadequate to involve the newer advancements in teaching. But in-service programmes are seen effective to bring about positive attitude in teachers towards in-service learning. Most teachers were in favour of in-service training programmes.

Khosla (1970) observed that training institutions should pay more emphasis to the professional growth of teachers, with the involvement of experts in various faculties.

Gupta (1979) exposed the areas to be included in in-service programmes, such as pedagogical and methodological subjects, use of community resources and socially useful productive work.

Assuzu (1983) studied the availability of educational media for in-service education of secondary teachers. The study concluded that media for in-service education are inadequate and most of the teachers are desiring to participate in the in-service programmes.

Lali (1990) analysed the initiative of secondary school teachers for professional improvement. The study revealed that majority of young teachers are not interested in professional improvement and aged teachers are more interested in in-service programmes.

The mathematics faculty of Regional College of Education (1992) developed a correspondence - cum - contact in - service programme for mathematics teachers, teaching at plus two level. The programme was found to be effective to provide in-service education in mathematics content of plus two level.

Baker (1991), studied the effects of an in-service training programme for co-operating teachers on the supervision of student teachers in an urban school system. The study concluded that the material developed for in-service education is found to be effective.

Jungsatitkul (1991) and Osantowski (1993) studied the effectiveness of in-service programme on the performance of teachers and suggested that the in-service programme showed improved performance in most of the participants.

Conclusion :

The studies on in-service education relevant to the present study were reviewed above. The review revealed that in-service education is useful to improve the professional competence of teachers. But facilities for in-service training are limited. It is also clear that self learning materials are effective to provide in-service education to teachers. Since majority of teachers are interested in professional improvement the facility for the same should be increased. So the present study to provide in-service education to secondary school biology teachers is highly necessary.

(4) Studies on Individualised and Self-learning :

The studies on individualised learning, and self-learning reviewed, are as follows:-

Programmed materials were developed by Young (1968), Reid & Booth (1969), Cavanagh (1969) and Chauhan (1973) and their effectiveness as a means for self - learning was studied.

The studies were conducted with experimental groups and a control groups. The studies revealed that individual learning is a success. The advantages such as more responsible attitude from the part of pupils and lowering the cost of education were obtained as results. It was concluded that auto-instructional material is effective for self - learning of adolescents and adult learners.

Pultorak (1975) and Rowland (1995) worked on modular approach for effective instruction as modular approach for effective instruction of graduate students. Questionnaire, pre test and post test were used to gather relevant information. The results showed that modules are very effective in instruction.

Grey (1996) studied the difference in achievement of students in traditional and distance learning environments. Non-experimental design was formulated to conduct the study. Achievement test, and questionnaire were the major tools used. The study concluded that students in distance learning environments achieve academic success at a rate equal to or better than students of traditional environments.

The effectiveness of multimedia approach for instruction of secondary level pupils was experimentally studied by poornan (1968) siemanckowsky (1969), Krishnan (1983), and Vasanthakumari (1986). The studies showed that multimedia approach is found to be effective in improving competency of students. This approach seemed to benefit both high and low achievers, and it tends to increase the interest of learners. The rate of achievement also seemed to be higher than that of teaching using traditional methods.

Sivadasan (1981), Rabindra Das (1984), Siddiqui (1986) and Al bader (1993) had developed self instructional materials for the benefit of students at the secondary level and studied the effectiveness of them. Pre-test and post-test were conducted to validate the efficiency of the material.

The studies revealed that self learning materials are ^{very} ~~using~~ effective ~~in~~ for learning at secondary level. Students were able to learn at their own pace using the self learning materials and the achievements of students are higher than that of using traditional methods.

Self learning programmes for teachers were developed by Lambhate (1987), and Das (1990) and the effectiveness of the material was studied. Quasi-experimental design was used to conduct the studies. Achievement test was used to assess the performance of participants. The study revealed that teaching through self-learning material is significantly more effective than traditional teaching.

Bailker† (1983) studied the effectiveness of self-instructional micro-teaching course used for the in-service learning of secondary school mathematics teachers. The self-learning materials in print (two hand books) and an audio cassette were developed. The effectiveness was tested by the comparison between the scores of pre test, post test and delayed post test. The study concluded that the self-instructional micro teaching course was very effective to improve the general instructional competence of mathematics teachers.

Conclusions :

The studies on individualised learning and self learning relevant to the present study are reviewed above. The foregoing review of studies revealed that learning through self instructional materials are very effective.

COMMENTS

The review of related studies done in this chapter shows that very few studies are conducted in the different areas related to the present study.

Though there are somany recommendations for improving the status of science education, it continues as a theoretical discipline in most of the schools even today. The majority of science teachers are unaware of the newer developments in the field of science education. Hence, there should be provision for continous education of teachers.

The secondary school teacher education curriculum followed by many of the training institutions are ineffective to meet with the challenges of newer developments in the field of education. Suitable in-service education programme is necessary to bridge this gap occured due to inadequate pre-service training.

The in-service education programmes conducted by various agencies are found to be effecive for the professional improvement of teachers in service. But the facilities for in-service programme are very limited.

Self - learning materials are found to be very effective for any type of learning. The knowledge obtained through self-learning materials are more retainable, and it has marked advantages over traditional type of learning. So effective in-service training can be given using self-instructional materials.

Hence, it is believed that the present study of developing a self-instructional package for secondary school biology teachers for their in-service learning will be a highly significant and worthwhile one. This study is a new one of its kind, as the investigator could not locate any such projects attempted by other persons.

CHAPTER III

METHODOLOGY

* Objectives of the study

* Target group

* Procedure of the study.

Procedure of Preliminary works

Procedure of Preparation of SIP

Procedure of validating the SIP

METHODOLOGY

An account of the methodology for conducting the present study is given in this chapter. Methodology is the vital part of any research, as it guides the way to proceed. The selection and application of suitable methods, procedures and techniques comes under the purview of methodology. The present study is meant for developing a SIM for the in-service learning secondary school biology teachers. The following objectives were formulated for the conduct of the study.

OBJECTIVES OF THE STUDY

- 1) To develop self-instructional materials in a package with reference to the necessary content to fill up the gaps in the update knowledge of secondary school biology teachers through their in-service learning.
- 2) To validate the developed package by ascertaining its effectiveness.

TARGET GROUP

The secondary school biology teachers constitute the learner community of the present study. These learners are different in age, sex, period of teaching experience, locale of school (rural/urban) etc. Majority of

them do not participate in any in-service programme and some of them have experience of participating in in-service programmes. Those who do not participate in any in-service programme may not get opportunities to update their knowledge and those who participated also may not get a complete picture of the advancements in the field of biology education. Therefore, the investigator wishes to provide update knowledge in education through a self instructional material to the target group, so that they can use it at their own pace and by spending sufficient time. The following procedure was used to conduct the study.

PROCEDURE OF THE STUDY

The procedure for the conduct of the present study is as follows :

- a) Analysis of pedagogical theories to identify the necessary content areas for biology teacher education at secondary level.
- b) Thorough analysis of the prevailing B.Ed. Syllabi of some universities and to identify the gaps in the content with regard to update knowledge of biology teacher education.
- c) Analysis of the syllabus for in-service education of secondary school biology teachers, conducted by colleges of teacher education.

- d) Interviewing secondary school biology teachers to gather their opinions and suggestions regarding various aspects of in-service education and for the development of SIM.
- e) Preparation of a comprehensive syllabus for developing the SIP on the basis of the analysis of pedagogical theories, existing B.Ed. Syllabi, Syllabus for in-service education and the suggestions of secondary school biology teachers.
- f) The development of self-instructional package (print and Audio media) on the basis of the principles of ~~distance of the principles of distance~~ education.
- g) The validation of the developed package, for the development of the SIP.

The primary source of information for the development of the SIP was pedagogical theories, which enable the identification of necessary content areas for biology teacher education. The B.Ed. Syllabi prescribed by different universities were analysed on the basis of these criteria. The syllabus for in-service education of secondary school biology teachers conducted by College of Teacher Education also was analysed in this regard. The method used for the three steps of the procedure mentioned above was document analysis. An interview also was conducted with secondary school biology teachers to

realise their needs and to gather their suggestions regarding in-service education.

Document Analysis : According to Good (1971), "Content or Document analysis is the detailed evaluation and appraisal of the manifest and latent content of various types of communication". So, in the present study document analysis method was adopted to analyse source books and reports in order to identify the criteria for the selection of content for teacher education of secondary level biology. The method was also used to analyse the B.Ed. Syllabi prescribed by different universities, and the syllabus for the in-service education of secondary school biology teachers conducted by Colleges of Teacher Education.

Interview : Interview was another tool, used by the investigator to gather relevant information from secondary school teachers. According to Young (1979) "Interview can be defined as an effective, informal, verbal and non-verbal conversation, initiated for specific purposes and focussed on certain ^{content areas} planned ~~tool~~. As people are more willing to talk than to write, the questions can be explained to get valid responses. On the basis of its nature interview can be of two types.

They are :

- i) Structured interview, and

ii) Unstructured interview.

The structured form of interview uses a set of predetermined questions. It may often take the form of a questionnaire. The unstructured interview does not follow a set or a list of predetermined questions.

The detailed description of the whole procedure from steps 'a' to 'g' is divided into three major sections.

They are :

I - Procedure of Preliminary works

II - Procedure of Preparation of SIP.

III - Procedure of validating the SIP.

The detailed methodology is described below.

I - Procedure of Preliminary works

The procedure of preliminary works proceeds through steps 'a' to 'e' as described below.

a) **Analysis of the Pedagogical Theories.**

The documents such as National Policy on Education (1986), Review of NPE 1986 (Ramamurthi Committee 1990), Janardhana Committee on NPE (1992) Revised NPE (1992), and Programme of Action (1992) were used to identify the guideline for analysing the pedagogical theories.

The analysis of these documents provided a guide line which involved the following observations.

1. Science education should prepare the students to take up varied roles.

Students are able to :

- * take up differentiated roles of science.
- * Understand process of science.
- * inculcate values of human culture.
- * Proceed according to his own pace.
- * do practical exercises.
- * explain daily life phenomena.

2. Improvement in various aspects of teacher education such as,

- * Strategies of instruction.
- * Strategies of evaluation.
- * utilising resources and media for teaching.
- * management of classroom activities.

This guide line was used to identify the necessary criteria for selecting content for secondary level biology teachers education. The investigator analysed the available necessary books to identify the content for biology teacher education at secondary level.

The 'Biology Teaching Method' by Falk (1971), 'Biology Teachers Handbook' by klinckmann (1971), 'Inquiry Techniques for Teaching Science' by Roney (1968), 'Science Teaching and Testing' by Nedelsky (1965), 'A Source book for Biological Science' by Marholt, et. al (1958), 'Biology Teachers Handbook' by Schwab (1965), 'Models of Teaching' by Joyce & Weil (1985), 'Psychology of Learning and Instruction' by Dececco (1977), 'Objectives and Methods for secondary Teaching' by pierce & Lorber (1977), 'New Directions in teaching secondary school science' by Hurd (1971), 'Teaching Science creatively' by washton (1967), 'The Impact Science Teaching' by Vaidya (1971), 'Hand book on Supervised Teaching and field assignment' by R.C.E. Mysore, (1981), 'Intership in teaching - A Hand book' by RCE Mysore (1984), and A.V. Instruction by Brown, et. at. (1973) were the books analysed by the investigator to identify the content areas necessary for biology teacher education at the Secondary level.

The important content areas identified as necessary for a biology teacher by the analysis of pedagogical theories from the books mentioned above are as follows :

- i) The characteristics of a learner at secondary level.
- ii) Different aspects of planning for teaching biology at secondary level.
- iii) Instructional strategies in biology as explained through the models of teaching.

- iv) Preparation of accessory learning aids.
- v) learning equipment.
- vi) Resource units.
- vii) Strategies of evaluation in biology.
- viii) Steps in classroom management.

These are to be mastered by any biology teacher at the secondary level. Therefore these were considered as the criteria to identify the gaps in the existing B.Ed. Syllabi.

b) Analysis of the present B.Ed. Syllabi.

The investigator then proceeded to analyse the present B.Ed. Syllabi of different universities and other institutions in India. For this, the investigator first requested the different universities and other institutions such as NCERT & Regional Institute of Education to mail their B.Ed. Syllabi to him. All universities in Kerala, University of Madras, Annamalai University, Madurai Kamaraj University, Andhra University, Kakatiya University, Osmania University, Srivenkateswara University, Bhopal University, University of Rajasthan, Punjab University, Aligarh Muslim University, and University of Jammu were approached for this purpose.

All universities except the universities in Kerala and Madras University run distance mode B.Ed Course along with their regular B.Ed. Course. Hence the investigator specifically selected these Universities to get their B.Ed, Syllabi.

But none of these Universities responded. The investigator therefore approached in person some of the Universities and Institutions which are within his reach. Thus he could obtain the B.Ed. Syllabi of all Universities in Kerala and some from the other notable institutions like Regional Institute of Education and NCERT.

The B.Ed. Syllabi prescribed by University of Calicut, Mahatma Gandhi University, University of Kerala, Regional Institutes of Education, the syllabus outline for science methods course for secondary teacher education by NCERT, and the course outline for the four year B.Sc. Ed. Course of Regional Institute of Education were analysed using document analysis method to understand, whether the identified criteria are practiced in different institutions. This helped to identify the gaps in the existing content of secondary level biology teacher education in the different universities and other institutions sampled by the investigator. The syllabi analysed by the investigator are provided as appendix I-A to I-F respectively.

The major gaps identified are listed below :

1. Psychology of a learner at secondary level.
2. Pedagogical analysis in biology.
3. Extended curricular activities,
4. Utilising community resources, and
5. Minimum levels of learning.

c) **Analysis of the syllabus for In-service courses.**

In Kerala, the conduct of in-service courses to teachers of secondary level was started only recently. The institutions entrusted with this duty are the Institute of Advanced Studies in Education and Colleges of Teacher Education. It is understood that both of them follow almost the same syllabus for conducting in-service courses. The investigator, therefore, collected the syllabus used by the College of Teacher Education at Calicut meant for the in-service course the biology teachers, for the purpose of analysing the in-service course syllabus.

The analysis of the syllabus for in-service course was mainly focussed on the content and activities of the course syllabus. Thus it helped to verify which all gaps are to be filled up. The syllabus is given as Appendix - II.

The analysis showed the following inclusions as the content for the in-service course.

1. Aspects of lesson planning
2. New trends in teaching strategies
3. Newer developments in evaluation
4. Preparation of teaching aids.
5. Pedagogical analysis, and
6. Technique for effective learning.

Thus it can be understood that the secondary school biology teachers do not have update knowledge in these areas. Therefore these areas also were selected to be included in the proposed SIP.

In order to supplement the information obtained by the document analysis of pedagogical theories, B.Ed. Syllabi, and Syllabus for in-service course, an interview also was proposed to be used to gather relevant information from the secondary school biology teachers.

d) **Analysis of Teachers' views obtained through Interview.**

In the present study structured interview was conducted with secondary school biology teachers. Two separate interview schedules were prepared, one for the teachers who had not participated atleast once in an

in-service programme. The two interview schedules are given as Appendix III-A and III-B respectively.

The interview schedule for teachers who never participated in in-service programmes sought information regarding various aspects of in-service education such as the mode of the course, opinion about learning through a SIM, topics to be included, medium of instruction, style of presentation, suggestions of the respondents, etc. The schedule also gave provision to enquire about the major problems faced by them during the teaching situations.

The investigator interviewed sixteen secondary school teachers belonging to kozhikode and wayanad revenue districts under this sample. Among them due representation was given to sex, locale of the school, nature of school (boys/girls/co-educational schools) and type of school (Government/aided/unaided). The responses of the interviewees are summarised in Appendix IV-A.

The interview schedule for teachers who had participated in in-service programme consisted of some additional items (see Appendix III-B). The additional items pertain to different aspects of in-service education programmes such as its usefulness, applicability of content, continuous application, adopting new ways of teaching after attending the course,

adequacy of the course, etc. All the other items in the first schedule were included in the second schedule also.

The investigator interviewed twelve teachers who had participated in an in-service course of ten days duration conducted by the College of Teacher Education, Kozhikode. Among them due representation was given to sex, locale of school, nature of school and type of school. No representatives from unaided schools were obtained as unaided schools do not come under the scheme of in-service education conducted by the College of Teacher Education. The opinions and suggestions are summarised as Appendix IV-B.

The interview helped the investigator to collect valuable information regarding the needs of the teachers and the nature of course materials needed for them. The major information obtained through interview are the following.

- 1) All respondents stressed the need of in-service education.
- 2) Teachers were in favour of learning using a SIM.
- 3) They suggested topics such as instructional strategies, accessory learning materials, strategies of evaluation, etc to be included in the SIM.

- 4) They also suggested that the SIM should include newer advancements in teacher education. And it should be simple, precise and well designed for self-learning.

~~The gaps in the existing content of secondary level biology teacher education were identified.~~

e) **Preparation of A Syllabus for Developing the SIP :**

The gaps in the existing content of Secondary level biology teacher education were identified on the basis of the pedagogical theories, and the results of analysis of B.Ed Syllabi followed by different universities, syllabus for in-service education conducted by colleges of Teacher Education, and the information obtained through the interview of secondary level biology teachers. These could help to organise a syllabus outline for preparing the learning materials. The learning materials were to be essentially of distance mode, designed for self-learning of secondary school biology teachers.

In order to bridge the gaps in the existing content of biology teacher education, the following major areas were included in the syllabus outline according to the identified objectives. The objectives and areas of new content are given below.

Objectives

1. To develop an understanding of characteristics of a learner at Secondary level.
2. To develop a positive attitude towards evolving appropriate plans for biology teaching.
3. To apply the principles for analysing pedagogy in teaching biology.
4. To develop an awareness in adopting newer strategies of instruction in biology at secondary level.
5. To apply knowledge in preparing media and materials for teaching biology at secondary level.
6. To develop a positive attitude towards adopting newer strategies of evaluation.
7. To develop an awareness for proper classroom management.

Areas of Content :

The following areas of content are suggested to realise the objectives formulated.

1. Psychological considerations of a learner at secondary level.
2. Planning for teaching biology.
3. Pedagogical analysis in biology.
4. Instructional strategies in biology.
5. Media and materials for teaching biology.

6. Strategies of evaluation in biology.
7. Classroom management.

These areas were further classified into units, and each unit spelt out the details within it. These were arranged in the order of the objective formulated for the syllabus. The detailed syllabus is provided as Appendix V.

The above syllabus was used to develop the SIP for secondary school biology teachers.

II. Procedure of Preparation of SIP

This describes step 'f' of the total procedure. The procedure of preparation of SIP involves two sub-sections such as,

- i. The structure of a SIM.
- ii. Development of the self-instructional package which are explained as given below :

i) **The Structure of a SIM.**

In chapter II the necessary structure of a SIM is already presented under the section 'The Theoretical overview of SIM'. The detailed structure proposed for the present SIP is described here.

Self learning achieves a more importance now a days. The course materials for such distance mode courses are entirely different from the traditional text books in many respects. The design of self-instructional materials greatly depend on the nature of learners. In fact the learners can be of any age, with difference in experience in life. All these heterogeneity should be catered to while designing a SIM.

The size of the material depends on the amount of information contained in it. If the information contained is less, then the material would be treated as a unit. And if large amount of information should be covered through the material, as in the case of the present study, the whole material would have to be divided into Blocks, and sub divided into units. Each of such blocks should involve many related units-and each unit should involved related points of a single aspect given in different sections. Each block begins with a block introduction which provides an orientation to the information presented in different units. The details of the structure of a unit is given below.

Structure of a unit :-

The word 'Unit' implies a division of a block which includes the information pertaining to a single topic. The function of each unit is self-instruction. In order to guide self learning each unit in addition to covering the

subject matter has to provide orientation to the study, enough illustrations and effective style of presentation, and reinforcement, and feedback.

Beginning of a unit :

The beginning part of each unit serves to provide guidance to the learner regarding the content of the unit, how to approach the unit, and the expected outcome of the unit. As said earlier the contents of the unit is listed at the beginning of each unit. This enables to understand the inclusions of unit and to develop a suitable ^{plan for} learning. The objectives of the unit are stated followed by the content list. The objectives provide description of the expected learning outcomes and help the learners to decide how to approach the material and also to have self assessment of their learning. The objectives are to be stated in simple, clear and precise behavioural terms.

Just as the block introduction there is an introduction section in each unit of the material, which should come just after the objectives. Introduction should provide an overview of the unit, that is, what is going to be discussed in the unit, and it also mentions the important points of the unit. The introduction should be written in simple clear and precise manner so that the learner could easily get into the unit.

Body of a unit :

The body of the unit is the main part of each unit, which provides new and additional information to the learners. A unit will normally consist of a number of sections. The sectioning is based on the objectives of a unit. Usually each section is relating to a single objective. These sections will be arranged in a sequential order as in the order of the content list. The information should be presented in simple language, with familiar words, and short and precise sentences. The style of presentation should be as warm as possible so as to address the learner directly. On the contrary to the traditional text books, the content in the SIM should be explained in simple terms, with the help of suitable illustrations and diagrams so as to substitute classroom learning.

Apart from these there should be activities to be done by the learners also. They can be in the form of developmental questions given to be answered then and there in the material. Another type of activity which is given under the caption 'Learning Activity' can also be presented in specific points of the unit. This is meant to utilise the previous knowledge of the learner and also to provide a prediction of the coming information. Enough space should be given for the responding to Learning Activities.

Each section should be ending with an exercise for the self-assessment of the learner. These exercises are denoted using the caption 'Check Your Progress'. This is to give feedback to the learner as to the correctness of his learning. Possible answers for check your progress exercises should be given at the end of each unit. There should be enough space for answering such self-check questions, also. These exercises are distinguishable from the remaining content with the use of a change in typography. Necessary directions are also to be given along with the such exercises so that the learner could understand what he is expected to do.

The study of a complete unit in one sitting is generally not possible because of the length and depth of the units. A division into suitable sections provides stopping places within the unit. Such divisions will help the learner to begin and stop the study of any part of the material at his own pace and time suitable for learning. A learner can spend enough time to get mastery over the material. The scope for testing his progress in learning within short steps and provision for checking the correctness of answers will provide immediate feedback. According to the correctness of learning the learner could either pass on to next section or to revise the same section once again.

Ending a Unit :

The last section of a unit is meant for checking the achievement of learner in that unit by the learner himself. The ending part of each unit constitutes a summary of the unit under the caption 'Let us Sum Up'. This should come as the last ^{section of} each unit, which can be usually presented in the form of key points in each unit.

This section should enable the learner for the learning of the unit as a whole instead of individual sections. It also should help the learner to locate the points he had learnt properly, and to check whether further learning is required for any part of the unit.

The 'Possible Answer' Section should follow the 'Let us Sum Up' Section in each unit. The 'Possible Answer Section' will provide answers for the 'Check Your Progress' Exercises. This section should help the learner to check the correctness of his responses against the exercises. So the provision of immediate feedback and motivating the learner for further learning can be effected using this section.

In short, the structuring of the material as discussed above is appropriate to meet the individual differences and there by facilitating self-learning at a distance.

Organising the content in a Unit :

The selection and organisation of content within a unit is a very important step in the production of self-instructional materials. The major criteria for the selection of subject matter are :

- 1) relevance of the subject matter to the learners ;
- 2) ability of the matter to stimulate thinking or problem solving.

The following criteria can be used in the ordering of subject matter in SIM.

Specific	→	General
Easy	→	Difficult
Basic	→	Advanced
Simple	→	Complex
Familiar	→	Unfamiliar

The organisation of the presentation of subject matter is given below.

Organising the Presentation :

The effectiveness of a SIM depends on different aspects of presentation such as clarity of content, clarity of language, style of presentation, learning

activities, provision for motivating learners, exploiting learner's experiences, providing facilities for retention, Provision for transfer of learning, Provision for feedback, Provision for guidance and access devices, and quality of illustrations and explanations.

The ways of taking care of all these aspects while preparing a SIM are already discussed in Chapter II. Hence a repetition is avoided here.

Guidance for learning the material can be provided by means of introduction, anticipatory questions, typography and instructions. As stated earlier there will be a common introduction to the material in the form of 'Let us begin here' at the beginning of the material, introduction at the beginning of each block and introduction at the beginning of each unit. They will provide guidance for proper learning. The change in typography of headings, and running matter also provide guidance for self-learning. Instructions should be given at specific points to guide towards exercises and change the medium of the SIM wherever necessary.

Different structuring devices should be used to increase the accessibility of the material. The change in type face, and the system of using numbers to denote sections, sub-sections or sub-sections, will increase accessibility of the material. Different type faces should be used for major

headings, (Block, unit and Section headings) and for sub heading. Italics type is preferable to denote exercises, activities and possible answer sections. The numbering of units can increase the accessibility to a greater extent. For example take the case of Block I, Unit. I. of the present SIP. The sections were numbered as 1.0, 1.1, 1.2. 1.3, etc. and sub-sections 1.2.1, 1.2.2.....1.3.1, etc. and sub-sections were numbered as 1.2.1.1, 1.2.1.2. etc. Such a type of numbering will be highly preferable for a SIM.

The nature of illustration and diagrammes in the material also will influence the quality of the material. Illustration and diagrammes should be neatly drawn and adequately labelled. They should be correct and accurate and should be properly linked with the textual material.

The mechanical make up of the SIM is very important with regard to its utility. Mechanical qualities such as size and shape of the SIM, Nature of binding, Quality of paper used and Readability of the SIM are influential factors in this regard.

The medium type print on A-4 papers are commonly used internationally for Self-instructional materials. Half the size of A-4 papers also can be used for SIM. The binding of the textual material can be of spiral type or conventional type.

The size of the type face, (10-12 points) adequate space between lines, number of words per sentence, and marginal space determine the readability of the SIM. The utility of the material increases with the increase in readability.

Thus, a SIM should substitute classroom learning by providing appropriate objectives, proper presentation of content, motivating the learner, exploiting learner's experiences, providing learning activities, facilitating retention, promoting transfer of learning, providing enough feedback, providing adequate guidance and increasing the readability of the material.

The investigator had followed the above guidelines in the preparation of the present SIP. The next part of this chapter discusses how the present SIP was developed following the structure described above.

ii) Development of the Self-Instructional Package.

A flow chart of the present SIP and its unit are given before the detailed discussion. (See Figures 1 & 2) The whole material of the present SIP includes two components such as a Self-Instructional text in print, and as audio cassette bearing selected illustrations of the textual material. The printed text was developed by considering all the aspects required for an effective SIM. It has the following features of Self-learning at a distance.

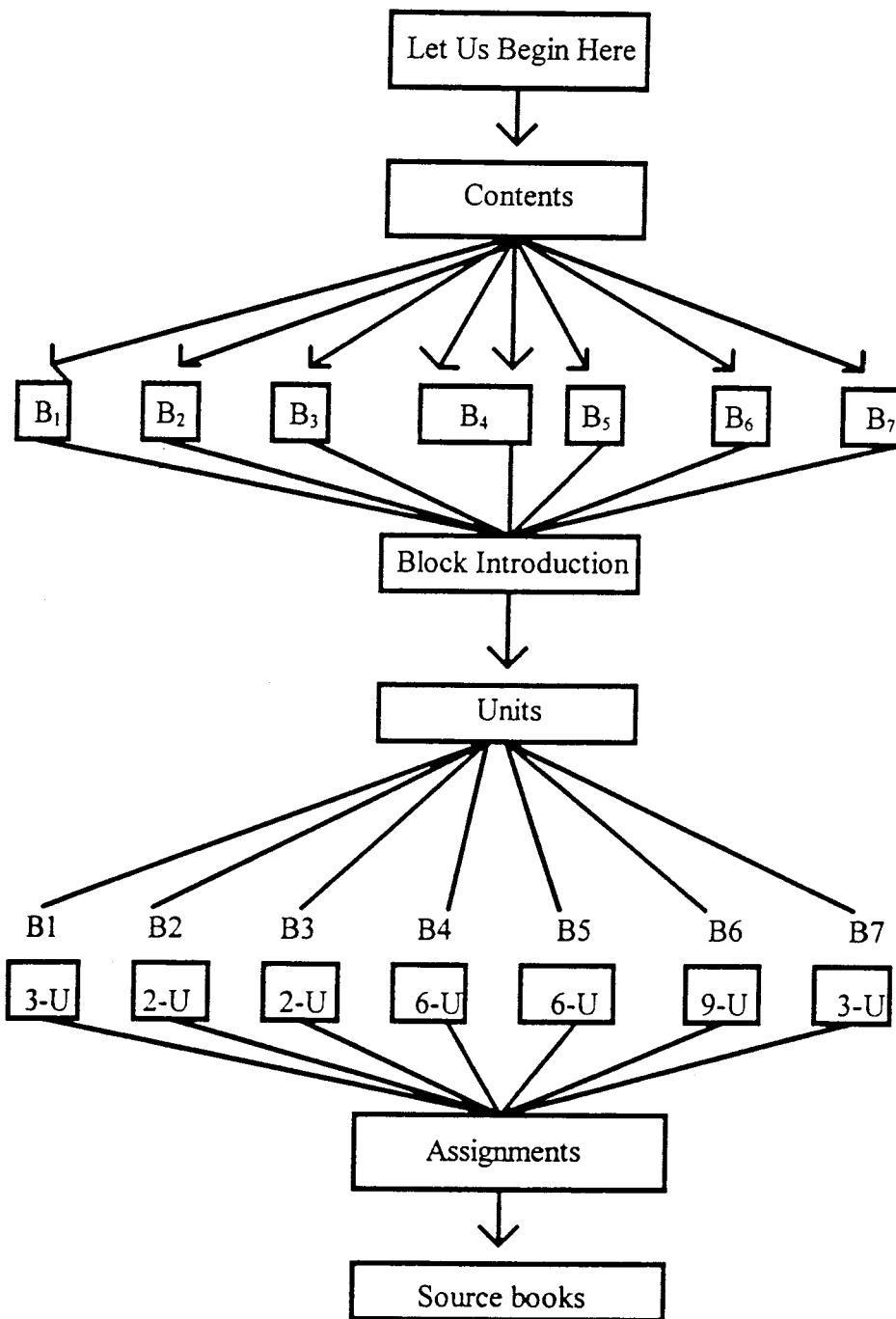


Fig.1. Flow Chart of the Present SIP.

Flow Chart of a Unit in the Present SIP.

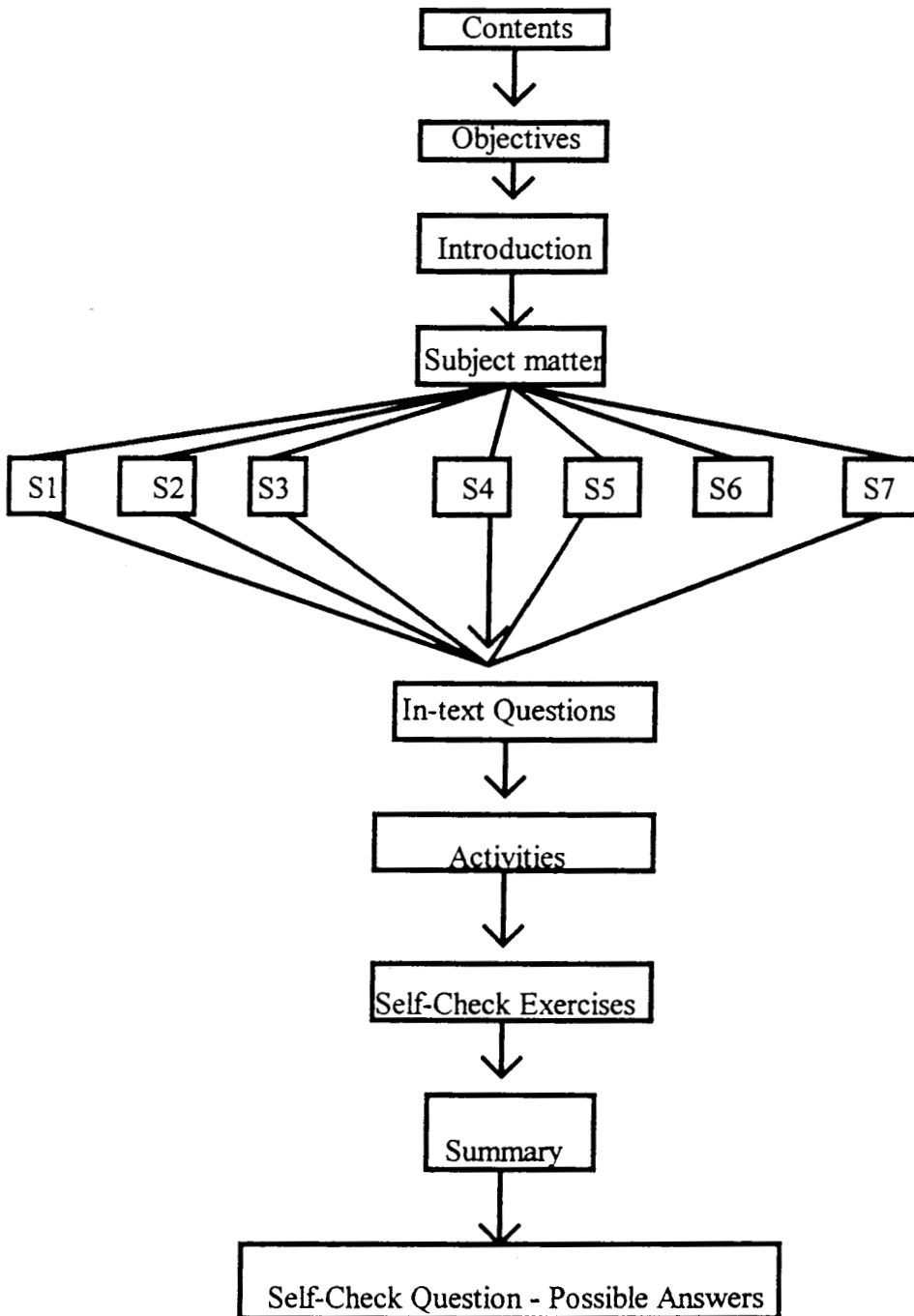


Fig. 2. Flow Chart of a Unit in the Present SIP.

Note : Every unit of the developed SIP followed the similar format.

The present SIP started with a content list which involves the names of blocks in the material. This is followed by a 'Let Us Begin Here' Section, which provide a proper guidance to the learner about the format of the material and how to approach the material for learning.

The whole material of the SIP was divided into seven blocks. Each of the blocks was pertaining to a major objective and area of content identified. The number of units presented in each block was varying with the amount of content presented in each. Each block began with a list of ^{units} in it followed by block introduction, which was meant to provide an orientation towards the information presented in it.

A block usually ended with Assignment questions, which was meant for facilitating the learning of the material in the block as a whole, instead of individual units.

Altogether there were thirty one self-learning units in the SIM of the present study. Each unit began with list of contents followed by the sections such as objectives and introduction. The objectives were stated in simple, clear and precise behavioural terms. The introduction also was written using simple language so that the learner could easily get into the unit with necessary background knowledge.

The subject matter was divided into different sections. The sectioning was based on the objectives of each unit. The information was presented in simple language with familiar words and short and precise sentences. Suitable illustrations, diagrams, and explanations were used to present the content matter. The whole material was presented in personalised style. There were activities under the caption 'Learning Activity' at specific points of the content, which could help to think analytically further and provide a prediction of coming information. Each section ended with a 'Check Your Progress' exercise. This was used to provide feedback to the learners and also to check the correctness of their learning. Enough space was given for answering learning activities, and check your progress exercises. Possible answers were given for check your progress exercises at the end of each unit, while no such answers were given for learning activities, but they were discussed in the body of the unit. Both learning activities and check your progress exercises were printed in italics type face. Necessary directions were provided along with the exercises, to provide adequate guidance to learners.

The 'Let us Sum Up' Section at the end of each unit was helpful for the learning of the unit as a whole and for facilitating retention.

In addition to these, adequate provisions were made in the material for motivating learners, exploiting learner's experiences, providing facilities for

retention, provision for transfer of learning, provision for guidance and accessibility and suitable mechanical qualities.

Typography, introduction section, directions and cross references were suitable for providing guidance for learning. Structuring devices such as change in typography, typeface, and numbering system were meant to increase the accessibility of the SIM.

The illustrations and diagrams used were neatly drawn, adequately labelled and properly attached with the textual material.

The size of the paper used was slightly smaller than A-4 size, with ordinary binding, which was suitable for easy handling. The type face used for running matter was of ten point, and a single space was given in between two lines. Adequate marginal space was given on all the four sides.

Thus the investigator developed the SIM by involving all the necessary aspects required for an effective SIM. The information under each content area was collected from a wide variety of source books, (source books of each block are cited at the end of each block in the material) journal articles, and from discussion with experts. The points where clarification was necessary in the content were decided based on the personal experiences of secondary

school teachers, Secondary School pupils and on the personal experiences of the investigator.

The investigator tried hard to provide up-date information regarding all the topics discussed in the material. He had also studied in detail how to develop the self learning materials of distance mode. This enabled him to finalise the format of the material.

The audio cassette was prepared as a supplementary material, the procedure of which is given below.

Supplementary Material :

In order to supplement the self learning materials in print, the investigator prepared audio materials on selected topics of the syllabus. The topics included the illustrations for instructional strategies for secondary level biology teaching such as Concept attainment model, Advance organiser model, Biological Science inquiry model, Cognitive Growth model and Group investigation model.

Suitable content area from the secondary level biology was selected and converted it in the form of respective model of teaching, by following the

same sequential phases of each model. Each illustration was designed in the form of the actual classroom situation, so that the learner would get a clear picture of each teaching strategy given in the illustration.

The illustrations were arranged in the audio cassette in the same order in which the teaching models were arranged in the printed material. Specific directions were given at the relevant points in the printed text, to which the audio illustrations were linked. Each illustration begins with an announcement about the name of the model illustrated and ends with the direction to change the medium, that is, to turn back to the printed material.

The investigator made the illustrations in the manner of an actual classroom set up, by using the sounds of bell, distinguishable sounds of teacher and different students, sounds of writing on the black board, and by the difference in loudness of sound of students. All these sounds together with the sound of natural situations provided an original classroom like environment for each illustration.

All these aspects of the audio material were meant to increase the effectiveness of the audio component as a part of the self-instructional package.

Thus the final SIP involved self-instructional material in print, and an audio cassette. These two components were firmly attached together by means of a polythene bag, so as to use it as a package of self-learning materials.

The investigator made his maximum effort to make the study fruitful by following all the essential features of a self-instructional material and audio supplementary material. Thus it is hoped that the SIP developed by the investigator is suitable for the in-service education of secondary level biology teachers. A copy of the developed package is presented as Appendix. VI.

Both the textual material and the audio cassettes were then duplicated. The text was duplicated using xeroxing of the computer print out of the material. The master audio cassette was duplicated using an audio recording system. Both these components were attached into adequate number of self-instructional packages for validation. These packages were then administered to the selected 200 secondary school biology teachers.

III. Procedure of validating the SIP.

The following steps were taken by the investigator for the validation of the package.

- i) Administration of the SIP to a sample target group.

- ii) Development and administration of Achievement Tests on the basis of the SIP to a sample and estimating the percentage of achievement.
- iii) Estimation of error rate in the Achievement Tests.
- iv) Development of a Questionnaire for the qualitative assessment of the effectiveness of the SIP and its administration to the sample target group followed by its analysis.
- v) Seeking opinion of Experts in the field of Education/Distance Education regarding the effectiveness of the SIP.

The details of procedure of validating the package is explained in three Sub-sections.

- i) Tools,
 - ii) Sample, and
 - iii) Techniques of analysis.
- i) **Tools :**

In the present study the investigator developed two Achievement Tests and a questionnaire on the basis of the SIP. Using the procedure given below.

Development of Achievement Tests :

The investigator initially decided to develop an achievement test on the basis of the SIP. But by realising the depth of the material he finally decided to conduct two achievement tests each of three hours duration. The

percentage of scores on the achievement test was to be treated as an index for the effectiveness of the material. Details of the development of the achievement tests are given below.

Fixing up of topics to be included in both of the achievement tests was the first task in the development of the test. The investigator decided to include Blocks 2,3,4, & 5 in Achievement test I and Block 1,6 & 7 in Achievement test II. The topics under Achievement test I included different aspects of instruction such as planning, pedagogical analysis, instructional strategies, and media and materials required for instruction. Since all these topics are in close association with each other the investigator decided to include them together under Achievement test I. In addition to this, these blocks include information in sixteen units, that is nearly half of the total content of the SIM.

Blocks 1,6 & 7 are the psychological considerations of a learner, strategies of evaluation and classroom management respectively. These topics are interconnected and essential for complementing effective instruction. So the investigator included them under Achievement test II.

Preparation of the Achievement tests :-

The question papers for achievement tests were developed using the standard procedure for the preparation of achievement tests. Preparation of Achievement test I and Achievement test II are described below.

Achievement test I.

In order to prepare the test, adequate weightage was given to content, objectives, and type of questions.

Weightage to content :

In this step the content areas to be tested were selected and weightage for each content was given. See table. 1.

TABLE 1

Weightage to Content of Achievement Test I

Sl. No.	Content	Marks out of 100	% of marks
1.	Planning for teaching biology at secondary level	20	20
2.	Pedagogical analysis of secondary level biology	10	10
3.	Instructional strategies in biology	35	35
4.	Media & materials for teaching biology	35	35
Total		100	100

The investigator decided to provide maximum weightage to Block 4 & 5 (35% each), 20 percent to Block - 2 and 10% percent to Block - 3, depending on the depth of the content in the material.

Weightage of Objectives.

In this step adequate weightage was given to objectives according to its importance see table - 2.

TABLE 2

Weightage to Objectives of Achievement Test I

Sl. No.	Objectives	Marks out of 100	% of marks
1.	Understanding	65	65
2.	Application	35	35
Total		100	100

The investigator decided to select two objectives namely understanding and application to be tested, and to provide more weightage to understanding (65%) than application (35%), according to the importance of them.

Weightage to type of Questions.

In this step proportionate weightage was given to type of Questions.

See table. 3.

TABLE 3

Weightage to Type of Questions of Achievement Test I

Sl. No.	Type of Questions	Marks out of 100	% of marks
1.	Short essay type	60	60
2.	Essay type	40	40
Total		100	100

The investigator selected short essay type and essay type questions in the test. More weightage was given to short essay type (60%) than essay type (40%) according to the importance of the type for coverage of complete content.

Scheme of Options :

No option was given in the Achievement test I as the Test was intended to know mastery of all the selected content.

Scheme of Sections :

Two sections such as section A and Section B were present in the test. Section A dealt with essay type questions and section B include short essay type questions.

Blue print :

All these aspects were included to develop a blue print for the Test I.

See figure 3.

Sl. No.	Objectives	Understanding		Application		Total
		S	E	S	E	
	Type of questions → ↓ content					
1.	Planning for teaching Biology at seco. level	2(10)		2(10)		4(10)
2.	Pedagogical analysis of seco. level Biology	2(10)				2(10)
3.	Instructional strategies in Biology	3(15)			1(20)	4(35)
4.	Media & materials for teaching Biology	2(10)	1(20)	1(5)		4(35)
Sub total		9(45)	1(20)	3(15)	1(20)	
Total		10(65)		4(35)		14(100)

Fig. 3. Blue print of Achievement Test I

~~Figure 3. Blue print of Achievement Test. I.~~

Achievement Test I was developed on the basis of this blue print. The Test - I consisted of fourteen questions^{for} a total of one hundred marks. Questions were arranged in sections A and B. Each essay question carried 20 marks, and each short essay question carried 5 marks. A scoring scheme also was prepared by the investigator for valuing the answers in response to Achievement Test I. The Achievement Test I and its scoring scheme are given in Appendix No. VII. A & B.

Achievement Test II

In order to develop the Test II proportionate weightage was given to content, objectives and type of questions.

Weightage of content

In this step the content areas to be tested were selected and weightage was given for each. See Table. 4.

TABLE 4

Weightage to Content of Achievement Test. II

Sl. No.	Content	Marks out of 100	% of marks
1.	Psychological considerations of a learner at the secondary level	25	25
2.	Strategies of evaluation in biology	50	50
3.	Classroom management	25	25
Total		100	100

The investigator to provide maximum weightage to Block 6(50%) and 25 percent each to Block 1 and 7 depending on the depth of the content.

Weightage to objectives

In this step adequate weightage was given to objectives according to its importance. See table 5.

TABLE 5

Weightage to Objectives of Achievement Test II

Sl. No.	Objectives	Marks out of 100	% of marks
1.	Understanding	65	65
2.	Application	35	35
Total		100	100

For this Test also, the investigator decided to select two objectives namely understanding and application to be tested and to provide more weightage to understanding (65%), than application (35%) according to their importance.

Weightage to type of questions.

In this step proportionate weightage was given to type of questions.

See table 6.

TABLE 6

Weightage to Type of Questions of Achievement Test II

Sl. No.	Type of Questions	Marks out of 100	% of marks
1.	Short essay type	60	60
2.	Essay type	40	40
Total		100	100

The investigator selected short essay type and essay type questions in the test. More weightage was given to short essay type (60%) than to essay type (40%) according to their importance for coverage of the content.

Scheme of Options

As in the case of test I no option was given in test II also.

Scheme of Sections.

As in the case of test I two sections, namely section A and B were present in the second test also. Section A dealt with essay type questions and section B contained short essay type questions.

Blue print :

All these aspects were included to develop a blue print for the test II, which is given in figure. 4.

Sl. No.	Objectives	Understanding		Application		Total
		S	E	S	E	
	Type of questions → ↓ content					
1.	Psychological consideration of a learner at secondary level	3(15)	1/2(10)			3 1/2(25)
2.	Strategies of Evaluation in Biology	4(20)		2(10)	1(20)	7(50)
3.	Classroom Management	2(10)	1/2(10)		1(5)	3 1/2(25)
Sub Total		9(45)	1(20)	3(15)	1(20)	
Total		10(65)		4(35)		14(100)

Figure. 4 : Blue Print of Achievement Test II.

Achievement Test II was developed on the basis of this blue print. The Test II also contained fourteen questions for a total of one hundred marks. Questions were arranged in Sections A and B. Each essay question carried 20 marks and each short essay question carried 5 marks. A scoring scheme was prepared by the investigator for valuing the answers of learners in response to Achievement Test II. The Achievement Test II and its scoring scheme are given in Appendix. VIII - A & B.

Development of the questionnaire :

A questionnaire was developed by the investigator to gather relevant information about the effectiveness of the SIP. The constructionas for preparation of the questionnaire were taken from the theoretical frame work of the SIM.

The questionnaire used in this study consisted of two kinds of items, such as closed form and open form. The questionnaire was developed on the basis of the dimensions given below.

- i) General data of Secondary school biology teachers.
- ii) Aspects of organisation of the SIM.
- iii) Aspects of presentation of the SIM.
- iv) Mechanical make up of the SIP.
- v) Aspects of audio component., and
- vi) General opinion about the SIP.

Different criteria under these dimensions were utilised for making the items of the questionnaire. The criteria are given below.

i) General data of Secondary school Biology teachers :

The first part of the questionnaire was to gather the general data of teachers such as their age, sex, educational qualifications, teaching experience, locale of the institution, and management of institution. This part was included to ensure that enough representation was given to all these strata in the sample.

ii) Aspects of organisation of the SIM :

The criteria under the dimension of organisation of the SIP utilised for making the items in the questionnaire were,

- * relevancy of the content included,
- * depth of the content included,
- * appropriateness of the objectives selected.
- * Adequacy of content.
- * correctness of information
- * Adequacy of content
- * maintenance of continuity of content
- * Arrangement of Sections
- * Statement of objectives
- * Arrangement of units
- * length of units
- * effectiveness of SIM to fulfil learner's needs.

Various items were formulated on the basis of these criteria to evaluate the organisational part of the SIM.

iii) Aspects of presentation of the SIM :

The criteria under the dimension of presentation of the SIM were as follows :

- * Clarity in presentation
- ~~* Clarity in presentation~~
- * Clarity of explanations
- * usefulness of examples
- * Appropriateness of media used
- * Style of presentation
- * Style of explanations
- * Suitability of structuring of the SIM.
- * Adequacy of learning activities
- * Relevancy of learning activities
- * Arrangement of learning activities
- * Nature of learning activities
- * Appropriateness of activities & exercises
- * Appropriateness of self-check questions
- * Style of self-check questions
- * Difficulty level of self-check questions

- * Adequacy of cross references
- * Appropriateness of directions
- * Difficulty level of assignment questions
- * Appropriateness of assignment questions
- * Style of assignment questions
- * Level of assignment questions
- * Suitability of application type questions
- * Nature of explanations
- * Linking of explanations with life
- * Exploiting learner's experiences
- * Link between information in the SIM
- * Adequacy of cross-references
- * In-text questions and retention
- * Summaries and retention
- * Self-check questions and retention
- * Possible answers and retention
- * Illustrations, explanations and retention
- * Meaningful presentation and retention
- * Questions and transfer of learning
- * Provision for transfer of learning
- * Interest in learning
- * Nature of feedback

- * Possible answers and feedback
- * Let Us Sum Up Sections and feedback
- * Self-check questions and feedback
- * Usefulness of assignments
- * Adequacy of references
- * Suitability of typography
- * Suitability of numbering
- * Appropriateness of headings
- * Appropriateness of Introduction Sections
- * Simplicity of Introduction Sections
- * Provision for clarification of doubts
- * Clarity of directions
- * Nature of diagrams
- * Correctness of diagrams
- * Clarity of diagrams
- * Link between diagrams with the content

Various items were formulated on the basis of these criteria to evaluate the effectiveness of the aspects of presentation of the SIM.

iv) Mechanical make up of the SIP.

The criteria under the mechanical make up^{of} the SIP were.

- * mechanical qualities of SIP such as size and shape, nature of binding, quality of paper used, and nature of attachment of audio component.
- * readability of the SIM such as number of words per sentence, size of type, space in between lines, and marginal space.

Different items were formulated on the basis of these criteria to evaluate the mechanical make-up of the SIP.

v) Aspects of the audio component :

The items dealing with the quality of audio component were based on the criteria such as,

- * Correctness of the content in the illustration
- * Audibility of the cassette
- * time used for the illustration
- * sequencing of content in the oral presentation.
- * nature of pauses
- * correctness of pronunciation, and
- * overall impression of the cassette.

Items based on these criteria were helpful to evaluate the effectiveness of the audio component of the SIP.

vi) General Opinion about the SIP :

The items pertaining to this dimension involved opinion of the learners regarding any addition, or deletion or modification of any part of the SIP. The items in this area were of open form in nature.

Items pertaining to all these dimensions were logically arranged to develop the questionnaire used for collecting relevant data from the secondary school biology teachers for the present study. The total number of items in the questionnaire was ^{ninety five} 95. A sample questionnaire is given as Appendix VIII. The responses were meant for qualitative analysis.

ii) **Sample :**

The target group of the present study was secondary school biology teachers. Since the population of the secondary school biology teachers is very large, the investigator thought to limit his study to the selected representatives of the population belonging to four revenue districts of Kerala such as Kannur, Wayanad, Kozhikode and Palakkad. The investigator had collected the list of biology teachers in those four districts which came upto nearly 1500. He then wrote to them about the SIP and the project. Many of them wrote back to the investigator which showed their interest to take part in the programme. The investigator then randomly selected fifty teachers from those who were willing from each of the four districts so as to get a sample

size of two hundred. This was nearly thirteen percent of the population of biology teachers in the said districts.

The investigator could conduct the present study on a sample size of 178 (11%) for the questionnaire and 57 (3.8%) for the achievement tests.

iii) Techniques of analysis :

The techniques of analysis involved the techniques given below.

- a) Estimation of the percentage of achievement.
- b) Estimation of error rate in the Achievement Tests
- c) Qualitative assessment of the SIP using tables and percentages, obtained by the analysis of the questionnaire.
- d) Opinion of experts in the field of Education/Distance Education regarding the effectiveness of the SIP.

a) Estimation of the Percentage of achievement :

The effectiveness of the SIP was proposed to be decided by estimating the percentage of sample obtaining a particular level of achievement. For this a hundred point scale was converted into a five point scale, for the purpose of assigning grades according to the percentage of marks secured in the achievement tests.

The categorisation selected for this was as follows ;

81	to	100	-	Excellent	-	A
61	to	81	-	Very good	-	B
41	to	60	-	Good	-	C
21	to	40	-	Poor	-	D
0	to	20	-	Very Poor	-	E

Letter grades A to E were used for the sake of convenience. Letter 'A' stands for Excellent, 'B' for Very Good, 'C' for 'Good', 'D' for 'Poor', and 'E' for 'Very Poor' performance. The scores obtained in the achievement tests were converted to percentages. The number of individuals coming under each category was to be estimated. The percentage of individuals in each category was taken as an index for the effectiveness of the SIP.

In addition to this the investigator proposed to compute the mean percentage of score in the achievement tests. A high mean percentage score in the achievement will be an indication of the effectiveness of the SIP.

b) **Estimation of Error rate :**

The investigator decided to estimate the error committed by the teacher in the Achievement Tests as an index for the effectiveness of the SIM.

The error rate can provide information about the total percentage of errors committed in the Achievement Tests.

Error rate can be computed using the following formula.

$$\text{Error rate} = \frac{\text{Number of errors committed by 'N' individuals}}{\text{Number of questions} \times \text{'N'}}$$

Number of errors was to be obtained by the addition of the errors made by each individual in both the tests. The sum total of errors committed by the total individuals underwent the testing was obtained by the addition of errors made by each individuals. In the present study number of individuals were 57 and the number of questions (i.e., maximum correct answer points) were 200.

c) **Qualitative assessment using tables and percentage :**

The data obtained from the questionnaire was proposed to be tabulated and converted into tables and percentages. The percentage of the sample favoured a statement was taken as an index for the effectiveness of that dimension of the SIP. Thus the favour of the sample towards all items were tabulated to estimate the effectiveness of the SIP. The dimensions of the SIP involved those of organisation, presentation, mechanical make up, quality of audio component, and general opinion. So items pertaining to all these dimensions were thoroughly analysed to realise the quality of the package.

Procedure of Administration of Tools :

The developed SIP was supplied to the selected sample in the first week of June 1997. After seeking the opinion of the eachers, a period of four months was fixed for learning through the SIP and getting mastery over the content.

After this period was over, it was time to validate the SIP. The investigator conducted two achievement tests on 11th October 1997, at three different venues, namely, G.H.S. Poonur - Kozhikode, G.H.S.S. Thariyade - Wayanad, and G.H.S. - Palakkad, in the three different districts simultaneously. The investigator was not able to provide a venue in Kannur district due to unavoidable reasons.

The investigator consulted the heads of the institutions of the three centres well in advance and got permission for the conduct of the test. A staff member from each of these centres was entrusted to supervise the testing. The question papers were personally delivered by ~~kept in safe~~ the investigator ^{and kept in} safe custody at the office of each centre.

Achievement test I was conducted from 9.30 am to 12.30 pm and achievement test II was conducted from 1.30 pm to 4.30 pm of 11th October

1997. The date and venue of the examination was informed to the 200 teachers who were taken as sample for the study, three weeks before the conduct of the tests. But only 57 subjects had turned up for taking the tests.

Administration of the questionnaire :

The questionnaire was then administered to the 200 secondary school biology teachers, who were selected as the sample for the study. The questionnaire was administered to the teachers in the second week of September. One hundred and seventy eight teachers filled in the questionnaire and returned them. Four teachers informed the investigator that they were not able to continue with the programme due to personal problems, the remaining eighteen teachers did not return the questionnaire.

The questionnaire was analysed to get valuable information about the effectiveness of the SIP.

Scoring

The answer sheets of the respondents to the two achievement tests were valued using the scoring scheme developed for tests I and II. The marks obtained for each respondent were converted to percentages. The average

percentage of the two tests for each respondent was then tabulated. These percentages were then used to estimate the percentage of achievement and mean percentage.

Opinion of experts in the field of Education :

Opinion of experts in the field of education was also taken as an index for ensuring the effectiveness of the SIP developed by the investigator.

The investigator gathered opinion of experts during the different phases of the preparation of the SIP. He had consulted experts from the very beginning of the study, i.e., for finalising the syllabus of the SIP. The investigator had also sought guide lines ^{for} ~~from~~ the content and format of the SIM from different experts in the field of education.

Also, the final SIP was given to few experts in the field of distance education to realise the effectiveness of it for self-learning. Their opinion was proposed to be taken as a direct index of its effectiveness.

The results of the analysis of effectiveness of the SIP are presented in Chapter IV.

CHAPTER IV

ANALYSIS

* Analysis of Scores of Achievement Tests.

* Estimation of error rate.

* Analysis of data obtained through the questionnaire.

* Analysis of expert opinion about the SIP.

* Finalisation of the SIP.

14
NB-2650



ANALYSIS

This chapter deals with the Analysis of data gathered using the two achievement tests and the Questionnaire for secondary school Biology teachers. The systematic analysis of this data is hoped to provide valuable information about the effectiveness of the SIP.

Analysis of the data proceeded through three sections. They are :

- Section I Analysis of scores of achievement tests.
- Section II Estimation of Error Rate, and
- Section III Analysis of data obtained through the Questionnaire.

Section III was sub-divided according to the Sections in the Questionnaire such as Analysis of general data, Aspects of organisation of the SIM, Aspects of presentation of the SIM, Aspects of Mechanical make up of the SIP, Aspects of Audio component of the SIP, and General opinion about the SIP.

I. ANALYSIS OF SCORES OF ACHIEVEMENT TESTS:-

The scores of the two Achievement Tests were analysed as follows. The scores of each subject on each Achievement Test, percentage of marks of

each subject based on both Tests, grade obtained and total error committed by each subject are given in table 7.

TABLE 7

Scores and Results of Analysis of Scores on Achievement Tests

Sl. No.	Reg. No.	Marks in Test I	Marks in Test II	Percentage of marks	Grade	Total Error
1.	101	61	60	60.5	B	79
2.	102	67	69	68	B	64
3.	103	57	61	59	C	82
4.	104	73	67	66.5	B	60
5.	105	72	70	71	B	58
6.	106	62	73	67.5	B	65
7.	107	66	64	65	B	70
8.	108	81	75	78	B	44
9.	109	78	80	79	B	42
10.	110	63	66	64.5	B	71
11.	111	73	65	69	B	62
12.	112	68	76	72	B	56
13.	113	71	69	70	B	60
14.	114	65	59	62	B	76
15.	115	56	60	58	C	86
16.	116	70	73	71.5	B	57
17.	117	68	78	73	B	54
18.	118	62	63	62.5	B	75
19.	119	58	60	59	C	82
20.	120	61	58	59.5	C	81
21.	121	77	81	78	B	42
22.	122	69	71	70	B	60
23.	123	52	61	56.5	C	87
24.	124	63	70	66.5	B	67
25.	125	61	64	62.5	B	75
26.	126	62	58	60	C	80
27.	127	59	66	62	B	75
28.	128	79	77	78	B	44
29.	129	70	68	69	B	62
30.	130	68	71	69.5	B	61
31.	131	66	61	63.5	B	73

Sl. No.	Reg. No.	Marks in Test I	Marks in Test II	Percentage of marks	Grade	Total Error
32.	132	71	70	70.5	B	59
33.	133	70	72	71	B	58
34.	134	74	63	68.5	B	63
35.	135	62	70	66	B	68
36.	136	55	61	58	C	84
37.	137	60	71	65.5	B	69
38.	138	75	74	74.5	B	57
39.	139	69	77	73	B	54
40.	140	86	83	84.5	A	31
41.	141	64	55	59.5	C	81
42.	142	61	67	64	B	72
43.	143	76	58	66	B	66
44.	144	66	71	68.5	B	63
45.	145	62	69	65.5	B	69
46.	146	64	62	63	B	74
47.	147	58	65	61.5	B	77
48.	148	75	76	75.5	B	49
49.	149	67	77	72	B	56
50.	150	61	62	61.5	B	77
51.	151	71	75	73	B	54
52.	152	71	69	70	B	60
53.	153	55	53	54	C	92
54.	154	80	85	82.5	A	35
55.	155	75	79	77	B	46
56.	156	52	57	54.5	C	91
57.	157	63	61	62	B	76

Analysis of the scores of the Achievement Tests shows that the scores were ranging between 54 and 84.5. On the basis of the grading system explained in the methodology, the scores obtained for the fifty seven individuals were graded as in table 8.

TABLE 8

Percentage of Teachers in Each Grade of Achievement

Sl. No.	Range of Marks	Grade	Number of individuals	% of teachers
1.	81 -- 100	A (Excellent)	2	4
2.	61 -- 80	B (V. Good)	45	78
3.	41 -- 60	C (Good)	10	17
4.	21 -- 40	D (Poor)	--	--
5.	0 -- 20	E (V. Poor)	--	--
Total			57	100

It is evident from Table 8 that 3.5% of the total individuals secured more than 80 % of marks, 77.25% of individuals performed in a very good manner between 61-80 percentage of marks and the remaining 19.25% of individuals showed good performance, that is, in the range between 41-60 percentage of marks; but it may be pointed out that the least mark secured was 54.

The results indicate that almost all respondents showed good performance in the Achievement Tests. This shows that the present SIP is effective to provide self instruction for the in-service education of secondary level biology teachers.

Mean percentage of score in the achievement tests also was found out. The mean percentage was 67.4. Though this percentage is not nearing perfection, it can come in the B grade or 'Very Good' category as described above. So the percentage analysis of achievement shows that the SIP is effective upto a "Very Good" extent.

II - ESTIMATION OF ERROR RATE

Data obtained on the Achievement Tests can be analysed also to estimate the error rate committed by the individuals in the achievement tests. Error rate also can be taken as an index of the effectiveness of the SIP. Error rate can be estimated by using the following formula.

$$\frac{\text{Number of Errors committed by N students}}{\text{Number questions} \times N} \times 100.$$

The error rate in the Achievement Tests of the present study can be calculated using this formula as follows.

Number individuals	- 57
Number of Errors committed by 57 individuals	- 3725
Number questions	- 200
So the error Rate	= $\frac{3725}{200 \times 57} \times 100$
	= 32.68

The error rate will be decreasing according to the increase in learning. In the present study the error rate is 32.68 which is not so low. This may be because of two reasons.

The first reason is that this study could not be conducted as a systematic course, instead it was conducted along with the teachers' regular works. So they might have got only limited time to learn the material. The second reason is that the present study was conducted within a very limited time span of four months. Though the teachers themselves had agreed for the time of four months, most of them had complained about limitation of time when they reported for the testing. If more time had been given to subjects for learning, more mastery would have been obtained. So it is assumed that by providing ample time for learning the present SIP the error rate can be lowered to its minimum.

Comments and Conclusion :

The analyses of sections I & II were the analyses of the scores obtained on the Achievement Tests. This quantitative analyses have proved that the developed SIP is effective upto a 'Very Good' extent. The findings have shown that the achievement could not come upto the maximum and the error rate could not go upto the minimum. Still, with just four months'

learning of the SIP the average performance could come upto 68% and error rate is only 32%. Therefore it would be hoped that, if teachers used the SIP as often as necessary, with its able assistance, their biology education could be more effective upto an excellent level. (It may be pointed out that the Achievement Tests had contained questions for applying the knowledge gathered from the SIP to actual situations). Thus, it is concluded that the quantitative analysis proves that the SIP develop in the study is valid for the use of secondary school biology teachers' for their self-learning.

In the next section the qualitative analysis of the validity is attempted.

III ANALYSIS OF DATA OBTAINED THROUGH THE QUESTIONNAIRE.

The questionnaire used for this study has six aspects as given in Chapter III. The aspects are i) General data of Secondary School biology teachers. ii) Organisational aspects of the SIP iii) Presentation aspects of the SIP. iv) Mechanical make up of the SIP. v) Aspects of Audio Component, and vi) General Opinion about the SIP. The data obtained through the questionnaire has been analysed and the results are discussed below. Each aspect analysed is first provided in the corresponding table and its description follows.

i) **General Data of Secondary School Biology Teachers :**

The General Data of Secondary School Biology teachers showed difference in data regarding Age, Sex, Teaching experience, Nature and Location of institution. This analysis was done to ensure adequate representation from each of these strata in the final sample. The details of the sample obtained are discussed below.

TABLE 9

Age wise Distribution of Secondary School Teachers

Sl. No.	Age	Number	%
1.	Below 30 Yrs.	1	0.56
2.	30 - 35 Yrs.	44	24.72
3.	36 - 40 Yrs.	78	43.82
4.	41 - 45 Yrs.	53	29.78
5.	Above 45 Yrs.	2	1.07
Total		178	100

There was only one teacher who was below 30 years, 44 teachers were in the age group of 30-35 years, 78 teachers were belonging to the age group of 36-40 years, 53 teachers were belonging to the age group of 41-45 years

and only 2 teachers were above 45 years of age. About 75% of teachers were above 36 years. The age of the teachers influence the results of the present study.

Sex - wise Distribution of Secondary School Teachers.

TABLE 10

Sex - wise Distribution of Secondary School Teachers

Sl. No.	Sex	Number	%
1.	Male	102	57
2.	Female	76	43
Total		178	100

Among the teachers responded to the questionnaire 57% were males and 43% were females.

Teaching Experience of Secondary School Teachers.

TABLE 11

Teaching Experience of Secondary School Teachers

Sl. No.	Teaching Experience	Number	%
1.	Below 5 years	11	6
2.	5 - 10 years	58	33
3.	11 - 15 years	100	56
4.	More than 15 years	9	5
Total		178	100

Teachers have experience ranging from below five years to above fifteen years were included in the study. Eleven teachers have experience upto five years, 58 teachers have experience of five to ten years. 100 teachers have experience of eleven to fifteen years and 9 teachers have more than fifteen years of experience. It is evident that 61 percent of teachers entered in the service atleast eleven years ago. So they may not be familiar with the recent advancement in the field of secondary teaching.

Nature of Institution :-

TABLE 12

Nature of Institution

Sl. No.	Nature of Institution	Number	%
1.	Government	105	59
2.	Aided Private	73	41
Total		178	100

Among the teachers responded 59 percent were belonging to government school, and 41 percent belonging to aided schools.

Location of Institution :-

TABLE 13

Location of Institution

Sl. No.	Location	Number	%
1.	Rural	113	63
2.	Urban	65	37
Total		178	100

One hundred and thirteen teachers were belonging to rural schools and 65 teachers were belonging to urban schools.

The respondents comprised of 57 percent males and 43 percent females, 75% of them were above 36 years of age. Fifty six percent of teachers have a teaching experience of 11 to 15 years. Fifty nine percent of respondents were belonging to government schools and 63 % of teachers were working in schools in rural area. This shows that the sample obtained for the following analysis has got adequate representation of all the strata selected for the study.

ii) Organisational Aspects of the SIM :

The data collected with respect to the organisational aspects of the SIM were analysed. The results are provided below.

Effectiveness of SIM

TABLE 14

Effectiveness of SIM to Fulfill Learner Needs

Sl. No.	Nature of Effectiveness	Number	%
1.	Help to fulfill learner needs	156	88
2.	Do not help learners	22	12
Total		178	100

Among the respondents 88 percent suggested that the SIM is effective to fulfill learner needs. Only 12 percent opined that the SIM is not effective.

Relevancy of Content :-

TABLE 15

Relevancy of Content in the SIM

Sl. No	Relevancy	Number	%
1.	Relevant	166	93
2.	Irrelevant	12	7
Total		178	100

Ninety three percent of respondents proposed that the content in the SIM is relevant, while 7 percent opined that the content is irrelevant.

Depth of the Content :-

TABLE 16

Depth of Content in the SIM

Sl. No.	Depth of content	Number	%
1.	Adequate	143	80
2.	Inadequate	35	20
Total		178	100

Among the respondents 80 percent opined that the content have adequate depth, while 20 percent viewed that the content is inadequate.

Statement of Objectives :-

TABLE 17

Nature of Statement of Objectives in the SIM

Sl. No.	Nature of Statement	Number	%
1.	Simple, Clear form	132	74
2.	Not Simple clear form	46	26
Total		178	100

Among the teachers 74 percent had stated that the objectives are stated in simple clear form, while 26 percent suggested that the objectives are not stated properly.

Arrangement of content :-

TABLE 18

Arrangement of content and Realisation of Objectives

Sl. No.	Arrangement of Content	Number	%
1.	Suitable for the realisation of objective	152	85
2.	Unsuitable	26	15
Total		178	100

According to 85 percent of respondents the arrangement of content is suitable for the realisation of objectives, while 15 percent were against the nature of arrangement of content for the realisation of the objectives.

Adequacy of Content :-

TABLE 19

Adequacy of Content and Realisation of Objectives

Sl. No.	Adequacy of Content	Number	%
1.	Adequacy of content	146	82
2.	Inadequate	32	18
Total		178	100

The content given in each section is adequate for the realisation of the

objectives as opined by 82 percent of respondents, while 18 percent were in difference of opinion.

Correctness of Information :-

TABLE 20

Correctness of Information in the SIM

Sl. No.	Correctness of Information	Number	%
1.	Correct Information	150	84
2.	Incorrect Information	28	16
Total		178	100

According to 84 percent of teachers the information given in the material is correct, while 16 percent opined that the information is incorrect.

Length of Unit :-

TABLE 21

Length of Units in the SIM

Sl. No.	Length of Units	Number	%
1.	Lengthy	75	42
2.	Adequate length	89	50
3.	Too Short	14	8
Total		178	100

According to 50 percent teachers, Units in the SIM were of adequate length, 42 percent of teachers viewed that the units were lengthy, while 8 percent teachers opined that the units were too short.

Suitability of Dividing the Content :-

TABLE 22

Suitability of Dividing the Content in the SIM

Sl. No.	Suitability in dividing the content	Number	%
1.	Dividing content as seven blocks is suitable	149	84
2.	Unsuitable	29	16
Total		178	100

According to 84 percent of teachers dividing the content of SIM to seven blocks was suitable, which was unsuitable according to 16 percent of teachers.

Arrangement of Units :-

TABLE 23

Nature of Arrangement of Units in the SIM

Sl. No.	Nature of arrangement of Units	Number	%
1.	Units are sequentially arranged	109	61
2.	Units are not sequentially arranged	69	39
Total		178	100

Sixty one percent of respondents felt that the Units were sequentially arranged in the SIM, while the arrangement was not sequential for 39 percent of teachers.

Maintenance of Continuity of Content :-

TABLE 24

Nature of Continuity of Content in the SIM

Sl. No.	Nature of continuity	Number	%
1.	Continuity of content is maintained in SIM	109	61
2.	Not continuous	69	39
Total		178	100

Among the respondents 61 percent suggested that continuity of

content was maintained throughout the SIM, while 39 percent respondents felt lack of proper continuity.

Arrangement of Sections :-

TABLE 25

Nature of Linking of Sections in each Unit

Sl. No.	Nature of Linking	Number	%
1.	Sections are properly linked	134	75
2.	No Proper linking	44	25
Total		178	100

According to 75 percent of teachers Sections in the material were properly linked together, while 25 percent viewed that the linking was improper.

Comments :-

Data regarding the organisational aspects of SIM were analysed in this section. The results bringout, how far the different theoretical features utilised for the organisation of a SIM are met with by the present SIM.

The following organisational aspects were analysed and the percentage of positive responses of each is given in brackets of each organisational aspect.

Effectiveness of SIM to fulfill learner needs (87%), Relevancy of content (93%), Depth of content (80%) statement of objectives (74%), Arrangement of content (85%), Adequacy of content (82%), Correctness of information (84%), Length of Units (50%), Suitability of dividing the content (84%), Arrangement of Units (61%), Maintenance of continuity of content (61%), and Arrangement of Sections (75%).

The results of analysis of the aspects of organisation show a range of 50 percent - 93 percent of involvement of the theoretical features in the organisation of the SIP. The lowest percentage of positive response was obtained to length of units (50%) and highest response to relevancy of content (93%). Regarding the length of unit 42 percent of teachers viewed that the units were lengthy. The length of the unit will depend on the amount of information contained in it. Certain units in the present SIP are lengthy in order to present essential information required by teachers who have no touch with the recent developments for effective classroom instruction.

Except this aspect all other aspects of organisation were rated as positive by 60 percent and above of the subjects. Only two aspects were rated as positive by 61 percent of teachers, two aspects by more than 70 percent (74 & 75), and the other seven aspects as positive by more than 80 percent of teachers. This indicates that the theoretical features of the aspects of organisation are very well maintained for the development of the present SIP.

iii) Aspects of Presentation :-

The data gathered with respect to the aspects of presentation of the SIM are analysed as follows.

Clarity of Content :-

TABLE 26

Clarity of content in the SIM

Sl. No.	Nature of Clarity	Number	%
1.	Good clarity	70	39
2.	Moderate clarity	84	48
3.	Not clear	24	13
Total		178	100

According to 39 percent of respondents the content has good clarity, 48 percent of respondents that the content was not clear. So 87 percent of respondents felt that, the material had moderate to good clarity.

Clarity of Explanations :-

TABLE 27

Clarity of Explanations in the SIM

Sl. No.	Nature of explanations	Number	%
1.	Explanations using familiar words & short sentences	106	60
2.	Unfamiliar words and long sentences	72	40
Total		178	100

Sixty percent of respondents opined that the explanations were clear, while 40 percent of respondents viewed that the explanations were not clear.

Usefulness of Examples :-

TABLE 28

Usefulness of Examples in the SIM

Sl. No.	Nature of Examples	Number	%
1.	Examples are useful	147	83
2.	Not useful	31	17
Total		178	100

Majority of respondents, 83 percent, have opined that the examples were useful but 17 percent of respondents remarked that the examples were not useful.

Clarity of Diagrams :-

TABLE 29

Clarity of Diagrams in the SIM

Sl. No.	Nature of Clarity	Number	%
1.	Simple and clear	97	54
2.	Not Clear	81	46
Total		178	100

Fifty four percent of respondents remarked that the diagrams were simple and clear but 46 percent of respondents viewed that the diagrams were not clear.

Appropriateness of media :-

TABLE 30

Appropriateness of media of SIM

Sl. No.	Nature of media	Number	%
1.	Appropriate media	153	86
2.	In appropriate media	25	14
Total		178	100

According to 86 percent of teachers the media used for SIM were appropriate, but 14 percent of teachers opined that the media were inappropriate.

Style of Presentation :-

TABLE 31

Style of Presentation of the SIM

Sl. No.	Style of Presentation	Number	%
1.	Personalised style of presentation	132	74
2.	Not personalised style	46	26
Total		178	100

Seventy four percent of teachers responded that the SIM was

presented in personalised style, while 26 percent of teachers said that the material was not in personalised style.

Style of Explanations :-

TABLE 32

Nature of Explanations in the SIM

Sl. No.	Nature of explanations	Number	%
1.	Explanation proceed from known to unknown	115	65
2.	Not in such an order	63	35
Total		178	100

Among the respondents 65 percent opined that the explanations proceeded from known to unknown but 35 percent did not agree with that order in presentation.

Suitability of structuring of the SIM :-

TABLE 33

Suitability of Structuring of SIM

Sl. No.	Suitability of Structuring	Number	%
1.	Structure of SIM Suitable for self learning	130	73
2.	Structure is unsuitable for self learning	48	27
Total		178	100

Seventy three percent of teachers viewed that the structuring of the SIM could promote self learning, while 27 percent of teachers had difference of opinion.

Adequacy of Learning Activities :-

TABLE 34

Number of Learning Activities in the SIM

Sl. No.	Number of Learning Activities	Number	%
1.	Sufficient	114	64
2.	Insufficient	33	19
3.	Excess	31	17
Total		178	100

Among the respondents 64 percent suggested that there were

sufficient number of learning activities, 17 percent remarked that there were excess number of learning activities, and 19 percent viewed that the number of learning activities were insufficient. So, 81 percent of respondents felt that the number of learning activities were sufficient or more.

Relevancy of Learning Activities :-

TABLE 35

Relevancy of Learning Activities in the SIM

Sl. No.	Nature of Learning Activities	Number	%
1.	Relevant for learning	116	65
2.	Irrelevant	62	35
Total		178	100

Sixty five percent of teachers viewed that the learning activities were relevant for learning while 35 percent said that the learning activities were irrelevant.

Arrangement of Learning Activities :-

TABLE 36

Suitability of Placing of Learning Activities

Sl. No.	Nature of Placing	Number	%
1.	Learning Activities at suitable places	122	69
2.	Not at suitable places	56	31
Total		178	100

Among the respondents 69 percent said that the learning activities were well placed, while 31 percent had difference of opinion.

Nature of Learning Activities :-

TABLE 37

Nature of Learning Activities

Sl. No.	Nature of Learning Activities	Number	%
1.	Learning Activities are thought provoking	114	64
2.	Not thought provoking	64	36
Total		178	100

Sixty four percent of respondents responded that learning

activities were thought provoking while 36 percent did not favour this opinion.

Appropriateness of Activities and Exercises :-

TABLE 38

Interest in the Activities and Exercises in the SIM

Sl. No.	Nature of Interest	Number	%
1.	Activities and exercises are interesting	142	80
2.	Not interesting	36	20
Total		178	100

Activities and exercises provided in the SIM were interesting to 80 percent of teachers, while not interesting to 20 percent of teachers.

Appropriateness of Self-check Questions :-

TABLE 39

Appropriateness of Self-check Questions

Sl. No.	Nature of Self-check Questions	Number	%
1.	Appropriate to check the objectives	118	66
2.	Inappropriate to check the objectives	60	34
Total		178	100

According to 66 percent of teachers the Self-check questions

were appropriate to check the selected objectives, but 34 percent of teachers viewed that self check questions were inappropriate for this purpose.

Style of Self-check Questions :-

TABLE 40

Style of Self check Questions

Sl. No.	Style of Self-check Question	Number	%
1.	Demand Application of new knowledge	137	77
2.	New knowledge is not necessary	41	23
Total		178	100

Among the respondents 77 percent opined that the Self-check questions demanded application of new knowledge, while 23 percent of teachers felt that application of new knowledge was not necessary to answer the self-check questions.

Difficulty Level of Self-check Questions :-

TABLE 41

Difficulty Level of Self-check Questions

Sl. No.	Nature of difficulty	Number	%
1.	Easy	102	57
2.	Difficult	76	43
Total		178	100

According to 57 percent of teachers the self-check questions were easy but to 43 percent of respondents self-check questions were difficult.

Adequacy of Cross references :-

TABLE 42

Adequacy of Cross References in the SIM

Sl. No.	Adequacy of Cross references	Number	%
1.	Adequate Cross reference	126	71
2.	Inadequate Cross reference	52	29
Total		178	100

Among the respondents 71 percent felt that the units in the SIM were

properly linked with adequate cross-reference, but 29 percent felt that cross-references were inadequate.

Appropriateness of Directions in the SIM :-

TABLE 43

Nature of Directions in the SIM

Sl. No.	Nature of directions	Number	%
1.	Directions in learning Activities & Self-check questions appropriate	147	83
2.	Inappropriate	31	17
Total		178	100

Among the respondents 83 percent viewed that the directions in learning activities and self-check questions were appropriate, while 17 percent of respondents had difference of opinion.

Difficulty Level of Assignment Questions :-

TABLE 44

Difficulty Level of Assignment Questions

Sl. No.	Difficulty Level	Number	%
1.	Easy	92	52
2.	Difficult	61	34
3.	Confusing	25	14
Total		178	100

Fifty two percent of teachers felt the assignment questions were easy. Thirty four percent of respondents felt them as difficult, and for 14 percent the questions were confusing.

Appropriateness of Assignment Questions :-

TABLE 45

Appropriateness of Assignment Questions

Sl. No.	Nature of Assignment Questions	Number	%
1.	Appropriate	142	80
2.	Inappropriate	36	20
Total		178	100

According to 80 percent of respondents the assignment questions were appropriate, but to 20 percent of respondents the assignment questions were inappropriate.

Style of Assignment Questions :-

TABLE 46

Style of Assignment Questions

Sl. No.	Style of Assignment Question	Number	%
1.	Thought provoking	141	79
2.	Not thought provoking	37	21
Total		178	100

Among the respondents 79 percent remarked that the assignment questions were thought provoking, while 21 percent had difference of opinion.

Level of Assignment Questions :-

TABLE 47

Level of Assignment Questions

Sl. No.	Level of Assignment Questions	Number	%
1.	Demand information from Block as a whole	171	96
2.	Not in this manner	7	4
Total		178	100

Ninety six percent of respondents viewed that the assignment questions demanded information from block as a whole, while 41 percent of respondents were not in favour this opinion.

Suitability of Application Type Questions :-

TABLE 48

Application Type Questions and Interest in Learning

Sl. No.	Nature of application type questions	Number	%
1.	Help to sustain interest in learning the SIM	120	67
2.	Do not help to sustain interest	58	33
Total		178	100

The application type questions help to sustain interest in learning the SIM for 67 percent of respondents, but do not help to 33 percent of respondents.

Nature of Explanations :-

TABLE 49

Nature of Explanations in the SIM

Sl. No.	Nature of explanations	Number	%
1.	Related with experiences	112	63
2.	unrelated to experiences	66	37
Total		178	100

According to 63 percent of respondents the explanation in the material were related to their experience, but unrelated to 37 percent of respondents.

Linking of Explanations with Life :-

TABLE 50

Linking of Explanations with Life

Sl. No.	Nature of Linking	Number	%
1.	Explanations directly linked to life	119	67
2.	Not linked with life	59	33
Total		178	100

Sixty seven percent of respondents felt that the explanations were directly linked to life, and 33 percent of respondents did not feel any link with life.

Utilisation of Experiences :-

TABLE 51

Utilising Knowledge of Daily Life in the SIM.

Sl. No.	Nature of Utilisation	Number	%
1.	Utilise knowledge of daily life	142	80
2.	No such Utilisation	36	20
Total		178	100

Among the respondents 80 percent viewed that the knowledge of daily life was properly utilised in the material, and 20 percent respondents opined that there was no such utilisation.

Link between information in the SIM :-

TABLE 52

Linking of Information in Different Units in the SIM

Sl. No.	Nature of Link	Number	%
1.	Make use of information in previous unit	156	88
2.	No such use	22	12
Total		178	100

According to 88 percent of teachers the SIM made use of previous information for presenting new information, 12 percent respondents did not feel such a use of information.

~~According to 88 percent of teachers the SIM made use of previous information for presenting new information, 12 percent respondents did not feel such a use of information.~~

In-text Question and Retention :-

TABLE 53

Usefulness of In-text Questions for Retention

Sl. No.	Nature of In-text Questions	Number	%
1.	Useful for easy retention	125	70
2.	Not useful for retention	53	30
Total		178	100

Among the respondents 70 percent remarked that the in-text questions were useful for easy retention, while 30 percent opined that the in-text questions were not useful for retention.

Summaries and Retention :-

TABLE 54

Usefulness of Summaries for Retention

Sl. No.	Nature of Summaries	Number	%
1.	Useful for retention	149	84
2.	Not useful for retention	29	16
Total		178	100

According to 84 percent of respondents the summaries were useful for retention and not helpful for retention to 16 percent of respondents.

Self-check Questions and Retention :-

TABLE 55

Usefulness of Self-check Questions for Retention

Sl. No.	Nature of Self-check Questions	Number	%
1.	Facilitate retention	128	72
2.	Not Useful for retention	50	28
Total		178	100

Seventy two percent of respondents favoured that Self-check questions facilitated retention, but 28 percent did not favour the opinion.

Possible Answers and Retention :-

TABLE 56

Usefulness of Possible Answers for Retention

Sl. No.	Nature of Possible Answers	Number	%
1.	Helpful for retention	149	84
2.	Not helpful for retention	29	16
Total		178	100

Eighty four percent of respondents viewed that possible

answers were helpful for retention, while 16 percent opined that possible answers do not help for retention.

Illustrations, Explanations and Retention :-

TABLE 57

Usefulness of Illustrations, Explanations and Retention

Sl. No.	Nature of Illustrations and Explanations	Number	%
1.	Adequate for retention	126	71
2.	Inadequate for retention	52	29
Total		178	100

Among the respondents 71 percent viewed that illustrations and explanations were adequate for retention, but 29 percent opined that illustrations and explanations were inadequate for retention.

Meaningful Presentation and Retention :-

TABLE 58

Meaningful Presentation and Retention

Sl. No.	Nature of Presentation .	Number	%
1.	Whole material is meaningfully presented	115	65
2.	Not meaningfully presented	63	35
Total		178	100

Sixty five percent of respondents favoured that, meaningful

presentation of the material facilitated retention, 35 percent of respondents did not favour this opinion.

Questions and Transfer of Learning :-

TABLE 59

Application Type Questions and Transfer of Learning

Sl. No.	Nature of Questions	Number	%
1.	Application type Questions promote transfer	140	79
2.	No provision for transfer	38	21
Total		178	100

Seventy nine percent of respondents viewed the application type questions in the SIM facilitated transfer of learning, while 21 percent opined that those questions did not facilitate transfer of learning.

Provision for Transfer of Learning :-

TABLE 60

Provision for Transfer of Learning in the SIM

Sl. No.	Nature of Provision	Number	%
1.	To identify similar situation & build similar examples	112	63
2.	No such provision	66	37
Total		178	100

Among the respondents 63 percent remarked that there were adequate provision for transfer of learning, while 37 percent of respondents did not feel such provisions.

Interest in Learning :-

TABLE 61

Interest in Learning the SIM

Sl. No.	Nature of Interest	Number	%
1.	Interested in learning SIM	138	78
2.	Not interested	40	22
Total		178	100

Seventy eight percent of teachers were interested in learning the material, while 22 percent were disinterested.

Nature of Feedback :-

TABLE 62

Nature of Feedback in the SIM

Sl. No.	Nature of feedback	Number	%
1.	Immediate feedback through the material	139	78
2.	No such feedback	39	22
Total		178	100

Seventy eight percent of teachers viewed that there was immediate feedback through the material, but 22 percent respondents opined that there was no provision for such a feedback.

Possible Answers and Feedback :-

TABLE 63

Possible Answers and Feedback

Sl. No.	Nature of Possible Answers	Number	%
1.	Possible Answers provide feedback	163	92
2.	No provision for feedback	15	8
Total		178	100

Ninety two percent of respondents, viewed that there was adequate feedback through the possible answers section of the SIM, while there was no such provision according to 8 percent of respondents.

'Let Us Sum UP' Sections and Feedback :-

TABLE 64

Let Us Sum UP Sections and Feedback

Sl. No.	Nature of Sum UP Sections	Number	%
1.	Provisions for Adequate feedback	156	88
2.	Feed back is not enough	22	12
Total		178	100

Among the respondents 88 percent felt that the provision of feedback through 'Let Us Sum UP' Section was enough, but it was not enough to 12 percent of respondents.

Self-check Questions and Feedback :-

TABLE 65

Self-check Question and Feed back

Sl. No.	Nature of Self-check Questions	Number	%
1.	Gives adequate feedback	123	61
2.	Feedback is inadequate	55	31
Total		178	100

Sixty one percent of respondents viewed that self-check

questions gave adequate feedback, but self-check questions was inadequate for feedback according to 31 percent of respondents.

Usefulness of Assignments :-

TABLE 66

Usefulness of Assignment Questions

Sl. No.	Nature of Assignment Questions	Number	%
1.	Useful to get an overall idea	117	66
2.	Do not get an overall idea	61	34
Total		178	100

Sixty six percent of respondents remarked that assignment questions were useful to get an overall idea of information presented in each block, while 34 percent of respondents did not support this opinion.

Adequacy of References :-

TABLE 67

Adequacy of References in the SIM

Sl. No.	Adequacy of References	Number	%
1.	References are adequate	125	70
2.	References are inadequate	53	30
Total		178	100

Among the respondents 70 percent felt that the reference given in the SIM was adequate, but it was inadequate to 30 percent of respondents.

Suitability of Typography :-

TABLE 68

Suitability of Typography of the SIM

Sl. No.	Nature of Typography	Number	%
1.	Typography provides guidance for learning	112	63
2.	No such guidance	56	37
Total		178	100

Sixty three percent of respondents viewed that typography of the SIM provided guidance for proper learning while 37 percent of respondents did not feel such a guidance.

Suitability of Numbering :-

TABLE 69

Suitability of Numbering in the SIM

Sl. No.	Suitability of Numbering	Number	%
1.	Numbering of headings facilitate learning	124	70
2.	Does not facilitate learning	54	30
Total		178	100

Among the respondents 70 percent opined that the numbering of headings facilitated learning. While 30 percent of respondents viewed that the numbering was unsuitable for it.

Appropriateness of Headings :-

TABLE 70

Nature of Headings in the SIM

Sl. No.	Nature of Headings	Number	%
1.	Appropriate	141	79
2.	Inappropriate	37	21
Total		178	100

Seventy nine percent of respondents felt that the headings and sub-headings in the SIM were appropriate, but 21 percent of respondents felt it as inappropriate.

Appropriateness of Introduction Sections :-

TABLE 71

Nature of Introduction Sections

Sl. No.	Nature of Introduction Sections	Number	%
1.	Give guidance to learn each unit	143	80
2.	No such guidance given	35	20
Total		178	100

According to 80 percent of respondents the introduction section gave guidance to learn each unit, but 20 percent of respondents did not favour this opinion.

Simplicity of Introduction Sections :-

TABLE 72

Simplicity of Introduction Sections in the SIM

Sl. No.	Nature of introduction	Number	%
1.	Deal with known facts	108	61
2.	Deal with unknown facts	70	39
Total		178	100

Sixty one percent of teachers felt that the introduction section

dealt with known facts. While 39 percent suggested that the introduction section dealt with unknown facts.

Provision for the Clarification of Doubts :-

TABLE 73

Provision for the Clarification of Doubts through the SIM

Sl. No.	Nature of provision	Number	%
1.	Provisions in the SIM for clarifying doubts	134	75
2.	No such provisions	44	25
Total		178	100

Among the respondents 75 percent suggested that the provisions for clarifying the probable doubts were adequate in the material, while 25 percent respondents viewed that such provisions were inadequate.

Clarity of Directions :-

TABLE 74

Clarity of Directions to change medium

Sl. No.	Nature of Directions	Number	%
1.	Directions to change media are clear	174	98
2.	Directions are not clear	4	2
Total		178	100

Ninety eight percent of respondents remarked that the directions to change the media of SIP was clear.

Nature of Diagrams :-

TABLE 75

Nature of Diagrams in the SIM

Sl. No.	Nature of diagrams	Number	%
1.	Diagrams well drawn and labelled	135	76
2.	Not clear	43	24
Total		178	100

Among the respondents 76 percent opined that the diagrams were well drawn and adequately labelled, while 24 percent respondents viewed that the diagrams were not clear.

Correctness of Diagrams :-

TABLE 76

Correctness of Diagrams

Sl. No.	Nature of Diagrams	Number	%
1.	Diagrams are correct	148	83
2.	Incorrect	30	17
Total		178	100

Eighty three percent of respondents viewed that the diagrams were correct, but incorrect to 17 percent of respondents.

Link between Diagrams and Content :-

TABLE 77

Linking of Diagrams with the Content

Sl. No.	Nature of Link	Number	%
1.	Diagrams are directly linked to the content	122	69
2.	Not properly linked	56	31
Total		178	100

Sixty nine percent of respondents opined that the diagrams were properly linked with the content, but the linking was not proper according to 31 percent of respondents.

Comments :

Data regarding the aspects of presentation of SIM were analysed in this Section. The results bring out information regarding how far those aspects were utilised for the development of SIM of the present study.

Analysis of the following aspects were done and the results of the positive responses to each are provided in the brackets.

The aspects of presentation involves aspects such as Clarity of content (39%), Clarity of explanations (60%), Usefulness of examples (83%), Clarity of diagrams (54%), Appropriateness of media (86%) Style of presentation (74%), Style of explanations (65%), Suitability of structuring of the SIM (73%), Adequacy of Learning Activities (64%), Relevancy of Learning Activities (65%), Arrangement of Learning Activities (69%), Nature of Learning Activities (64%), Appropriateness of Activities and Exercises (80%), Appropriateness of Self-check Questions (66%), Style of Self-check Questions (77%), Difficulty level of self-check Questions (57%), Appropriateness of Directions in the SIM (83%), Difficulty level of Assignment Questions (52%), Appropriateness of Assignment Questions (79%), Style of Assignment Questions (79%), Level of Assignment Questions (96%), Nature of explanations (63%) Linking of explanations (63%), Linking of explanations with Life (67%), Interesting to learn (78%), Utilisation of experiences (80%), Link between information in the SIM (88%) Intext Questions and Retention (70%), Summaries and Retention (84%), Self-check Questions and Retention (72%) Possible Answers and Retention (84%), Illustrations, explanations and Retention (71%), Meaningful presentation and retention (65%), Questions and Transfer of Learning (79%), Suitability of

Application type questions (67%), Provision for Transfer of Learning (63%), Nature of Feedback (78%), Possible Answers and Feedback (92%), Let Us Sum UP Sections and Feedback (88%), Self-check Questions and Feedback (69%) Usefulness of Assignments (68%), Adequacy of cross references (71%), Adequacy of References (70%), Suitability of Typography (63%), Suitability of Numbering (70%), Appropriateness of Headings (79%), Appropriateness of Introduction Sections (80%), Simplicity of Introduction Sections (61%), Provision for the clarification of Doubts (75%), Clarity of Directions (98%), Nature of Diagrams (76%), Correctness of Diagrams (83%) and Link between Diagrams and content (69%).

Among these aspects except clarity of content, Clarity of diagrams, Difficulty level of Self-check Questions, and Difficulty level of Assignment Questions, all other aspects were favoured by more than 60 percent of respondents. Regarding Clarity of content 39 percent opined of good clarity and 47 percent suggested moderate clarity. So altogether 86 percent favoured the clarity from moderate to good. This may happen due to misunderstanding of the item in the Questionnaire. Regarding Clarity of diagrams, certain diagrams were not clear due to faults in duplication, which is corrected in the final material appended as in Appendix - VI.

With regard to the difficulty level of Self-check Questions and Assignment Questions, a given level of difficulty is essential to take the learners towards mastery learning.

Of the remaining 43 aspects analysed, 13 showed favourable opinions by more than 80 percent of teachers while 15 aspects each showed positive responses by more than 70 percent and 60 percent of teachers.

So it may be concluded that the different theoretical frame works for the presentation were integrated well in the SIM developed in the present study.

iv) Mechanical make up of the SIP :

The data collected with reference to the mechanical make up of the SIM are analysed as follows.

Appropriateness of Cover Page :-

TABLE 78

Appropriateness of Cover Page

Sl. No.	Nature of cover page	Number	%
1.	Attractive and motivating	165	93
2.	Not Attractive and motivating	13	7
Total		178	100

Ninety three percent of respondents viewed that the cover page was attractive and motivating but it was not attractive to 7 percent respondents.

Appropriateness of the size of the SIP :-

TABLE 79

Appropriateness of the size of the SIP

Sl. No.	Size of the SIP	Number	%
1.	Appropriate size	154	87
2.	Inappropriate size	24	13
Total		178	100

Eighty seven percent of respondents suggested that the size of the SIP was appropriate, but it was inappropriate according to 13 percent of the respondents.

Suitability of Binding :-

TABLE 80

Nature of Binding of the SIM

Sl. No.	Nature of Binding	Number	%
1.	Suitable for easy handling	171	96
2.	Unsuitable for handling	7	4
Total		178	100

Ninety six percent of respondents remarked that the binding of the book helped for easy handling.

Quality of Paper Used :-

TABLE 81

Quality of Paper used for the SIM

Sl. No.	Quality of Paper	Number	%
1.	Good quality	155	87
2.	Bad quality	23	13
Total		178	100

Eighty seven percent of respondents viewed that the paper used for printing the material was of good quality, but it was of bad quality according to 13 percent of respondents.

Attachment of Audio Cassete with Print material :-

TABLE 82

Nature of Attachment of Audio Cassete with Print material

Sl. No.	Nature of Attachment	Number	%
1.	Properly attached	178	100
Total		178	100

All respondents (100%) suggested that the audio cassette was properly attached with the print material.

Adequacy of words in sentences :-

TABLE 83

Adequacy of words in sentences of the SIM

Sl. No.	Nature of words per sentences	Number	%
1.	Adequate	133	75
2.	Inadequate	45	25
Total		178	100

Seventy five percent of respondents opined that the sentences in the SIM have adequate words per sentences, which was inadequate to 25 percent respondents.

Suitability of Type of the SIM :-

TABLE 84

Suitability of the Type of the SIM

Sl. No.	Size of Type	Number	%
1.	Suitable size for easy reading	117	66
2.	Unsuitable size	61	34
Total		178	100

Among the respondents 66 percent opined that the type was suitable for easy reading, while 34 percent viewed that the type was unsuitable.

Adequacy of Space Between Lines in the SIM :-

TABLE 85

Adequacy of Space Between Lines in the SIM

Sl. No.	Space between lines of the SIM	Number	%
1.	Adequate space between lines	124	70
2.	Inadequate space	54	30
Total		178	100

Seventy percent of respondents suggested that there was adequate space between lines of the print material, but it was inadequate to 30 percent of respondents.

Adequacy of Marginal Space :-

TABLE 86

Adequacy of Marginal Space in the SIM

Sl. No.	Marginal Space	Number	%
1.	Adequate marginal space	140	79
2.	Inadequate marginal space	38	21
Total		178	100

Seventy nine percent of respondents viewed that the marginal space of the SIM was adequate, while 21 percent of the respondents opined that the marginal space was inadequate.

Comments :

The aspects of mechanical make up of the SIP were analysed. The aspects analysed and the percentage of positive answers received are :

Appropriateness of cover page (93%), Appropriateness of the size of the SIM (87%), Suitability of binding (96%), Quality of paper used (87%), Attachment of Audio cassette with Print Material (100%), Adequacy of words in sentences (75%), Suitability of Type of the SIM (66%), Adequacy of Space between lines in the SIM (70%) and Adequacy of Marginal Space (79%).

The responses show that almost all theoretical frame work about the mechanical make up of self Instructional materials were utilised for the development of the SIP in the present study.

v) **Aspects of the Audio Component of SIM :-**

Data gathered with reference to the aspects of audio component are analysed as follows.

Quality of Audio Cassette :-

TABLE 87

Quality of Audio Cassette in the SIP

Sl. No.	Quality of Audio Cassette	Number	%
1.	Good	152	85
2.	Bad	26	15
Total		178	100

According to 85 percent of respondents the audio cassette was of good quality, but 15 percent opined that the quality was bad.

Correctness of Content in the Cassette :-

TABLE 88

Correctness of content in the Cassette

Sl. No.	Correctness of the Content	Number	%
1.	Illustrations deal with correct models	136	76
2.	Illustrations are incorrect	42	24
		178	100

Among the respondents 76 percent opined that the content of the cassette was the correct illustrations of respective teaching models, while 24 percent of respondents viewed that the illustrations were wrong.

Audibility of the Cassette :-

TABLE 89

Audibility of the Cassette

Sl. No.	Audibility of Cassette	Number	%
1.	Properly Audible	169	95
2.	Not Properly audible	9	5
Total		178	100

Ninety five percent of respondents remarked that the Cassette was properly audible.

Length of Illustrations :-

TABLE 90

Adequacy of Length of the Illustrations

Sl. No.	Length of Illustrations	Number	%
1.	Adequate length	123	69
2.	Inadequate length	55	31
Total		178	100

According to 69 percent of respondents the illustrations were of adequate length, but the illustrations were too short for 31 percent of respondents.

Maintenance of Sequence in the Illustrations :-

TABLE 91

Sequence of Steps in the Illustrations

Sl. No.	Sequencing of steps	Number	%
1.	Maintained the sequence of steps in the model	172	97
2.	Do not maintained the sequence	6	3
Total		178	100

Among the respondents 97 percent favoured that the sequential steps

in the teaching models were maintained in the oral presentation.

Absence of Unnecessary Pauses :-

TABLE 92

Absence of Unnecessary pauses in the cassette

Sl. No.	Nature of Pauses	Number	%
1.	No Unnecessary Pauses	112	63
2.	Unnecessary pauses present	66	37
Total		178	100

Sixty three percent of respondents viewed that there were no unnecessary pauses in the audio cassette, while 37 percent of respondents opined that there were unnecessary pauses in the oral presentation.

Nature of voices in the Cassette :-

TABLE 93

Nature of Voices in the Audio Cassette

Sl. No.	Nature of voices	Number	%
1.	Voices of teacher and students are distinguishable	178	100
Total		178	100

All respondents (100%) remarked that the voices of teacher

and students in the cassette were distinguishable.

Correctness of Pronunciation :-

TABLE 94

Correctness of Pronunciation in the Cassette

Sl. No.	Nature of Pronunciation	Number	%
1.	Correct Pronunciation	144	81
2.	Incorrect Pronunciation	34	19
Total		178	100

Eightyone percent of respondents opined that the pronunciation in the cassette was correct, but which was wrong to 19 percent of respondents.

Unwanted Noise in the Cassette :-

TABLE 94

Nature of Unwanted Noise in the Cassette

Sl. No.	Nature of Noise	Number	%
1.	No Unwanted noise	124	70
2.	Unwanted noise present	54	30
Total		178	100

Seventy percent of respondents viewed that there were no

unwanted noise in the cassette, but according to 30 percent of respondents there were unwanted noise in the cassette.

Overall Impression of Cassette :-

TABLE 96

Overall Impression of the Audio Cassette

Sl. No.	Impression of Cassette	Number	%
1.	Good	167	94
2.	Moderate	11	6
Total		178	100

Ninety four percent of respondents had good impression about the audio cassette.

Comments :

The aspects of the audio component of the SIM were analysed. The major aspects of the audio components are Quality of audio Cassette (85%), Correctness of Content in the Cassette (76%), Audibility of the Cassette (95%), Length of Illustrations (69%), Maintenance of sequence in the illustrations (97%), Unnecessary Pauses (63%), Nature of voices in the Cassette (100%), Correctness of pronunciation (81%), Unwanted noise in

the Cassette (70%), and Overall impression of the Cassette (94%). The percentages given in the brackets are of positive answers.

The aspect 'Absence of unnecessary Pauses' has lowest rating among the aspects of audio component. The reason for the low rating may be because of misinterpretation of necessary pauses as unnecessary ones.

The responses show that all theoretical features of the audio component were present appropriately in the audio cassette developed in the SIP for the conduct of present study.

vi) General Opinion about the SIP :-

This section involves the preferences of respondents for the block and units of the SIM, Adequacy of information present, and change if required in any part of the SIM. But only a few respondents filled in their opinion regarding this section

With regard to the preference of Blocks, Block 5 was preferred by 76 individuals, Block - 7 by 52 respondents and Block - 1 by 48 respondents.

Regarding the adequacy of information a few responded that all units have adequate information.

No change in any part of the material was suggested by the respondents.

CONCLUSION :-

As the above qualitative analysis of the opinions of teachers on the questionnaire had revealed that all the dimensions of the SIP selected to be evaluated are adequately represented in the present SIP, It may be concluded that the developed SIP is valid for the effective self-learning of secondary school biology teachers.

ANALYSIS OF EXPERT OPINION ABOUT THE SIP :-

The SIP was given to a few experts in the field of Education/~~Distance~~ Education. All of them agreed with the format of the SIM and with its contents. No change for any part or the pattern of material was proposed by any of the experts.

FINALISATION OF THE SIP :-

The achievement test results, error rate analysis, qualitative analysis of the inclusion of the theoretical aspects of the SIP, and opinion of experts, favoured the format and inclusions of the present SIP. The performance of teachers in the achievement tests was very good, the rate of achievement also was high and error rate comparatively low. The essential theoretical features of the SIP also were maintained well in the present SIP. The experts in the field of education, who examined the SIP also favoured the format of the present SIP. The investigator, therefore, has decided to accept the draft SIP developed for the present study as the final one in view of the above reasons.

CONCLUSIONS AND SUGGESTIONS

-
- * The study in Retrospect
 - * Major findings.
 - * Interpretation and conclusion
of results.
 - * Educational implications.
 - * Suggestions for further
Research.
-

CONCLUSIONS AND SUGGESTIONS

THE STUDY IN RETROSPECT :-

Restatement of the Problem.

The study, as stated in the earlier contexts of the present report was intended to develop a Self-instructional package for the in-service learning of secondary school biology teachers, and to validate the developed package for its effectiveness in use. The study was stated as "DEVELOPMENT OF SELF INSTRUCTIONAL PACKAGE FOR SECONDARY SCHOOL BIOLOGY TEACHERS FOR THEIR IN-SERVICE LEARNING".

Objectives of the Study :-

1. To develop self-instructional materials in a package with reference to the necessary content to fill up the gaps in the update knowlegde of Secondary School biology teachers through their in-service learning.
2. To validate the developed package by ascertaining its effectiveness.

Procedure :-

The study proceeded through the following steps.

- a) Analysis of pedagogical theories to identify the necessary content areas for biology teacher education at secondary level.
- b) Thorough analysis of the prevailing B.Ed. Syllabi of a few universities and to identify the gaps in the content with regard to update knowledge of biology teacher education.
- c) Analysis of the syllabus for in-service education of secondary school biology teachers conducted by colleges of teacher education.
- d) Interviewing secondary school biology teachers to gather their opinions and suggestions regarding various aspects of in-service education, and for the development of self-instructional material.
- e) Preparation of a comprehensive syllabus for developing the SIP on the basis of the analysis of Pedagogical theories, existing B.Ed. Syllabi, syllabus for in-service education, and the suggestions of secondary school biology teachers.
- f) The development of Self-instructional package (print and audio media) on the basis of the principles of distance education.
- g) Validation of the developed package by administering it on secondary level biology teachers.

Sample :-

The target group of the present study was secondary school biology teachers. For its validation, the present study was conducted on a sample of 178 biology teachers in secondary schools of various districts in Kerala. The sample size had to be reduced to 57 for the Achievement testing. The sample was selected using purposive random sampling technique based on strata such as age, and teaching experience of the subjects, and locale and management of schools.

Tools :-

The following tools were used for the present study.

1. Two Achievement Tests on the basis of the SIM.
2. A Questionnaire on the various of aspects of the SIP.

Techniques used for validation :-

Percentage of achievement of teachers in the Achievement Tests were determined. The error rate committed by the teachers in the Achievement tests also was estimated. Tables and percentages were used for the qualitative analysis of the data obtained through the questionnaire.

Opinion of experts in the field of education also was sought for the validation of the package.

MAJOR FINDINGS :-

The major findings of the present study are as follows .

1. Majority of teachers (77%) had achieved marks at the range of 61-80 in the Achievement Tests. This can be claimed as a very good performance, though they got a period of only four months for learning the SIP. More than 80 percent of marks was obtained by 44 percentage of teachers. The remaining 19 percentage of the individuals also showed good performance as they secured marks at the range of 54-60. All the teachers who had appeared for the achievement test had acquired any of the higher grades such as A or B or C. None of them had secured below 50 percent of marks in the Achievement testing. It was found out that 81 percent of biology teachers had scored more than 61 percent of marks in the Achievement testing. It was also revealed that all respondents exhibited good performance in the Achievement Tests.
2. The mean percentage score in the Achievement Tests was 67.
3. The error rate committed by the secondary level biology teachers was estimated. It is found that 32.68 percent error rate was

committed by the 57 secondary school biology teachers in the Achievement Tests developed on the basis of the SIP. The rate of achievement by the teachers is 67.32 percent.

The qualitative analysis of data regarding the various aspects of development of the SIP gathered through the questionnaire resulted in the following findings.

4. Analysis of aspects of organisation of the SIM shows that majority of organisational aspects were rated to a range of 50-93 percent. Various aspects of organisation present in the SIM in the descending order of rating are in the following order.

Relevancy of content	:	(93%)
Effectiveness of SIM to fulfill learners needs	:	(87%)
Arrangement of Content	:	(85%)
Correctness of information	:	(84%)
Suitability of dividing the content	:	(84%)
Adequacy of content	:	(82%)
Depth of content	:	(80%)
Arrangement of sections	:	(75%)
Statement of objectives	:	(74%)
Arrangement of units	:	(61%)
Maintenance of Continuity of content	:	(61%)
Length of Units	:	(50%)

It is found that except one aspect of organisation, all other aspects were rated positive ^{by} 60 percent and more respondents. The lowest rating had occurred in the case of length of the units. Only 50 percent responded that the units are of adequate length, but 42 percent viewed that the units are lengthy. Certain units are lengthy because of the amount of information contained in it. This could not be avoided as the full content was required to complete those units.

5. Analysis of aspects of presentation of SIM shows that majority of presentational aspects are rated to a range between 39-98 percent.

The ratings of various aspects of presentation in the descending order are as follows.

Clarity of directions	:	(98%)
Level of assignment questions	:	(96%)
Possible answers and feed back	:	(82%)
Link between information in the SIM	:	(88%)
Let us Sum UP Section in the SIM	:	(88%)
Appropriateness of media	:	(86%)
Possible answers and retention	:	(84%)
Summaries and retention	:	(84%)
Correctness of diagrams	:	(83%)
Appropriateness of directions in the SIM	:	(83%)
Usefulness of examples	:	(83%)

Appropriateness of introduction sections	:	(80%)
Utilisation of experiences	:	(80%)
Appropriateness of activities and exercises	:	(80%)
Appropriateness of assignment questions	:	(79%)
Style of assignment questions	:	(79%)
Questions and transfer of learning	:	(79%)
Appropriateness of headings	:	(79%)
Nature of feedback	:	(78%)
Interest in learning	:	(78%)
Style of self check questions	:	(77%)
Nature of diagrams	:	(76%)
Provision for clarification of doubts	:	(75%)
Style of presentation	:	(74%)
Suitability of structuring of the SIM	:	(73%)
Self check questions and retention	:	(72%)
Illustrations, explanations and retention	:	(71%)
Adequacy of cross references	:	(71%)
Adequacy of references	:	(70%)
Suitability of numbering	:	(70%)
Intext questions and retention	:	(70%)
Self check questions and feed back	:	(69%)
Arrangement of learning activities	:	(69%)

Link between diagrams and content	:	(69%)
Usefulness of assignments	:	(68%)
Linking of explanations with life	:	(67%)
Suitability of application type questions	:	(67%)
Appropriateness of self-check questions	:	(66%)
Style of explanation	:	(65%)
Relevancy of learning activities	:	(65%)
Meaningful presentation and retention	:	(65%)
Adequacy of learning activities	:	(64%)
Nature of learning activities	:	(64%)
Nature of explanations	:	(63%)
Suitability of typography	:	(63%)
Provisions for transfer of learning	:	(63%)
Simplicity of introduction sections	:	(61%)
Clarity of explanations	:	(60%)
Difficulty level of self-check questions	:	(57%)
Clarity of diagrams	:	(54%)
Difficulty level of assignment questions	:	(52%)
Clarity of content	:	(39%)

It is found that except four aspects of presentation all other aspects are rated by 60 percent and more respondents as positively present in the SIM

developed. These aspects which got rating below 60 percent are difficulty level of self-check questions, difficulty level of assignment questions, clarity of diagrams and clarity of content.

Certain level of difficulty is essential for keeping the learner active while learning. In order to keep the learner active the investigator thought of using questions of moderate difficulty for self-check exercises and assignments.

Error in duplication of the material resulted in decreasing the clarity of one or two diagrams in certain copies of the material. The investigator had taken necessary steps to make maximum clarity to all diagrams in the final material.

Forty eight percent of respondents had suggested that the content have moderate clarity. This indicates that misunderstanding of the item in the questionnaire about the word 'clarity of content' led to such a negative response. Moreover, the other aspects that are necessary to give clarity for the material are all rated positively by the majority. So it can be believed that the content in the SIM has good clarity.

6. The analysis of the aspects of mechanical make up ranges between 66-100 percent. The ratings in the descending order is as follows.

Attachment of audio cassette with print material	: (100%)
Suitability of binding	: (96%)
Appropriateness of cover page	: (93%)
Appropriateness of the size of the SIM	: (87%)
Quality of paper used	: (87%)
Adequacy of marginal space	: (79%)
Adequacy of words in sentences	: (75%)
Adequacy of space between lines in the SIM	: (70%)
Suitability of the type of the SIM	: (66%)

The aspects of mechanical make up of the SIP were rated positive by 70 percent and more respondents except for a single aspect, i.e., suitability of type of the SIM. This also is rated positive by 66 percent of respondents. All respondents suggested that the attachment between the print material and audio cassette was perfect.

7. The aspects of the development of the audio component showed positive rating in the range between 63-100 percent. The ratings in the descending order is as follows.

Nature of voices in the cassette	:	(100%)
Maintenance of the sequence in the illustrations	:	(97%)
Audibility of cassette	:	(95%)
Overall impression of the cassette	:	(94%)
Quality of audio cassette	:	(85%)
Correctness of pronunciation	:	(81%)
Correctness of content in the cassette	:	(76%)
Unwanted noises in the cassette	:	(70%)
Length of illustration	:	(69%)
No unnecessary pauses	:	(63%)

The audio component of the material shows good quality in all its aspects. Sixty three percent and more learners are in favour of the quality of audio component. It can also be noted that except two, all other aspects in the questionnaire rated positive by 70 percent and more of the teachers.

8. In the last dimension of the General opinion about the SIP, no change in any part of the material was suggested by the respondents.
9. Lastly, the experts in the field of Education/Distance Education also have agreed with the format of the SIM and the content.

DISCUSSION OF RESULTS

The results obtained out of both the quantitative and qualitative analyses of the data gathered to ascertain the effectiveness of the SIP developed are self-explanatory.

The percentage analysis of achievement in the SIP by teachers had shown that most of the teachers had achieved upto a “Very Good” extent with Grade B.

The mean percentage of achievement also can be considered as “Very Good”.

The error rate is comparatively low which can come in the category of “Poor” only.

The qualitative analysis of the opinions of the teachers on the SIP had yielded the following results.

Of the twelve aspects under the dimension organisation of the SIM, one is rated positive by 93 percent of teachers; six by more than 80 percent of teachers; two by more than 70 percent of teachers; two by more than 60 percent of teachers and only one by 50 percent of teachers. Thus except one aspect, all the other eleven aspects of the organisational dimension are found to be present in the SIM form a very good to excellent level. The ‘relevancy

of the content' and 'effectiveness of the SIM to fulfil learner needs' were the two aspects that received highest appreciation.

The dimension of presentation of the SIM was evaluated by analysing its 52 aspects. Of these, three aspects are rated positive by more than 90 percent of teachers; 11 by more than 80 percent of teachers; 17 by more than 70 percent of teachers; 17 by more than 60 percent of teachers; and 3 by more than 50 percent of teachers. Only one aspect was rated positive by 39 percent of teachers which may be due to some error as explained elsewhere earlier. So 48 aspects of the presentation of the SIM are found to be from a very good to excellent level.

Under the dimension Mechanical make up of the SIP nine aspects were analysed altogether. Of these one aspect received 100 percent positive rating, two others, more than 90 percent rating, still other two, more than 80 percent rating, and three, more than 70 percent positive rating. Only one aspect received 66 percent positive rating. All these nine aspects are thus found to be present from a very good to excellent level.

The dimension of the Audio component of the SIP was evaluated by analysing ten aspects. Here also one aspect received 100 percent positive rating. Three aspects were rated positive by more than 90 percent of teachers;

two by more than 80 percent of teachers; two others by more than 70 percent of teachers; and the remaining two by more than 60 percent of teachers. Thus, the quality of the Audio Component also can be considered as excellent or very good.

Moreover than these results, no change in any part of the material was suggested by the respondents.

The experts in the field of Education/Distance Education also have agreed with the format and content of the SIP.

INTERPRETATION AND CONCLUSION OF RESULTS

From the findings of the present study it can be concluded that the higher percentage of achievement by the learners in the Achievement Tests, is an indication of the effectiveness of the material. Such higher percentage of achievement occurs only by effective instruction.

The error rate is low when compared with the rate of achievement. Provision of adequate time for getting mastery over the material will increase the rate of achievement there by decreasing the error rate.

The content present in the material is relevant. The SIM is seen effective to fulfill the needs of the learners. The arrangement of content is suitable for realisation of objectives. The information presented in the material seems correct. Dividing the content into Blocks, respective units and sections are suitable. The content is presented in adequate quantity and depth. Activities and exercises in the material are appropriate. The cross reference provided in the material is adequate. The material is structured in such a way to stimulate interest in learning.

All these aspects shows that the organisation of the SIM is well suited for providing self-instruction.

The directions in the material, nature of headings, typography and introduction section are adequate to provide guidance for proper self-learning.

Possible answer sections, Let us Sum UP Sections, and Self-check questions, provide adequate feed back and help retention.

The style of presentation and structuring of the material is suitable for self-learning. There is adequate provision for transfer of learning in the material. The assignment questions also help transfer of learning and help to provide an overall idea of the information presented.

The experiences of learners are utilised effectively in the material. Learning activities exploit the previous knowledge of learners. All these aspects shows that the presentation of the SIM is suitable for self-learning.

The audio component is well attached with the print material. The cover page of the print material is attractive and motivating. The size and binding of the print material is suitable for easy handling. The type of the material with enough marginal space and space between lines helps easy reading. The paper used for duplicating the material is of good quality. All these aspects show that the mechanical make up of the SIM is appropriate for self-learning.

The audio cassette is properly audible and the voices can be distinguished clearly. The content and pronunciation of the audio illustrations are correct. There were no unwanted noises or unnecessary pauses in the cassette. The cassette is of good quality. All these aspects show that the audio component of the material is suitable for self-learning.

Since all the aspects of organisation, presentation, mechanical make up, and audio component of the material are suitable for self-learning, it can be concluded that the SIP developed by the investigator for the present study is suitable for providing in-service learning of secondary level biology teachers.

EDUCATIONAL IMPLICATIONS

The present study has proved that self-instructional materials can be developed with high effectiveness for the target group fixed. The conclusions of the present study have wide spread educational implications.

Since, self-instructional materials are proved effective for in-service learning of teachers, it can have due impact on the nature of in-service education in future.

The authorities who are organising in-service programmes, and, the teachers who are participating in those programmes may know that they could not realise the objectives of the programme completely through courses of a short duration. And it is not possible to organise long term in-service programmes for all, because it will disrupt the functioning of our educational institutions.

Since we are striving for quality improvement of the present system of education, it is essential to provide adequate training for all in this regard within a short span of time. Self-instructional materials are the only effective instrument to realise this objective. In order to supplement the SIM short face-to-face programmes can be organised.

The government should take necessary steps to develop SIPs of this kind in all subjects for the benefit of teachers, who are not aware of the techno-pedagogical advancements, at all levels of education.

Even, open Universities can be started for the above sake in all the states or at the national level. A pass with excellence in such courses can be rewarded by giving additional increments or promotions for attracting all teachers to such courses. At least this extrinsic motivation will prompt the teachers to learn the SIPs regularly, hence its wastage can be avoided.

Also, the University Education Departments can conduct such courses with SIPs and face-to-face contact sessions for short duration, in certain select highly relevant areas of education for the select target groups. This can include courses in Educational Management and Administration for Head Teachers of Schools, Principals of Colleges, D.E.O.'s, A.E.O.'s, etc; Courses in Special Education for the untrained teachers in Special Education Institutions; Bachelor Degree Course for untrained teachers in schools; course in research methodology for those who are in need of conducting research projects such as the staff of DIETs etc. Similar need-based courses run with the help of SIPs will definitely be attractive to the target group and will be viable.

The Adult Education and Extension Education Centres also can successfully utilise SIPs for giving general education to the drop outs. Girls and other disadvantaged groups, and also those who are forced to seek early employment, find it difficult to complete their education even upto the secondary level. Among them, those who are initiated of self-learning can be much benefited of SIMs/SIPs for obtaining general education certificates and, if motivated, for seeking further education.

SUGGESTIONS FOR FURTHER RESEARCH

From the point of view of the present study, it is felt that further research must be conducted in the following areas.

1. Similar studies can be conducted in all other subjects of secondary level.
2. Similar studies can be conducted at the other levels of education such as elementary level and higher secondary level.
3. Educational programmes of tertiary level can also use SIMs for theory teaching, so that it will lessen the burden on teachers for finishing the theory portions. Instead, the teachers can utilise more time for tutoring and conduct of practical sessions or projects. So studies to prepare SIMs for students also can be suggested.

4. Now a days many universities are duplicating their campus courses through distance education modes. The students of these courses are getting only low-quality print materials for their study. So studies can be conducted to prepare quality study materials for distance education courses run by universities.

BIBLIOGRAPHY

Books

- Aggarwal, J.C. (1988) Teachers role, status, service. conditions and education in India. New Delhi : Doba House.
- Aggarwal, J.C. & Agrawal, S.P. (1989) National Policy on education. New Delhi : Concept publishers.
- Ary. D; Jacobs, L.C. & Razarich, A. (1972) Introduction to Research in Education. New York :
- Association of Indian Universities (1982). Monograph on syllabus analysis and restructuring. New Delhi, DC : Author
- Best, J.W & Kahn, J.V. (1989). Research in education (6th ed.) New Delhi : Prentice Hall India.
- Biehler, R.F. (1974) Psychology applied to teaching (2nd ed.). Boston : Houghton mittlin Company.
- Blair, G.M; Jones, R.S & Simpson, R.H. (1975). Educational psychology. (4th ed.) New York : Macmillan publishing Co.
- Bloom, B.S. (Ed.) (1971) Taxonomy of Educational Objectives :
Book - 1 Cognitive domain. London : Longman group.
- Bloom, B.S. (Ed.) (1979). Taxonomy of Educational Objectives :
Book - 2 : Affective domain. New York : David Mckey Company.
- Borah, S. (Ed.) (1987). Distance Education. New Delhi : Amar Prakash.

- Borje, H. (1981). Status and trends of distance education : A survey and bibliography. London : Kogan page.
- Brog, W.R & Gall, M.D (1983). Educational Research - An introduction (4th ed.) New York : Longman.
- Brown, J.W. Lewis, R.B. & Harclerod, F.F. (1973).
A V Instruction, technology, media, and methods. (4th ed.)
New York : Mc Graw Hill.
- Buch, M.B. (Ed.) (1979). Second survey of research in education.
Baroda : Society for educational research and development.
- Buch, M.B. (Ed.) (1987). Third survey of research in education.
New Delhi : NCERT.
- Burke, P.J. (1987). Teacher development. New York : Falmer Press.
- Cable, R. (1970). Audiovisual Hand book. (3rd ed.) London :
University Press.
- Carey, L.M. (1988). Measuring and Evaluating School learning.
Boston : Allyn and Bacon INC.
- Coppen, H. (1972). A Survey of British research in audio-visual aids
1945-71. London : National Committee for audio-visual aids.
- Dececco, J.P. & Crawford, W.R. (1977). Psychology of learning and
instruction (2nd ed.) New Delhi : Prentice Hall.

- Desai, D.M. (1971). New directions in the education of Indian teachers. Baroda : Faculty of education and psychology, M.S. University.
- Devagowda, A.C. (1973). Teacher education in India. Bangalore : Printersall.
- Divesta, F.J. & Thompson, G.G. (1970) Educational Psychology. New York : Meredith Corporation.
- Dressel, P.L. (1976) Hand book of Academic Evaluation. U.K. London : Jossey - Bass
- Ebel, R.L & Frisbie, D.A. (1991) Essential of Educational measurement (4th ed.) New Delhi : Prentice Hall.
- Erat, M. (1972). In-Service education for innovation New York : National Council of Educationa Technology.
- Falk. D. (1971). Biology teaching methods. New York : John Wiley & Sons.
- Gague, R.M. (1974) Essentials of Learning for instruction. Illinois : The Dryden Press.
- Giri, A.P. (1991). School broadcast Programmes - problems & prospects. New Delhi : Deep & Deep.
- Gold man, L. (Ed.) (1978). Research methods for counselors. New York : John Wiley & Sons.

- Good, C.V. (Ed.) (1973). Dictionary of education. New York : Mc Graw Hill.
- Henry, N.B. (Ed.) (1957). In-Service education - Part I Chicago : National Society for the study of education.
- Hills, P.J. (1976). The self teaching process in higher education. London : Croom Helm.
- Hooda, R.C. (1991). Evaluation of teacher education curriculum a factorial view. Rothak, India : Manthan publishers.
- Hurd, P.D. (1971). New directions in teaching secondary school science. USA : Mc Nally.
- Husen, T. & Postlethwaite, T.N. (Eds.) (1985). The International Encyclopaedia of Education. (1st ed.). New York : Pergamon Press.
- Joyce, B. & Weil, M. (1985) Models of teaching (2nd ed.) New Delhi : Prentice Hall.
- Kalra, R.M. (1976). Innovations in science teaching. New Delhi : Oxford & IBH.
- Khan, I. (Ed.) (1989). Teaching at a distance. Delhi : Amar Prakash.
- Khosla, D.N. (1970). Innovations and practice in teacher education in India at secondary level. Vol. I, New Delhi : Dept. of Teacher Education, NIE.
- Klinckmann, E. (1971). Biology teachers' hand book (2nd ed.) New Delhi : Association of Indian Universities.

- Kolesnik, W.B. (1970). Educational psychology (2nd ed.) New York : Mc Graw Hill.
- Koul, B.N. Singh, B. & Ansari. M.M. (Eds.) (1988). Studies in distance education. Delhi : Association of Indian Universities.
- Kundu, C.L. (1988). Indian year book on teacher education. New Delhi : Sterling.
- Mackenzie, N. Postgate, R. & Seupham, J. (1975). Open learning system and problems in post secondary education. Paris : Unesco Press.
- Mamidi, M.R. & Shankar, R. (1984). Curriculum development and educational technology. New Delhi : Sterling.
- Mehrens. W.A. & Lehmann, I.J. (1978) Measurement and evaluation in education & Psychology. (2nd ed.). New York : Holt Rinehart & Winston.
- Millman. J & Hammond, L.D. (Ed.) (1990) The New Handbook of teacher evaluation. U.K., Newbury Park : Sage.
- Misra, A. (1991) Performance discrepancy of Science teachers. Delhi : Kanishka.
- Morholt, E. Wein, B.P.F. & Joseph, A. (1988). A Source book for the biological sciences. New York : Harcourt Brace & World.
- Nair, C.P.S. (1971). Teaching Science in our Schools. New Delhi : S. Chand & Co.

- Nedelsky, L. (1965) Science teaching and testing. New Delhi :
Harcourt, Brace & World.
- Nunnally, J.C. & Ator, N.A. (1972) Educational measurement and
evaluation. (2nd ed.) New York : Mc Graw Hill.
- Paliwal, M. (1985) Teacher education on the move. New Delhi : uppal.
- Pierce, W.D. & Lorber, M.A. (1977). Objectives and methods of
Secondary teaching. NJ : Prentice Hall.
- Regional College of Education (1981). Hand book on Supervised
study and field assignments. SSCC B.Ed. Mysore, DC : Author.
- Regional College of Education (1984) Internship in teaching - a hand
book. Mysore, DC : Author.
- Regional College of Education (1992). Correspondence cum contact
in-service training programme in mathematics for classes XI & XII.
Mysore, DC : Author.
- Reily, R.R. & Lewis, E.L. (1983) Educational Psychology. New York :
Mc Millan.
- Romey. W.D. (1968) Inquiry techniques for teaching science. N.J. :
Prentice Hall.
- Schewab, J.J. (1965) Biology teachers' hand book. BSCB New
York : John Wiley & Sons.
- Sharma, R.C. (1981). Modern Science teaching. Delhi : Dhanpat Rai
& Sons.

- Siddiqui, M.A. (1991) In-Service teacher education. New Delhi : Ashish.
- Sing, T. (1978) Diffusion of innovations among training colleges of India. Varanasi : Bharat Bharati Prakasan.
- Travers, R.M.W. (Ed.) (1973). Second hand book of research on teaching. American Educational Research association. Chicago : Rand Mc Nally.
- Unesco Regional Office for Education in Asia (1973). Further education of teachers in service in Asia. APEID, Bangkok, DC : Author.
- Unesco Regional Office for Education in Asia & Oceania (1978). Developing instructional modules for teacher education. APEID, Bangkok, DC : Author.
- Unesco Regional Office for Education in Asia & Oceania. (1982). Distance learning for teacher education. Vol. I current status, Program and Practices. APEID, Bangkok, DC : Author.
- Unesco Regional Office for Education in Asia & Oceania (1982). Distance learning for teacher education Vol. 2. Guidelines on development of materials. APEID, Bangkok, DC : Author.
- Unesco Regional Office for Education in Asia & Oceania (1982) Distance leaning for teacher education Vol. 3. Exemplar materials, APEID, Bangkok, DC : Author.
- Vaidya, N. (1971) Impact Science teaching. New Delhi : Oxford & IBH.

Vargees, J.S. (1972) Writing worthwhile behavioural objectives.

London : Harpor & Row.

Washton, N.S. (1967). Teaching Science Creatively. London : W.B.

Sunders & Co.

Young, P.V. (1979). Scientific Social Surveys and research. New

Delhi : Prentice Hall.

Theses and Dissertations :-

Baby, S. (1989) The relation of science interest and science learning environment with divergent thinking in science. Unpublished M.Ed. dissertation, university of Calicut.

Butala, M.A. (1987). A critical inquiry into in-service educational programme conducted by secondary teachers training colleges in Gujarat. In M.B.Buch (Ed.) Fourth Survey of research in Education. New Delhi : NCERT.

Cavangh, P. (1969). The use of programmed instruction in a correspondence situation. IN H. Coppen (1972) A Survey of British Research in Audiovisual Aids. London : National Committee for audio visual aids.

Chauhan, S.S. (1962). Evaluation of the teacher training programme of the woman training college, Dayalburgh. Unpublished M.Ed. dissertation, Agra University.

Chauhan, S.S.(1973). Developing a programmed text in educational psychology for B.Ed. level. In M.B.Buch (Ed.) Third survey of research in education. New Delhi : NCERT.

Chopra, R.C. (1964). A critical appraisal of the post-graduate teacher training programme in Punjab. Unpublished M.Ed. dissertation, Agra University.

Gupta, S.P. (1979). A study of the in-service teaching, needs of secondary teacher educator. Unpublished research report, New Delhi : NCERT.

- Haridasan, N.K. (1989). The study of problem solving ability in biological science of high, average and low biology achievement at secondary school level. Unpublished M.Ed. dissertation, university of Calicut.
- Hopper, W.A.F. (1982). An experimental study in the use of modular approach for teaching biology. Published doctoral dissertation, M.S. University, Baroda.
- Jha, S.N. (1962). A critical study of secondary teacher training programme in U.P. Unpublished research report, University of Lucknow, Lucknow.
- Jose, K.M. (1987). A comparative study of the Biology achievement of high, average and low science aptitude of secondary school pupils. Unpublished M.Ed. dissertation, University of Calicut.
- Krishnan, S.S. (1983). Development of multimedia package for teaching a course on audio-visual education. Unpublished doctoral dissertation, M.S. University, Baroda.
- Lali, S. (1990). An analytical study of the initiative of secondary school teachers of Malappuram district for professional improvement. Unpublished M.Ed. dissertation University of Calicut.
- Lambhate, M.V. (1987). Development of instructional material for teachers teaching science to class VI in rural areas of Madhya pradesh. In M.B. Buch (Ed.) Third Survey of research in education. New Delhi : NCERT.
- Mian, M.S. (1980). An experimental study of teaching science in standards VI & VII through modules. Unpublished doctoral thesis. M.S. University, Baroda
- Mini. M. (1989). A study of sex difference in process outcomes in biology of secondary school pupils. Unpublished M.Ed dissertation, University of Calicut.
- Nair, P.V. (1987). A comparative study of certain cognitive, affective, and social variable which discriminate between high-creative and low-creative under achievers in secondary school science. Unpublished doctoral thesis, University of Calicut.
- Naushad, A. (1989). Effect of sex, locale and attitude towards problem - solving on process outcomes in biology. Unpublished M.Ed. dissertation, University of Calicut.

- Nincy, V. (1987). A comparative study of urban-rural difference in certain cognitive abilities related to biology achievement of standard VIII pupils. Unpublished M.Ed. dissertation, University of Calicut.
- Prashar, D.S. (1963). Evaluation of the effectiveness of teachers' training during last decade (1952-62). Unpublished M.Ed. dissertation, University of Jabalpur.
- Poorman, L.E. (1968). A comparative study of the effectiveness of a multimedia, systems approach to Physics with traditional approach at high school level. In A. Misra (1991), Performance discrepancy of science teachers. Delhi : Kanishka.
- Rabindradas (1984). The development and tryout of self-instructional materials on health education for high school students with special reference to communicable diseases. Unpublished doctoral dissertation, S.G. University.
- Razak, A.P. (1989). A survey of opinions of teachers about the revised biology and health science content of standard IX and X in Kerala State. Unpublished M.Ed. dissertation, University of Calicut.
- Rekha, K. (1988). A study of the effectiveness of the piagetian model of teaching for the development of problem solving ability in secondary school students. Unpublished M.Ed. dissertation, University of Calicut.
- Saeedakhtar (1965). An enquiry into the opinion and attitudes of student teacher towards the teacher training programme in the department of education. Unpublished M.Ed. thesis, Aligarh Muslim University.
- Salimkumar, C. (1994). Interaction of approaches to studying and achievement motivation on achievement in biology of secondary school pupils. Ph.D. thesis, Dept. of education, University of Calicut.
- SCERT, A.P. (1980). Evaluation of in-service training of secondary school teachers in science teaching centres attached to colleges of education. In M.B. Buch (Ed.) Fourth Survey of research in education. New Delhi : NCERT.
- Siddiqui, N.N. (1986). Development of a sample self-learning material for senior secondary biology and analysis of its effectiveness. Unpublished doctoral dissertation. University of Jamia Milia Islamia.

- Sivadasan, K.R. (1981). Project on developing science kits and self-instructional soft ware for audio-tutorial instruction. Unpublished research project University of Kerala.
- Sivaprasad, K. (1988). An investigation of the classroom environment for learning science in the secondary schools of Kerala. Unpublished M.Ed. dissertation, University of Calicut.
- Srivasthva (1966). Growth and organisation of in-service programme in India and its impact on secondary schools. Unpublished doctoral dissertation, Sardar Patel University.
- Sujatha, K.B. (1987). The relative efficiency of science aptitude, science interest and attitude towards science in predicting biology achievement of secondary school pupils. Unpublished M.Ed. dissertation, University of Calicut.
- Uzhunna, A.B. (1989) A comparative study of science learning approach and science learning environment between high, average and low creative secondary school pupils. Unpublished M.Ed. dissertation, University of Calicut.
- Vardhini, V.P. (1983). Development of a multimedia instructional strategy for teaching science at secondary level. In M.B. Buch (Ed.) Fourth Survey of research in education. New Delhi : NCERT.
- Varghese, P.J. (1989). Affective correlates of process outcomes in biology. Unpublished M.Ed. dissertation, University of Calicut.
- Vijayakumar, P. (1988). A critical analysis of the content of the text books of biology for standard IX of Kerala State. Unpublished M.Ed. dissertation, University of Calicut.

Journal articles :-

- Al badr, M.S. (1993). Predictors of success in self-instruction courses on micro computer application software. Dissertation Abstract International. Vol. 54., Feb. 1994.
- Assuzu, C. (1983). Status of educational media in the federal government secondary school system in Nigeria - an assessment with guidelines for in-service programme. Dissertation Abstract International, 45, 1089.

- Bailkeri, K.N. (1983). Effect of self instructional remedial micro teaching course on the instructional competence of in-service secondary school mathematics teachers. Dissertation Abstract International. Vol. 55. Jan. 1995.
- Carrol, T.N./ (1989). In-service workshop for high school physics teachers. Dissertation Abstract International (1990). 60.
- Das, B.C. (1990). Effectiveness of self learning materials for the orientation of University and college teachers. Experiments in Education (1973). 21.
- Gray. B.A.H. (1996) Student achievement and temperament types in traditional and distance learning environments. Dissertation Abstract International. Vol. 57, Oct. 1996.
- Green, J.C. (1994) Video Self-evaluation : Self guided staff training in a residential treatment facility for youths with developmental disabilities. Dissertation Abstract International. Vol. 55, Jan. 1995.
- Heaton, R.1. (1988). The effects of teacher training on student and teacher performance of listening and questioning skills. Dissertation Abstract International. Vol.55, Jan. 1995.
- Jungsatitkul, S. (1991). Effects of an in-service training programme on the performance of Thai Secondary school teachers of English. Dissertation Abstract International. Vol.52, May 1992.
- Osantowski, T.B. (1993). Effects of in-service training on teachers knowledge and applied skills related to identification of learning disabilities. Dissertation Abstract International. Vol. 54, Oct. 1993.
- Panda, B.B. (1994) Effect of Advance organizer and set induction on learning. Experiments in Education. Vol. 22. No. 9.
- Parakh, J.S. (1968). A study of teacher pupil interaction in BSCS yellow version biology classes. America Biology Teacher, 30, 841.
- Passi, B.K. (1994). Perceptions of participating Seema and Nathulal about personalised teacher education programme. Experiments in Education. Vol. 22. No.6.
- Pultorak, R.W. (1975). Development and field testing of a lab-module for instruction and vascular plant taxonomy. Dissertation Abstract International, 3540-A.

- Reid, D.J. & Booh, P. (1969). The effect of individual learning upon the future demand for science teachers. Journal of Biological Education, 4 (8).
- Rowland, S. (1995). The development and implementation of an instructional module that prepares pre-service teachers to address the needs of students with attention deficit hyper activity disorder. Dissertation Abstract International. Vol. 56. Dec. 1995.
- Shanguya, M.N. (1995). Factors relevant to teacher training improvement - A case study of instructional technology in the curriculum of the teacher education programme of kenyatta university. Dissertation Abstract International. Vol. 56. June 1996.
- Siemankowsky, F.T. (1969). An auto paced teaching process in physical science for elementary teacher preparation. Journal of Research in Science Teaching. 6, 150.
- Sullivan, O. (1981). A model for the effect of an in-service programme on junior high school students' Science achievement. Journal of Research in Science Teaching (May) 1990 .
- Vasantha Kumari (1986). Developing multimedia package for X standard students on the topic heredity. Abstracts of Educational Research. 1974-94. P. 40, No. 136.

Reports :-

- Bolam, R. (1980). In-service education and training of teachers and educational change. Final report of CERI Project on INSET, Paris : OECD.
- Ministry of Education (1952). Report of the secondary education commission. Govt. of India, New Delhi DC : Author.
- Ministry of Education. (1966). Education and National Development. Report of the education commission. Govt. of India. New Delhi DC : Author.
- Ministry of Human Resource Development (1986). National Policy on education. Govt. of India, New Delhi DC : Author.

Ministry of Human Resource Development (1992) Revised National Policy of Education. Govt. of India. New Delhi : DC : Author.

Ministry of Human Resource Development (1992). Programme of Action. Govt. of India, Department of Education, New Delhi, DC : Author.

Ministry of Human Resource Development (1994). Annual Report 1993-94. Part I. Govt. of India, Department of Education, New Delhi, DC : Author.

National Council for Educational Research and Training (1990) Guidelines and syllabi of elementary and secondary teacher education curriculum. New Delhi : DC : Author.

National Council for Educational Research and Training (1992). Fifth All India Educational Survey Vol. I, New Delhi, DC : Author.

National Council for Educational Research and Training (1997). Papers on common school system. In Indian Express daily 23 Oct. 1997.

Planning Commission (1992). Eighth five year plan. Govt. of India, New Delhi, DC : Author.

APPENDICES

APPENDIX 1

B.Ed. Syllabus of Different Universities

APPENDIX 1.A.

B.Ed. Syllabus of University of Calicut

Objectives : The student teacher

- 1) knows the various methods and techniques used in science education from time to time;
- 2) gets an understanding of the working of science and methods employed in sciences;
- 3) is interested in contemporary developments in instruction in life sciences ;
- 4) formulates instructional objectives ;
- 5) analyses and organise materials for class instructions;
- 6) selects and plans appropriate learning tools and situations;
- 7) employs are methods of instructions
- 8) guides learning;
- 9) evaluates pupils attainments;
- 10) evaluate his own work and marks deficiencies and inadequates;
- 11) tries out new improvements;
- 12) has professional, academic and social interests;
- 13) has an attitude of self reliance in professional matters.

Units

- I. knowing, Life Science - History of science - Traditional sciences of India's contribution to world science. Important land marks in the

growth of life science in most, knowledge explosion, Role of UNESCO, UNICEF in improving science education in India. General survey of work in life sciences - Progress in India Indian biologists of reown, past and present estimation of the role of life sciences on national development.

- II. Understanding life sciences: Science - scientific process - scientific method - science attitude, analysis into basic elements and definition. Karl Pearsons scheme in scientific method internalisation of scientific attitude in the affective domain. Life science - An interdisciplinary approach changing phases of life science education in India - various commissions and reports from general science to life science - The significance.
- Life science in the developed nation U.S.A., U.K., U.S.S.R., European countries, B.S.C.S. organisation, Nuffield foundations. A prespective for India N.C.E.R.T. and N.C.S.E.
- III. Formulation of objectives: Analysis of our national goal - an appraisal of the relevance of life sciences in the context - Life science in as instrument of social change and economic development - classification and statement of objectives. Their dimensions, specifications terminal behaviour, area of attainment, targetted change.

- IV. Teaching to learning: Evolution of methods through times, lecture, demonstration, heuristics, Dalton plan, Project, Biographical method, supervised study, Herbartian development, objective based instruction. Doing science the learner gets to know, comprehend, analyse, synthesis apply to solve problem masters relevant psychomotor skills, gets to internalise attitude, gets to refine interests, spirit of enquiry and investigation, observing, describing measuring, quantifying manipulating, inferring, experimenting, hypothesising, generalising, evaluating, discovery and creativity.
- Programmed learning team-teaching, micro - teaching, investigation projects.
- Pupils work books, practical and library records, project report, science clubs science fairs, science youth projects, science talent search, enrichment programme. Art of questioning, discussion, group dynamics pupil teacher planning.
- V. Curriculum Analysis: Principles and patterns of curriculum planning. A progressive curriculum A study of the Kerala syllabi and text books for standard VIII to X - Adapting curriculum to gifted and backward.
- VI. Planning life science learning a) Need for a written plan, planning at different levels full courses, one year, one unit one lesson/session.

- b) Laboratory - objectives of lab. work, trend and features of modern laboratory, lab. purchases registers and records, management, A. V. room, workshop.
- c) Resource units: Pupils assignments, life science bulletins.
- d) Learning equipment - specimens line ones, killing and preserving, seedling nurseries, aquaria, terraria, entomological cases - Micro scope, care and use of biology kits, improvisations.
- e) Field trips and excursions - other co-curricular reinforcements.

VII Evaluation :

1. What do look for - How to evaluate-ensuring validity, content validity, concurrent validity, construct validity, reliability (placement consistency, objectivity, administratbility, interpretability).
2. Planning, assembling, and editing a test paper, test administration.
3. Making test items-supply type, and selection type, preparing item cards.
4. Evaluating skills, attitudes, and interests, cumulative devices;
5. Scoring and grading-interpretation of test scores after analysis diagnostic test and remedial teaching.

VIII. Developing an Indian tradition of science teaching - short comings of the science teacher, suggestions for imposing competencies, summer institutes. All India science teachers association.

APPENDIX I.B

B.Ed. Syllabus of Mahatma Gandhi University

Objectives of the syllabus

1. The student teacher gains the knowledge of the nature of science and the relevance of teaching life science in schools.
2. He gets knowledge and understanding of traditional methods and new techniques and approaches to the teaching of life science.
3. He gets an understanding of principles of syllabus construction in life science and develops the ability to evaluate the merits and demerits of school syllabus in life sciences. He becomes familiar with the modern trends in curricular reforms.
4. He develops understanding and skill of planning different lessons, executing them and evaluating them.
5. He develops knowledge of the different materials and media in the teaching of life science and also the correct use of them in class room situations.
6. He gets an understanding of the principles of the new concept of evaluation and develops skill in preparing and administering objective based test items.
7. He develop knowledge of the co-curricular activities in life sciences and their relevance in class room instruction.

8. He develops correct estimate of his important role in the educational process and appreciates the need for his professional growth.
9. He develops knowledge, understanding and skills for effectively teaching any topic included under high school life sciences syllabi.

SECTION I

METHODOLOGY OF TEACHING LIFE SCIENCE

1. NATURE OF SCIENCE

What is science? Science as a product. It is an accumulation of facts, principles, generalisation and theories, Science as a process. Locating a problem, observation, collection of data, formulation of hypothesis (analysis and interpretation of data), verification, conclusion. Science as both a process and a product. Science as an ongoing process of enquiry. Science as human enterprise.

II. WHY TEACH LIFE SCIENCE ?

Broad aims :

- a) Developing scientific literacy.
- b) Effecting social changes.
- c) Raising the standard of living.
- d) Creating an awareness of national goals of teaching life science (with reference to population control, increase in food production)

eradication of diseases, better nutrition, improvement of livestock development of fisheries, conservation of natural resources).

Instructional objectives :

Knowledge

Understanding

Application

Skills

Interests

Attitudes (scientific attitude)

Appreciation.

III. METHODS, TECHNIQUES AND APPROACHES FOR TEACHING LIFE SCIENCE

- a) Methods - General survey of following methods. Lecture, demonstrational Project, Problem, Heuristic, Biographical, Dalton Plan.
- b) Techniques and Approaches to teaching - Programmed instruction, Team teaching; Techniques for catering to the needs of exceptional children (National Science Talent Search Scheme), Investigatory, versus factual approaches, interdisciplinary approach, inductive deductive approach.

IV. HOW TO FRAME A SYLLABUS IN LIFE SCIENCE

- a) Principles of syllabus construction.
- b) Critical study of the existing high school syllabi in Kerala.
- c) Modern trends in curricular reforms in the developed and developing countries (BS CS all versions and Nuffield Science foundation).

V. PLANNING IN TEACHING LIFE SCIENCE

- a) Why Planning.
- b) Types of planning. Yearly, monthly, unit, daily lesson (Emphasize objective based from at).

VI. MATERIALS AND MEDIA FOR TEACHING LIFE SCIENCE

1. Text book (Criteria of a good biology text book-comparative study of a BS CS Text book - any version).
2. Teachers Hand Book, Pupils Work Book.
3. Aids like black board, charts, models, different types of biological drawings, specimens, films, radio, television, aquarium, terrarium museum, bulletin board, garden, laboratory and science library, nature calender.
4. Improvised aids.
5. Resource unit.

VII. EVALUTION IN BIOLOGICAL SCIENCE TEACHING

1. Traditional system (essay) its defects and suggestions for improvement.
2. New concepts of evaluation, formulation and clarification of objectives in terms of behaviour, forms of questions, essay, short answer and objective type. Steps in the construction of a unit test. Test design- weightage to objectives, content and forms of questions, difficulty level blue print, criteria of a good test. Validity, reliability, objectivity and usability. Analysis of test results. Standardisation of achievement test. Diagnostic testing and remedial teaching.

VIII. CO-CURRICULAR ACTIVITIES IN LIFE SCIENCE

1. Science clubs
2. Science fairs.
3. Field trips and excursions.

IX THE LIFE SCIENCE TEACHER

Qualification of a Biology teacher, professional competencies, ways and means of developing these competencies. Inservice programmes, teachers organisation, study tours, exchange programmes, incentives for professional improvement.

SECTION II

PEDAGOGIC ANALYSIS OF BIOLOGY CONTENT, LESSON PLANNING AND EVALUATION

Note : Student teachers shall make an analysis of content into major and minor concepts, facts and terms decide upon the types of introduction, varieties of learning experiences, different aids to be used, assignments to be given and sample test items for all the topics included under the Biology syllabus of Kerala in Standard VIII, IX and X.

- A. Human physiology - Respiration :
Metabolism, excretion, endocrine glands, skin, Nervous system, and sense organs, Reproductive system. General Biology: Basic Principles of structure and processes of life. General aims and problems of modern Biology. Levels of Biology organisation. The organism, Micro organisms, bacteria, viruses, antibiotics, characteristics of life processes in animals and plants.
- B. Natural communities, Ecosystem, Biosphere Man and his environment, an Agricultural field, conservation of nature.
- C. The cell, Structure, Division Chemical basis of life. Biochemistry of the cell, metabolism and exchange of energy in cells, Biosynthesis of proteins, carbohydrates and fats, heredity, evolution.

SECTION III-PRACTICAL WORK

Total marks	100
1. Preparation of lesson plan for	
a) Discussion lessons	10
b) Demonstration lessons	
Emphasising different techniques and approaches	5
c) Criticism lessons	15
d) Practice lessons	25
2. Construction and administration of a unit test for a unit taught during practice teaching with scoring key marking scheme, questionwise analysis etc.	10
3. Preparation of five different improved aids of a Biology kit of a high standard with explanatory brochure for a particular unit.	25
4. Preparation of a Resource unit on any topic included in the high school life science syllabus.	10
5. Preparation of a paper on the life and contribution of an eminent scientist.	5

APPENDIX I.C

B.Ed Syllabus of University of Kerala

Objectives of the syllabus

1. The student teacher gains the knowledge of the nature of science and the relevance of teaching life science in schools.
2. He gets knowledge and understanding of traditional methods and new techniques and approaches to the teaching of life science.
3. He gets an understanding of principles of syllabus construction in life science and develops the ability to evaluate the merits and demerits of school syllabus in life sciences. He becomes familiar with the modern trends in curricular reforms.
4. He develops understanding and skill of planning different lessons, executing them and evaluating them.
5. He develops knowledge of the different materials and media in the teaching of life science and also the correct use of them in class room situations.
6. He develops understanding of the principles of the new concept of evaluation and develops skill in preparing and administering objective based test items.
7. He develop knowledge of the co-curricular activities in life sciences and their relevance in class room instruction.

8. He develops correct estimate of his important role in the educational process and appreciates the need for his professional growth.
9. He develops knowledge, understanding and skills for effectively teaching any topic included under high school life science syllabi.

SECTION I

METHODOLOGY OF TEACHING LIFE SCIENCE

1. NATURE OF SCIENCE

What is science ? Science as a product. It is an accumulation of facts, principles, generalisation and theories. Science as a process. Locating a problem, observation, collection of data, formulation of hypothesis (analysis and interpretation of data), verification, conclusion. Science as both a process and a product. Science as an ongoing process of enquiry. Science as human enterprise.

II. WHY TEACH LIFE SCIENCE ?

Broad aims :

- a) Developing scientific literacy.
- b) Effecting social change
- c) Raising the standard of living.
- d) Creating an awareness of national goals of teaching life science (with reference to population control, increase in food production

eradication of diseases, better nutrition, improvement of livestock development of fisheries, conservation of natural resources).

Instructional objectives :

Knowledge

Understanding

Application

Skills

Interests

Attitudes (scientific attitude)

Appreciation.

III. METHODS, TECHNIQUES AND APPROACHES FOR TEACHING LIFE SCIENCE

- a) Methods - General Survey of following methods. Lecture, Demonstrational Project, Problem, Heuristic, Biographical, Dalton plan.
- b) Techniques and Approaches to teaching - Programmed instruction, Team teaching, Techniques for catering to the needs of exceptional children (National Science Talent Search Scheme), Investigatory, Enquiry and discovery approaches, Conceptual versus factual approaches, interdisciplinary approach, inductive deductive approach.

IV. HOW TO FRAME A SYLLABUS IN LIFE SCIENCE

- a) Principles of syllabus construction.
- b) Critical study of the existing high school syllabi in Kerala.
- c) Modern trends in curricular reforms in the developed and developing countries (BS CS all versions and Nuffield Science foundation).

V. PLANNING IN TEACHING LIFE SCIENCE

- a) Why Planning.
- b) Types of planning. Yearly, monthly, unit, daily lesson (Emphasize objective based from at).

VI. MATERIALS AND MEDIA FOR TEACHING LIFE SCIENCE

1. Text book (Criteria of a good biology text book comparative study of a BS CS Text book - any version).
2. Teachers Hand Book, Pupils Work Book.
3. Aids like black board, charts, models, different types of biological drawings, specimens, films, radio, television, aquarium, terrarium museum, bulletin board, garden, laboratory and science library, nature calender.
4. Improvised aids.
5. Resources unit.

VII. EVALUATION IN BIOLOGICAL SCIENCE TEACHING

1. Traditional system (essay) its defects and suggestions for improvement.
2. New concepts of evaluation, formulation and clarification of objectives in terms of behaviour, forms of questions, essay, short answer, and objective type. Steps in the construction of a unit test. Test design weightage to objectives, content, and forms of questions, difficulty level blue print, criteria of a good test. Validity, reliability, objectivity and usability. Analysis of test results. Standardisation of achievement test. Diagnostic testing and remedial teaching.

VIII. CO-CURRICULAR ACTIVITIES IN LIFE SCIENCE

1. Science clubs.
2. Science fairs.
3. Field trips and excursions.
4. Experimental projects and action researches.

IX. THE LIFE SCIENCE TEACHER

Qualification of a Biology teacher, professional competencies, way and means of developing these competencies. Inservice programmes, teachers organisation, study tours, exchange programmes, incentives for professional improvement.

SECTION II

PEDAGOGIC ANALYSIS OF BIOLOGY CONTENT, LESSON

PLANNING AND EVALUATION

Note : Student teachers shall make ~~an~~ analysis of content into major and minor concepts, facts and terms decide upon the types of introduction, varieties of learning experiences, different aids to be used, assignments to be given and sample text items for all the topics included under the Biology syllabus of Kerala in Standard VIII, IX and X.

- A. Human physiology - Respiration :
Metabolism, excretion, endocrine glands, skin, Nervous system and sense organs, Reproductive system. General Biology : Basic Principles of structure and processes of life. General aims and problems of modern Biology. Levels of Biology organisation. The organism, Micro organisms, bacteria, viruses, antibiotics, characteristics of life processes in animals and plants.
- B. Natural communities, Ecosystem, Biosphere, Man and his environment, an Agricultural field, conservation of nature.
- C. The cell, Structure, Division, Chemical basis of life. Biochemistry of the cell, metabolism and exchange of energy in cells, Biosynthesis of proteins, carbohydrate and fats, heredity, evolution.

SECTION III - PRACTICAL WORK

Total marks	100
1. Preparation of lesson plan for	
a) Discussion lessons	
b) Demonstration lessons	10
Emphasising a different techniques and approaches	5
c) Criticism lessons	15
d) Practice lessons	25
2. Construction and administration of a unit test for a unit taught during practice teaching with scoring key marketing scheme, questionwise analysis etc.	10
3. Preparation of five different improved aids of a Biology of a high standard with explanatory brochure for a particular unit	25
4. Preparation of a Resource unit on any topic included in the high school life science syllabus.	10
5. Preparation of a paper on the life and contribution of an eminent scientist.	5

APPENDIX I.D

Syllabus for One year B.Ed. Course by Regional College of Education

Ist Semester

Objectives

1. To identify the major ideas/content in certain specified units of biological science of classes IX-X.
2. To develop skill to analyse the content to write behavioural objectives and select appropriate learning experiences.
3. To develop skill in writing lesson plans.
4. To develop skill in selecting appropriate teaching techniques.
5. To organise field trips to supplement lab. experience.
6. To develop skill in constructing test items and evaluating pupils' achievement.
7. To lactate deficiencies or difficulties in learning and practice remedial measures.
8. To develop skill in the preparation of various types of learning aids.

Development of skills

1. Analysis of lessons to concepts, behavioural objectives and relevant learning experiences.
2. Try out of different learning methods/approaches.
3. Preparation of teaching aids including improvised and effective use of different types of teaching aids.

4. Preparation of test items, construction of unit test.
5. Planning and conducting of field trips.
6. Organisation of team teaching projects.

Content analysis

- a. Cell structure and function
- b. Photosynthesis and respiration
- c. Control and co-ordination
- d. Ecosystem
- e. Evolution.

Evaluation (Theory)

1. Analysis of objectives, concepts and learning experiences
2. Different methods of teaching
3. Micro teaching
4. Principles of Evaluation
5. Internal assessment.

Evaluation (Practical)

1. Lesson planning
2. Simulated teaching
3. Records of field trips
4. Teaching aids and improvised aids.

IIInd Semester

Objectives

1. To familiarise with modern curricular materials in biology with special reference to B.S.C.S. Nuffield biology, NCERT.
2. To analyse curricular materials such as text books, lab guides, supplementary reading materials and teachers hand books.
3. To develop ability to design new laboratory
4. To plan for equipping lab. and its optional usage.
5. To develop skill in preserving different types of biological materials.
6. To develop skill in mounting biological materials.
7. To develop skill in organising science clubs, science fair, etc.
8. To develop ability to prepare resource units and self-learning packages in biology.

Content

1. Complementarity of structure and function
2. Complementarity of organism and environment.
3. Control and co-ordination
4. Growth and development.
5. Heredity and variation
6. Biological molecules, enzymes, DNA & RNA.

Development of skills

1. Analysing text books and other curricular materials and prepare proforma to evaluate them.
2. Preparation of blue print in biology lab. for school and indicating various ancillary facilities needed for teaching biology.
3. Preparation of preservation and status for biology lab.
4. Techniques for culturing biological materials.
5. Development of materials for exhibitions and other display.
6. Use of community resources in the development of self learning package.
7. Preparation of resource units in biology.
8. Analysis of biology lab. equipment for their optional utilization.

APPENDIX 1.E

Syllabus Outline for Science Methods Course for Secondary Teacher

Education NCERT

Section I

Unit 1. Nature of science

- Nature and scope of science
- Substantive structure
- Syntactical structure

(Mode: students define science in their own terms. Explain the examples of structure of science. Discuss the sociology of science and cite examples from Indian context. Write objectives of science teaching at secondary level).

Unit 2. Objective Based Science Teaching at Secondary Level

- Aims and objectives
- Types of objectives
- Relating objectives with learning outcomes
- Defining minimum levels of learning.

(Mode: Discuss on validity and feasibility of objectives. Choosing specific content areas, stressing how to achieve these objectives in realistic classroom settings. Special emphasis to be laid on instructional strategies fostering problem solving and decision making skills and skills of an affective nature).

Unit 3. Characteristics of a learner at secondary level.

- stages of cognitive development
- identification of these changes among children
- evolving biology teaching strategies to suit the needs of children

(Mode: Practice session and discussion. Choosing set of examples students to be trained to judge suitability of a given concept to a given stage of learner. To be done through group activity, each group being assigned a set of concepts to analyse and a discussion with entire class of their findings. Heterogeneity of realistic class room populations to be high lighted and various strategies to handle such situations to be discussed).

Unit 4. Learner centred and activity based Approach to Teaching Science

- concept approach (How concepts acquired through activities)
- Process approach (write different processes of science).
- Individualized instruction (Explain its need and importance).
- Programmed learning (develop one unit in this form)
- Computer aided instruction

(Mode: These approaches may be illustrated by selection of content from secondary school science topics).

Section II Curriculum Transaction

Unit 5. Science curricula

- Explain curriculum, determinants and organisation
- Science curricular projects (PSSC, BSCS, Chem study)
- Emerging trends
- Analysis and evaluation of syllabus and text books

Unit 6. Transactional Strategies

- Analysis of content and identification of concepts (student teachers will write ten concepts from a unit each from any two school science subjects)
- Listing instructional objectives and behaviour outcomes (student teachers write to behaviour outcomes for each unit, each from a topic in any two school science subject).
- Selection and developing learning activities/experiences matching with the developmental stages of the learner (Develop learning activities for three lessons)
- Preparation of lesson plan/unit plans (writes to lesson plans and 2 unit plans)
- Maintaining the ecology of class room
- Preparation of low cost improved apparatus (Prepare 2 apparatus)
- Preparation of multimedia materials (develop a radio script for educational broadcast)

Unit 7. Laboratory Management and Safety

- Lab. equipment, designing a science lab.
- Management of science lab. safety precautions
- Organising facilities in a science room.

Section III. Evaluation in Secondary Science

Unit 8. Extended curricular Activities in Science Teaching

- Field study, science club, science fair, science exhibitions, etc.
- Identification and use of community resources.

Unit 9. Evaluation

- Explain term evaluation, comprehensive and continuous evaluation.
- Develop hundred test items in Science
- Determine the need of diagnostic testing and remedial measures
- Prepare a diagnostic test, achievement test
- Analysis and interpret test data collected through field work.

Section IV. Innovative Experiences in Science Education at Secondary level

A study of some innovations for improvement of science education

write papers on the following which will be discussed in the seminar).

this could be done through project works.

- Nehru Science Exhibition,
- Mobile science ~~mans~~ (labs)

- Vikram Sarabai Science Centre, Ahmedabad
- Kerala Sasthra Sahitya Parishad
- Science journals.

APPENDIX 1.F

The Course Outline of B.Sc. Ed. Course followed by

Regional College of Education

1. An Introduction to school biology for teacher education,
2. Psychology of learning in relation to Biology teaching.
3. Aims and objectives of teaching biology.
4. Planning for teaching biology
5. Micro teaching
6. Approaches, methods and teaching techniques in Biology
7. Evaluation in Biology
8. Science laboratory for schools
9. Facilities for teaching Biology.

APPENDIX II

Syllabus Outline for In-service Teacher Education for secondary School

Natural Science Teachers conducted by College of Teacher

Education, Calicut.

1. National curricular framework. Different components, content, and process - Discussion
2. New trends in evaluation
3. Discussion to the preparation of an evaluation tool
4. Techniques of effective learning
5. Preparation of model lesson plan
6. Recent developments in strategies of teaching - discussion and suggestions
7. Microteaching - discussion and preparation of lesson plan
8. Pedagogical analysis (Botany) - discussion
9. Methodology of teaching science - discussion
10. Demonstration lesson - discussion
11. Pedagogical analysis (Zoology) - discussion
12. Methodology including lesson plan
13. Discussion and preparation of lesson plan
14. Preparation of teaching aids - discussion
15. Evaluation of the course by the participants
16. Responses and suggestions.

APPENDIX III.A

Interview Schedule for Secondary School Biology Teachers who had not participated in In-service Programme

1. As a trained teacher, would you feel that in-service training is essential ?
2. Have you participated in any in-service course ? ~~If you~~ was it useful to you ?
3. Among face-to-face and distance mode for the in-service courses, which one do you prefer ?
4. What is your opinion about learning by using self instructional materials for in service learning ?
5. In your suggestion, which all topics should be included while preparing a self instructional material for an in-service course ?
6. Which should be the medium of instruction for the self instructional material ?
7. Among the theoretical and practical side of the topics which should be more stressed in the course ?
8. Which style do you prefer for the course ? Investigative/illustrative ?
9. What are the major problems arising while you are teaching ?
10. Any other suggestions for the preparation of self instructional material for in-service learning.

APPENDIX III.B

Interview schedule for secondary school Biology Teachers who had participated in In-service Programme

1. As a trained teacher would you feel that in-service training is essential ?
2. Have you participated in any in-service course?
3. In what respects the course became useful ?
4. Could you apply the new information in your daily teaching ?
5. Are you applying it even now ?
6. Which all steps have you included in your teaching after attending the course ?
7. Is that course enough ? Or do you need further information/course ?
8. Among face to face and distance mode of courses, which one^{do} you prefer ?
9. What is your opinion about using self-instructional material for inservice learning ?
10. Which all topics should be included while preparing self instructional material ?
11. Which should be the medium of instruction for the self instructional material ?
12. Among the theoretical and practical side of the topics which should be more stressed in the course ?

13. What are the major problems arises while you are teaching ?
14. Any other suggestions for the preparation of self instructional material for in-service learning ?

APPENDIX IV-A

The Summary of Teachers' Responses to Interview Schedule III.A

1. All the teachers opined that in-service training is necessary, because of the newer developments in the field of education.
2. None of them have participated in any in-service course.
3. Majority of teachers prefer course through distance mode as it is more convenient to them. But some of them had no special preference to any mode.
4. All the respondents are in favour of learning through self instructional material.
5. Majority of them suggested that newer instructional techniques, preparation and use of accessory learning materials, more details on evaluation, etc. should be included in the syllabus. And some of them emphasis the inclusion of topics such as planning for teaching, strategies for individual learning, remedial teaching, etc.
6. The medium of instruction for the, SIM should be either English or Malayalam. Majority of respondents suggested that if the medium is English the language should be simple.
7. Almost all the teachers suggested that the practical or application side of the topics should be given more emphasis while preparing the course.

8. Majority of the respondents preferred investigative style of presentation of materials. But they suggested that models or illustrations should be included to guide the investigation.
9. The following are the major problems faced by the teachers while they are teaching:
 - a) Newer contents are included but the facilities for teaching and methods of instruction known are of the traditional type. So it is difficult to adopt newer methods of instruction.
 - b) Sustaining the interest of pupils.
 - c) Problems of indiscipline
 - d) Teacher pupil ratio is high.
10. The SIM should include newer advancement in teacher education. It should be simple, precise and well designed for distance learning.

APPENDIX IV.B

Summary of Teachers' Responses to Interview Schedule III.B

1. All the teachers opined that in-service training is necessary.
2. All of them participated in an in-service course conducted by CTE for a duration of 10 days. The course was useful as opined by the teachers.
3. The teachers opined that the course is useful in the sense that it provided valuable informations regarding various aspects of education such as psychology of learning, child-centred learning, measurement and evaluation, content analysis, etc.
4. All teachers who participated in the course applied the new informations in their daily teaching.
5. Most of the teachers are applying some techniques even now.
6. The following are the additions they include in their teaching.
 - a) Try to give more importance to children
 - b) Providing as much learning aids as possible
 - c) Special attention to slow learners
 - d) Try to get feed back from children.
7. All the teachers opined that they need further information regarding new advancement in the field of education.
8. Majority of teachers prefer course through distance mode. Some of them have no special preference to any mode.

9. Almost all the respondents are in favour of learning through SIM.
10. The teachers suggested that newer instructional techniques, details of characteristics of secondary school pupils, preparation of learning aids, more details about evaluation etc should be included in the syllabus. Some of them suggested the inclusion of individualised techniques of learning, planning for teaching, techniques of analysis of content, etc. also.
11. Most of the teachers have no special preference to any medium for the SIM. They opined that medium should be either English or Malayalam. All the teachers suggested that if the medium is English it should be simple.
12. Majority of the respondents advocated that the application side of the topics is more important as it guides teaching. So it should be more stressed in the course.
13. The following are the major problems they faced in their teaching.
 - a) New additions to the content occurs but the facilities for teaching and method of instruction known are not enough to provide effective instruction.
 - b) Due to the lack of proper information regarding child centered method, it is difficult to sustain the interest of learners.

c) Teacher pupil ratio is high in the classroom, which leads to many problems like indiscipline, difficulty to provide individual attention, problems in evaluation etc.

14. The SIM should be self contained one. It should involve all necessary details regarding techno-pedagogical advancement and should be simple. It should be made easily accessible to all Biology teachers.

APPENDIX V

Proposed syllabus outline for Self-Instructional Material

OBJECTIVES

1. To develop an understanding of characteristics of a learner at secondary level.
2. To develop skill in evolving appropriate planning in biology teaching.
3. To develop skill in pedagogical analysis of biology content at secondary level.
4. To develop skill in adopting newer strategies of instruction in biology at secondary level.
5. To develop skill in preparing accessory learning materials and organising extended curricular activities.
6. To develop skill in adopting newer strategies of evaluation to assess achievement in biology.
7. To understand the steps of maintaining class discipline.

The following sequence is suggested for the SIM to realise the objectives stated.

A brief introduction about self instructional material (SIM)

The syllabus arranged in VII different sections, each section is sub-divided into units for the convenience of preparing SIM. The sections are.

- I. CHARACTERISTICS OF A LEARNER AT SECONDARY LEVEL.
- II. PLANNING FOR TEACHING BIOLOGY AT SECONDARY SCHOOL LEVEL.
- III. PEDAGOGICAL ANALYSIS OF SECONDARY SCHOOL BIOLOGY.
- IV. INSTRUCTIONAL STRATEGIES IN BIOLOGY.
- V. PREPARATION OF ACCESSORY LEARNING MATERIALS AND ORGANISING EXTENDED CURRICULAR ACTIVITIES.
- VI. STRATEGIES OF EVALUATION IN BIOLOGY.
- VII. CLASS ROOM DISCIPLINE.

DETAILED SYLLABUS

A Brief introduction about SIM.

How to study and use SIM in biology.

Sec. I. CHARACTERISTICS OF A LEARNER AT THE SECONDARY LEVEL.

Unit 1. Stages of Cognitive Development

Pre-operational, concrete operational and formal operational.

Unit 2. Learner characteristics

Identification of the above changes among children.

Unit 3. Teaching the learner :

Evolving biology teaching strategies to suit to the needs of the children.

Sec. II. PLANNING FOR TEACHING BIOLOGY AT SECONDARY LEVEL

Unit 1. Long Term Planning

Details of long term planning. Unit planning, a model unit plan.

Unit 2. Lesson Plan

Important aspects of a lesson plan. Model lesson plan.

Sec. III. PEDAGOGICAL ANALYSIS OF SECONDARY SCHOOL BIOLOGY

Unit 1. Pedagogical principles

Techniques for analysing the content according to the pedagogical principles.

Unit 2. Models of Analysis

Model illustrating analysis techniques.

Sec. IV. INSTRUCTIONAL STRATEGIES IN BIOLOGY

Different models of teaching used to present different strategies of instruction.

Unit 1. Concept Attainment Model

Discussion of the Concept attainment model proposed by Bruner.

Unit 2. Advance organiser Model

Discussion of the Advance organiser model proposed by Ausubel.

Unit 3. Biological Science Inquiry Model

Discussion of the Biological Science Inquiry model proposed by Schwab.

Unit 4. Cognitive Growth Model

Discussion of the cognitive growth model proposed by piaget.

Unit 5. Group Investigation Model

Discussion of the group investigation model proposed by Herbert thelen.

Unit 6. Mastery Learning :

Discussion of mastery learning proposed by Benjamin Bloom, John Carrol, et al.

Sec. V. PREPARATION OF ACCESSORY LEARNING MATERIALS
AND ORGANISING EXTENDED CURRICULAR ACTIVITIES

Unit 1. Laboratory

Lab. equipment, designing science lab. management of science lab., safety precautions.

Unit 2. Learning Aids

Types of learning aids, improvisation of aids, effective utilisation of aids.

60

Unit 3. Learning Equipment

Specimens - collection and preservation, aquarium, terrarium, green house.

Unit 4. Community Resources

Utilisation of community resources for learning.

Unit 5. Extended curricular activities

Science club, science fair, science quiz, field trip, projects, nature action movement, etc.

Unit 6. Resource units

Need, steps in the preparation of resource units.

Sec. VI. STRATEGIES OF EVALUATION IN BIOLOGY

Unit 1. Meaning of Evaluation

Principles of evaluation comprehensive and continuous evaluation.

Minimum levels of learning, types of evaluation, internal assessment.

Unit 2. Testing Techniques

Types of tests, preparing test items, a model test plan.

Unit 3. Self Reporting Techniques

Inventories, questionnaires, opinionnaires, check list, etc.

Unit 4. Observation Techniques

Check list, rating scale, situational tests, anecdotal record, etc.

Unit 5. Miscellaneous

Records and documents, interviews, sociometry.

Unit 6. Case study

Steps involved in case study

Unit 7. Scoring and Grading

Aspects of scoring and grading for a comparison.

Unit 8. Diagnostic test and remedial teaching

Diagnostic test and remedial teaching as a means of formative evaluation.

Unit 9. Self Evaluation

Evaluation by teachers of their own competence in teaching.

Section VII. CLASS ROOM DISCIPLINE

Unit 1. Personality of Teacher

Personality and role of the teacher in maintaining class room discipline

Unit 2. Causes of indiscipline

Physical, Physiological, psychological and social causes.

Unit 3. Steps in Maintaining Discipline

Important aspects in maintaining class room discipline.

APPENDIX VI

The Self-instructional package used in the present study.

**SELF INSTRUCTIONAL PACKAGE FOR
SECONDARY SCHOOL BIOLOGY TEACHERS
FOR THEIR IN-SERVICE LEARNING**



BAIJU. K. NATH.

Junior Research Fellow. In Education

GUIDED BY

Dr. AYISHABI. T. C.

Reader in Education

Dept. of Education

University of Calicut.

**DEPARTMENT OF EDUCATION
UNIVERSITY OF CALICUT**

1997

**SELF INSTRUCTIONAL PACKAGE FOR SECONDARY SCHOOL
BIOLOGY TEACHERS
FOR THEIR IN SERVICE LEARNING.**

CONTENTS

BLOCK 1	PSYCHOLOGICAL CONSIDERATIONS OF A LEARNER AT SECONDARY LEVEL.
BLOCK 2	PLANNING FOR TEACHING BIOLOGY AT SECONDARY LEVEL.
BLOCK 3	PEDAGOGICAL ANALYSIS IN SECONDARY SCHOOL BIOLOGY.
BLOCK 4	INSTRUCTIONAL STRATEGIES IN BIOLOGY
BLOCK 5	MEDIA AND MATERIALS FOR TEACHING BIOLOGY
BLOCK 6	STRATEGIES OF EVALUATION IN BIOLOGY
BLOCK 7	CLASSROOM MANAGEMENT.

LET US BEGIN HERE

This is a self instructional package for secondary school biology teachers for their in-service learning. You may know that, there exist a gap between our concept of education with that of recent advancement in education. This package aims to bridge that gap and to provide you an orientation about the advancement in teaching biology. This package has two components namely a print material, and an audio cassette. This whole package is designed for self learning. If you proceed according to the following instructions, you can learn this material without any external assistance.

The information in this package is centered around seven themes of teaching biology. So the whole material is divided in to seven blocks. Each block is further divided into units. The number of units in each block vary according to the bulk of information contained in the block. All units have similar design. A schematic presentation of the design of units is given below.

UNIT X

- X.0 Objectives
- X.1 Introduction
- X.2 Section I (Main Theme)
 - X.2.1 Sub.section 1 of section *(Learning Activity)*
 - X.2.2 Sub section 2 of section. *(Check Your Progress)*
- X.3 Section 2 (Main theme)
 - X.3.1 Sub section 1 of section 2
 - X.3.2 Sub section 3 of section 2 *(Check Your Progress)*

X.3.2.1. sub Sub section 1 of section 2

.....
.....
.....
.....

X.n Let us sum up.

Check your progress : Possible Answers

There will be a list of contents at the first page of each unit. The section objectives and introduction is present in all units. Other sections will vary according to the information presented in each unit

The section **OBJECTIVES** in each unit give you an idea about what new behaviours will acquire by the completion of that unit. Usually a section deals with a single objective.

The **INTRODUCTION** section acts as a link between your existing knowledge and new knowledge presented in the unit.

Each section title in a unit is indicated by **BOLD CAPITALS** and each sub section title by relatively **Smaller But Bold** face the sub-sub-sub section titles are still in **small bold** type face so as to make it easier for you to discriminate between them. The items which need to be high lighted are numbers as (i), (ii) etc. The heading of the last section of each unit will be 'Let us Sum Up', which summarise the whole unit for the purpose of recapitulation and ready reference.

Along with these, self - check questions under the captions *Check Your Progress* have been provided at the necessary parts of the contents which enable you to understand what you have already learned. The possible answers of such questions are provided towards the end of each unit.

So, what you would do is to go through the units and note down important points. This will help you to assimilate what you have read, and answer the self check questions. These questions will help you

to keep on the right track as you read the units, so you would write the answer for each of such self-check questions in the space provided for the answer. You should compare your answer with the possible answer given at the end of each unit. This will help you to locate additional points required for your answer, if any. You may be tempted to have a look at the model answer, as soon as you come across an exercise. It is hoped that you will overcome the temptation and turn to the possible answers only after writing your answer.

The information presented in the sections demand your activity at selected points under the caption. *Learning Activity*, space is provided to mark your response of these activities also. You have to answer these activities so as to proceed with the further information following the activity.

Each block will have an assignment question at the end. You should prepare the answer for those assignments, which help you to integrate the information given in different units in a particular block and that with other blocks also. This also helps to get the complete idea presented in this material.

Block 4 of this material is concerned with instructional strategies in biology. So an illustration for each instructional strategy, except mastery learning, is given in an audio cassette. When you are working with the material you should turn to the audio component only at the point, where you are directed to listen to the audio. After listening to the illustration you should return to the print material as directed in the audio.

We hope that, you will be benefited by this package. Wish you all the best.

BLOCK I

PSYCHOLOGICAL CONSIDERATIONS OF A LEARNER AT THE SECONDARY LEVEL

UNIT 1 Stages of Cognitive Development

UNIT 2 Learner Characteristics

UNIT 3 Teaching the learner.

BLOCK 1.

PSYCHOLOGICAL CONSIDERATIONS OF A LEARNER AT THE SECONDARY LEVEL.

BLOCK INTRODUCTION

There are three units in this block. Unit 1 talks about stages of cognitive development. Unit 2 tells you about learner characteristics. Unit 3 discusses important aspects of teaching the learner according to his stage of development.

The block deals with the psychological aspects of learners and teaching the learner accordingly
Unit 1. Discuss

- a) important aspects of cognitive development.
- b) four stages of cognitive development.

In Unit 2 the discussion is on a) important characteristics of learners at Secondary level. ...b) Children with learning disabilities. Unit 3 talks about (a) the needs of the learners and b) selecting suitable teaching strategies.

Hope You will enjoy working through the units of the block.

UNIT 1

STAGES OF COGNITIVE DEVELOPMENT

Contents

- 1.0 Objectives
- 1.1 Introduction
- 1.2 Cognitive Development - Important considerations by piaget.
 - 1.2.1 Adaptation
 - 1.2.1.1 Assimilation
 - 1.2.1.2 Accommodation
 - 1.2.2 Equilibration
 - 1.2.3 Conservation
 - 1.2.4 Decentration
 - 1.2.5 Cognitive structures
 - 1.2.6 Mental operations
 - 1.2.7 Schema
 - 1.2.8 Schemes
- 1.3 Four stages of cognitive Development.
 - 1.3.1 Sensori - motor period
 - 1.3.2 Pre - operational period
 - 1.3.3 concrete operational period.
 - 1.3.4 Formal - operational period.
- 1.4 Cognitive Development - Implications to classroom learning.
- 1.5 Let us sum up.

1.0 OBJECTIVES

In this unit we will have a discussion on the important aspects of a cognitive development and the different stages of cognitive development of a child. The basic concepts of cognitive development, the four stages of cognitive development theory to classroom learning are discussed in this unit.

At the end of this unit, you will be able to:

- * interpret the important basic concepts of cognitive development.
- * distinguish among the four stages of cognitive development.
- * identify the stage of cognitive development of secondary level pupils.
- * apply the implications of cognitive development theory to class room learning.

1.1 INTRODUCTION

The unit presents the important aspects of cognitive development. The major contribution to this area is made by jean piaget, a swiss psychologist. He conducted many experiments in the area of cognitive development and formulated the basic concepts and four stages of cognitive development.

According to piaget, cognitive ability of a child directly depends on the cognitive development stage of a child. So, as teachers, you should understand the basic concepts of cognitive development and its implications to class room learning. It is also necessary to understand the stage of cognitive development of secondary level pupils. Details of these ideas are given below

1.2 COGNITIVE DEVELOPMENT IMPORTANT CONSIDERATIONS BY PIAGET

Usually we are unaware of the process by which we get knowledge. Of course there are various processes behind knowing anything. One task of psychology is to describe the cognitive processes behind knowing anything. These cognitive processes progressively changing with age upto the adult stage.

According to piaget, adult intelligence derives from the sensori motor co ordination of infants, through a series of stages that are related to age. The basic concepts of piagetian theory of cognitive development is given below. Let us have a look at these concepts first, and then we can proceed to the details of stage wise development.

1.2.1 Adaptation

We all know that living things develop adaptation devices in accordance with the environment. This acquisition must be necessary to lead a successful life in their environment. You know that, the acquisition of desirable characteristics are otherwise known as adaptation. Each child exhibits a variety of adapting behaviors similar to animals, through the course of its growth and developments to an adult stage. According to piaget the adaptation process include two, specific processes, namely assimilation and Accommodation.

1.2.1.1. Assimilation.

It is very interesting to watch small babies. Their only means of communication is crying at first. This helpless condition is gradually transformed as the child grows and develops to laugh, speak, hold objects, sit and walks.

These different activities will help the child to receive different forms of sensations from all types of external concrete environment. These sensations will lead to gradual mental development of the child in due course.

This development takes place by understanding and internalising the various objects in the surrounding. It is a process of familiarisation. Say for example, you may have seen that small babies take any object and put it into their mouth, in order to familiarise it, and also to familiarise with the process of eating. At a particular age each child puts every object into his mouth to learn or familiarise the process of eating. Here the process of eating develops as a new behavior to the existing reflex actions, such as sucking. But, the child does not know which all objects are eatable. While he is putting every object into his mouth, he understands which all are eatable. And also he can gradually recognize the specific taste of different materials.

It is the same process which has been happening in writing also. While the child is playing with different objects, he learns to hold things correctly. This ability helps him to hold pencils or pens in future. Thus playing with objects helps him to hold pencils or pens in future. Thus, playing with objects helps the children to familiarise with holding pencils or pens for writing.

You know that we teach children to draw lines and dots in zig-zag manner before introducing the letters. Then we may give them letters and pictures in dotted form and ask them to draw between the dots to get a complete letter or picture. Why do we do this? Is there any difference in teaching letters directly or in the way we have seen above?

Learning Activity . 1.

Try to answer the above question.

Note : a) *Space is given below to write your answer.*

.....
.....
.....
.....

As you might have suggested, giving dotted pictures or letters to complete them by drawing lines is better than asking to draw it directly. This is because, it helps to familiarise letters and pictures.

The understanding of all those matters which helps us to lead our daily life smoothly might have happened in this manner. This understanding process is termed an assimilation by piaget. It is defined technically as the use or classifying of an object in existing mental categories or operations. In simple terms assimilation is the process of familiarising something which was new and unknown till then.

Check your Progress 1.

It is said that, children's playing with objects has profound influence on their future life.

Substantiate this statement in the light of the concept 'assimilation'

Notes : s) *Space is given below for your answer.*

b) *Compare your answer with the one given at the end of this Unit.*

.....
.....
.....
.....
.....
.....
.....

1.2.1.2 Accommodation

We have already seen how children understand various processes in life. When the child realises that all objects are not eatable, he manages to play with the objects which are not eatable. Many similar processes are found in our daily life.

We have also seen that how children learn to write letters. A child at this stage may be in confusion at first, if he is asked to write a word from the known letters. You could see that by encouragement the child will finally write that word. Here the child adjusts with the new situation.

You may notice that, children at the beginning stage of speaking would have a habit of repeating whatever his family members speak. He understands how to speak by this repetition.

A child at this stage would come across many puzzling situations. For instance, if we asked him to tell his father's name, he may be puzzled and would say that "my father's name is father". Actually the child does not know the name, but in order to meet with the reality he made an adjustment. This process of changing the existing category of knowledge to adjust with reality is referred to as accommodation by piaget. Accommodation in children would be having very strong influence in their thinking process.

So, adaptation with the environment will be an integration of assimilation and accommodation.

Check your progress. 2

Write one example each showing assimilation and accommodation in children.

- Note :**
- a) Space is given below for your answer.*
 - b) Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

.....

.....

1.2.2. Equilibration

We had seen that, the interaction between assimilation and accommodation helps for adjustments with the environment. Along with the interaction a balance between these two process is necessary. Let us see how this balance is established. Say for example, crow may be first bird, familiarise to young children. Any bird, which could fly is a crow to the children at this stage. This is wrong assimilation. But he might have also assimilated the 'Cro, Cro' sound of the crow. When he sees a hen which does not make 'Cro' 'Cro' sound he is puzzled. And there fore, he is ready to accommodate by receiving new knowledge about the new bird. (here hen).

As the child grows and develops, he will face situations in which existing knowledge is insufficient, for the adjustment. Thus a state of confusion namely dis equilibrium is created. This dis equilibrium in turn triggers a process of self regulation namely equilibration. We had seen that adaptation takes place through assimilation and accommodation. One could adapt with the new situation only if he is ready to assimilate and accommodate the new knowledge. Here equilibration acts as the self regulatory process, by helping each one to adjust with the new situation, that is to get relieved from dis equilibrium. The equilibration stage is not a static stage.

It changes to a state of disequilibrium when the child meets with a new puzzling situation. This disequilibrium motivates the child to assimilate and accommodate which leads to the progressive development of the child.

Raju is three years old, when he sees an elephant first time in his life. Suddenly a dis equilibrium develops and tempts him to ask. "What is it?" His father said, 'Elephant' After a moment of equilibration disequilibrium occurs, when he looks at the elephant part by part. And at last he gets the full concept of elephant through repeated equilibration.

Check Your Progress.3

Write an example for the process of equilibration.

- Notes :**
- a) Space is given below for your answer*
 - b) Compare your answers with the one given at the end of this Unit.*

.....

.....

.....

.....

.....

1.2.3 Conservation

We are living in a world where all sorts of comparison can happen, we could compare objects on the basis of their size, arrange them in order and also able to count numbers. These abilities are gradually developed while children are growing. These developments are based on another cognitive process namely conservation. Let us examine certain examples to clear the concept of conservation.

Eg.1

Usually children at the kindergarten stage may cry for big pencils. This is the indication that they have conservation of size. If you give them a full sized pencil, they will stop crying. Otherwise they may cry till their aim is attained.

Eg.2

You may have experienced that children make mistakes while counting the numbers. If they had attained conservations of order, they would not make mistakes.

Eg.3

Pictures showing arrangements of stones in different patterns are given below and the question, which group has less number of stones is asked to children.

I	II	III	IV
0	0000	0	0000000
000	0000	000	000000
00000	0000	0000	
000	0	00000	
0			

If the children could say that each group has the same number, we can conclude that they have developed the power of conservation of the number.

Those who do not acquire the power of conservation are unable to understand the difference in size, order and number. By conservation piaget means, is the ability to pay attention to all details of things and situations and to receive them correctly.

Check your progress . 4

Give an instance to explain the concept of conservation.

- Notes*
- a) Space is given below to write your answer.
 - b) Compare your answer with the one given at the end of this Unit.

.....

.....

.....

.....

.....

.....

1.2.4 Decentration

When you are teaching, you might have to pay attention to different aspects of teaching at the same time. These aspects can include description, demonstration and paying attention to each pupil at the same time. You may not have difficulty in doing so. But young children cannot give attention to more than one factor till decentration ability develops.

A child with this ability can classify animals as dogs, cats, cows etc. but a child having the decentration ability can do more in this regard. He could make sub classification such as black dogs, white dogs, red dogs, spotted dogs and so on. This type of classification could be done only by considering more than one factor at a time. The child will be able to consider both shape and colour at a time. He may also be able to consider many characteristics such as shape, size, colour and weight at the same time and so on.

Thus according to piaget, decentration refers to the ability to consider more than one factors at the same time.

Check your progress 5.

Differentiate between conservation and decentration.

- Note*
- a) space is given below for writing your answers*
 - b) Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

1.2.3. Cognitive structures

It is easy to understand from our experience that children at different age show difference in mental abilities. Each age group possesses particular mental abilities for that group. Let us see an example to make this fact clear.

Raju, a 3 year old child said that, "the sun comes with me wherever I go. Last week I went to uncles house, the sun came and returned with me". The mental ability of this child is suitable to understand the concept of seeing the sun every where only in this fashion. But as the child grows and develops he will learn that the sun is not moving with us. The mental abilities of the child help him to understand a concept. These mental abilities are referred to as cognitive structures by piaget

Check your Progress.6

What is a cognitive structure ?

- Note* :
- a) Space is given below to write your answer;*
 - b) Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

1.2.6 Mental Operations

We are not able to breath under water. Why? You might put forth the reason to answer the question. Whenever we are exploring reasons, we perform mental operations. Each reasoning process can be done using cognitive structures, which we had seen in the sub Section 1.2.5. If we find it more specifically, behind every action there would be a mental operation.

Why do you take a chalk piece while you are going to teach ? It may be the same necessity which compels you to take an umbrella when you go out on a cloudy day. Thus as piaget defined, mental operations are cognitive structures in action.

These mental operations can be in two ways:

(i) Finding out the reasons and relations as concrete things are manipulated. This is known as Concrete operations. (ii) Reasoning out and relating in an abstract or hypothetical manner. No concrete objects are necessary to guide the thinking process here. This is known as formal operations.

1.2.7. Schema

We are already seen that mental structures are responsible for learning. Each new piece of information is internalised as a mental structure. As the more information has to be internalized, the more amount of mental structures are required. Each of such mental structure is called a schema. Say for instance, a child who sees an elephant first time in his life might ask many questions about that, and finally form a concept about it.

The development of the required schema or mental structure helps him to make a concept of elephant. It is developed by the cognitive processes such as conservation and decentration.

1.2.8. Schemes

We have to do various kinds of activities in our daily life. Many of them are routine activities such as brushing, dressing, teaching and so on. Each of such activities could be performed by the working of several mental operations in a series.

Say for instance, your teaching includes taking necessary materials, walking to the classroom, writing, drawing, questioning, describing and dictating. All of these activities come together in a specific series or pattern to the organization of your teaching. Similar to teaching, we are performing many of such organized behaviours. This type of organised pattern of behaviour is called as a scheme by piaget. Such schemes help the child is solving various problems in his life.

Check your progress 7.

List out the basic concepts of cognitive development

Note : a) Space is given below to write your answer;
b) Compare your answer with the one given at the end of this unit.

.....
.....
.....
.....
.....

1.3 FOUR STAGES OF COGNITIVE DEVELOPMENT

We have already discussed the concepts of cognitive development. And now we have to take a look at the various stages of cognitive development. According to piaget the four stages of cognitive development are sensori-motor period, pre-operational period, concrete, operational period and formal operational period.

1.3.1 Sensori motor period.

Children of age upto 2 years belonging to sensori motor period. You may be familiar with the activities of infant at this stage. Physical activities are the most striking feature at this stage. This stage is very important in the sense that the infant develops basic understanding of his surroundings at this stage. The child at this stage develops through the interaction with the physical world. You know that sucking is a common activity of infants. Whatever objects, he gets therefore, will be put into his mouth.

In this activity the children use mouth for assimilation and accommodation. That is, for familiarisation and adjusting with the reality. When they get a new object disequilibrium will occur and the child tries to restore equilibrium by familiarizing the object. His total body will be used for this familiarising activity. Towards the end of this stage the child gradually acquired a lot of schemes with regard to many objects by familiarising them.

The progressive development at this stage leads children to pre-operational stage.

1.3.2 Pre-operational period.

Children at the age group of 2-7 years come under this period. You may know the notable features of two year old child. Of course it is the development of language. The child learns to speak many words by limiting us. And they would be able to use language easily at the completion of development of this stage. A child at this stage will have to ask questions about everything he sees. The notable question at this stage is "What is that?". You will get the questions in a series if you answer each of them. Instead of answering the questions if you scold the child, he will be annoyed very much.

Another peculiar feature at this stage is the ability to use symbols. We know that children at this stage must have engaged in symbolic playing to a certain extent. For example, the famous form of such play is that, a group of children symbolically making doll houses, the bigger ones acting as father and mother. Small piece of wood or a doll is supposed to be a small baby in the house. Using leaves and flowers they prepare food and so on. This beautiful, symbolic play helps them to play their adult role while they grow into adult hood. The language development at this stage also proceeds through assimilation, accommodation, and equilibration. The ability for conservation and decentration also develops at this stage. Hence, the schemes on the objects developed earlier get modified and become more accurate. Cognitive structures expand due to new assimilations and accommodation to develop appropriate schemes, so as to result in concept formation.

After the completion of development at this stage children will proceed to the concrete operational period.

1.3.3 Concrete operational period.

Children of age group 7 to 11 years belong to this period. Let us try to recognise the markable features of children at this stage. He is able to do many things, 'in his head'. That is, he is able to think logically. But thinking will be confined to the things and objects familiar to him. (Refer to section 1.2.6)

concrete-operations period and formal - operations period

See an example

A child could be able to select the odd one from the group

1. Squirrel, penguin, langoor, lion, sheep.
2. Cow, cat, rabbit, goat, Buffalo.
3. Dog, Cat, cow, deer, sheep.

Here he performs certain mental operations to identify which one is not belonging to group.

He is also able to arrange items in serial order. See the following example. Arrange the following words in alphabatical order. Bombay, Abudabi, Calicut, Delhi, Culcutta, Ajmeer, Madras, Coimbatore.

The thing important is that, the child needs familiarisation or manipulation of objects or activities even at this stage. That is disequilibrium continues and the child assimilates new information, accommodates it and sets equilibrium with the help of visible concrete objects only. Mental operations develop more with the progress in concrete thinking.

1.3.4. Formal operational period

Most of the children acquire the skills of formal operations at the age groups of 11 to 15 years (Refer to E.2.6) There may be a transitional period between concrete operation period and formal operations period (it is explained in U.3). Let us see the characteristics of pupils at this stage.

They are able to

- * learn concepts
- * establish relation ships
- * list out abstract properties
- * express symbolically
- * reason hypothetically
- * verify and review his own reasoning and soon.

These are some of the major characteristics of pupils at this stage.

Familiarisation still continues as unfamiliar situations and objects are common in daily life. But equilibration at this stage is more easy as children at this stage are able to accommodate quickly than in earlier stages. Cognitive structures are developing in such a way to aquire schemes suitable for abstract thinking.

Now we shall discuss the implications of cognitive development to class-room learning. But before proceeding to the next section check your progress with the following question.

Check your Progress 8.

"You can categorise children according to their cognitive development level". Discuss this statement by exploring the major characteristics of children at each stage of development.

- Note :*
- a) Space is given below to write your answer;
 - b) Compare your answer with the one given at the end of this unit.

.....

.....

.....

concrete-operations period and formal - operations period.

- iii) There are implications for this theory in various aspects of teaching such as instructional process, nature of examples, nature of experience, etc.

Check your progress: Possible answers.

1. *Playing helps a child to familiarise with various objects, and various process in life. Playing with objects and putting them to mouth will help to familiarise the process of eating. Playing will also help to hold various objects such as pen and pencils and write or draw. In general, all play activities help the child to acquire a lot of new information by assimilation, i.e. getting familiar with new objects.*
2. *A tricycle is given to a child, who does not know what it is. He will look at it first, then touch it. Try to hold it and may push it. All these activities are directed to assimilation. Usually instead of riding the tricycle he will be pushing it for some time or some days. This is for adjustment, which leads to accommodation.*
3. *A child seeing a double decker bus for the first time, will look at it. A disequilibrium will have occurred now, because it is unfamiliar. When his parents explain about the bus an equilibration would have occurred so as to think that it may be like a double storeyed house.*
4. *Few beads were placed on a table. A child is asked to take five beads from a table. If he takes the correct number, it indicates that he has developed the power of conservation of number.*
5. *Conservation is an ability to know shape, size and number of objects. Decentration is an ability to classify objects on the basis of more than one of their characteristics.*
6. *The mental ability to understand new information is termed as cognitive structure.*
7. *The basic concepts of cognitive development are, adaptation, Equilibration, conservation, Decentration, cognitive structures, mental operations, schema and schemes.*
8. *Cognitive development of each child proceeds through four stages or periods, which are age specific.*
 - i) *Sensori-motor period (birth to 2 years) Physical activities are the striking characteristic.*
 - ii) *Pre-operational period (2 to 7 years) Development of language, conservation, decentration, enquiry attitude and symbolic playing are characteristics of this period.*
 - iii) *Concrete-operational period (7 to 11 years) Development of logical thinking, but thinking is confined to familiar and concrete objects only.*
 - iv) *Formal operational period (11 to 15 years) Ability to learn concepts, establish relationships, symbolic expression and hypothetical reasoning are developed at this period.*
9. *The theory of cognitive development has different implications to classroom teaching. The major implications are that it helps to*
 - i) *identify the cognitive development stage of a child.*
 - ii) *formulate special programmes to facilitate development from one stage to the other, and*
 - iii) *Provide suitable experiments and activities to acquire formal operations ability.*

UNIT 2

LEARNER CHARACTERISTICS

Contents

- 2.0 Objectives
- 2.1 Introduction
- 2.2 Important characteristics of learners at secondary level
 - 2.2.1 Identification of children at concrete operational stage.
 - 2.2.2 Identification of children at formal operational stage.
- 2.3 Unique characteristics of Secondary level pupils
 - 2.3.1 Meaning of adolescence
 - 2.3.2 Important characteristics of adolescents
 - 2.3.3 Effective dealing of adolescents.
- 2.4 Exceptional children
 - 2.4.1 Who are exceptional children ?
 - 2.4.2 Gifted children - characteristics
 - 2.4.3 Education of gifted children.
 - 2.4.4 Back ward children
 - 2.4.5 Dealing with backward children
- 2.5 Learning Disabilities
 - 2.5.1 What is learning disability ?
 - 2.5.2. Dealing with learning disabled children.
- 2.6 Let us sum up.

2.0 OBJECTIVES

In this unit we will see the major characteristics of learners at secondary level. This also includes the peculiar characteristics of adolescents, learning disabled children and the characteristics of exceptional children. At the end of this unit you will be able to :

- * identify the important characteristics of learners at secondary level.
- * identify the unique characteristics of adolescent
- * identify the cause to deal with adolescent.
- * identify the characteristics of gifted children
- * identify the ^{causes} ~~measures~~ of learning disabilities.
- * practise the measures to deal with learning disabled children.

2.1 INTRODUCTION

As you know each child has peculiar characteristics of his own. It is surely interesting to go into the details of such characteristics. You may have also come across the peculiar characteristics of teenagers here referred to as adolescents. And of course you could remember the fast learners, slow learners and children with any learning disabilities, present among the students in your class in the past years. But you must have forgotten the average learners. Because the child with any peculiar characteristics might be a noticeable child. So unit 2 will give a clear picture of the important characteristics of secondary level pupils. The peculiar characteristics of adolescents and the exceptional children are also described. You could also identify the major learning disabilities and the way to deal children having such disabilities.

by understanding this unit.

2.2 IMPORTANT CHARACTERISTICS OF LEARNERS AT SECONDARY LEVEL.

We have already seen that each stage of mental development has its own peculiar characteristics. The progressive changes in mental development reaches its completion at the end of the teenagers. We must have to do a brush up of their developmental stage just before. So let us try to identify the characteristics of pupils at the concrete operational stage.

2.2.1 Identification of children at Concrete Operational stage.

Development at this stage begins at the age of seven and goes upto almost till the age of eleven (7-11) years. Let us see an example to understand the nature of students at this level.

A group of fourth standard students are playing in a garden. There are two huge may flower trees with red flowers. One of this children said.

"This tree is flowering as a memento for our summer vacation, what is its name" ?

"May flower" said some one

"Why is it called so?"

"It is because the month in which it flowers "

"Why do they have red flowers?" The group is thrown into confusion for a moment. After a little thought one said.

"It is because of the strong sunlight and heat, Don't you know the metal turn red in the blacksmith's workshop? Surely it is same as that"

"That is true" The group concluded.

The children at this stage would be able to reason out, but the reasoning is related to objects, as we see in the earlier example. The physical world and the manipulation of objects alone come to the thinking and reasoning of children at this stage. They are able to make observation and draw inferences. But they are not able to consider all possibilities as we see in the example. They are also able to identify phenomenon but it will be unsystematic and incomplete. Though they are able to identify the flowering phenomenon they are unaware of the other aspects of flowering.

Learning activity - 1

Give an example, to explore the mental level of children at concrete operational period.

Note : *Space is given below for your answer*

.....
.....
.....

2.2.2 Identification of children at formal operational stage.

Formal operational thought is the characteristic feature of the age group of 11-15 years. So the pupils at secondary level belongs to this category.

Let us examine a group of secondary school students beneath the same may flower trees. The discussions of the group can be as follows.

"How beautiful these flowers are !"

"Why do they flower at this particular period in each year?"

"Hormones are responsible for that . Atmospheric conditions influence activation of hormones".

"Hormones are responsible for that . Atmospheric conditions influence activation of hormones".

'Why do they have red colour ?

"Because they reflect red colour only"

As in the example they are able to reason out concepts, express relationships, and they can express their thoughts in symbolic terms.

The cognitive development takes its final form at the end of this stage and the difference with adults is in respect of the depth of experience only. Children will be less experienced than adults.

Check your Progress 1

Write down the important characteristics of children at concrete operational stage and formal operational stage ?

- Note :*
- a) Space is given below to write your answer;*
 - b) Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

2.3 UNIQUE CHARACTERISTICS OF SECONDARY LEVEL PUPILS

We all are familiar with the characteristics of secondary level pupils. Even then we must have to discuss them in brief.

The age of this group ranges from 12 to 14 years, but pupils above 14 years also are common in our schools. As we have seen in the sub section (2.2.2.) they belongs to the formal operational stage. So mentally they are able to perform the highest level of thought. They have lack of experience, so we have to provide more and more examples while teaching, to enrich their experience.

The physical and biological characteristics of the pupils at this stage are given in this section. The unique characteristics of secondary level pupils are those of early adolescence. So let us have a discussion on various aspects of adolescence to realise the peculiarities at this stage.

2.3.1 Meaning of Adolescence

Adolescence is a transitional stage in every person's life in which he has lost his childhood. This is said to be the "period of storm and stress". The hormonal secretions, sudden biological growth and appearance of secondary sexual characteristics increase stress in pupils.

As high school teachers, you are familiar with adolescent. So before proceeding, you may attempt the following activity.

Learning activity 2.

What are the major characteristics of adolescents ?

- Note :*
- Space is given below for your answer.*

.....

.....

.....

2.3.2 Important characteristics of Adolescents

A child knows his role clearly, an adult also knows his role very well, but an adolescent must be in role confusion. Let us see the case of Suresh a fourteen year old boy. He was a problem child for all teachers, when one of the teachers enquired him about his family and personal life, he was really broken down. One moment his parents considered him as too young, and the next moment they scolded him for not behaving like a man though he is as big as his father. This 'role confusion' leads him to an aggressive behaviour. Effective counselling helped to channelise him into right way and he became one of the best students in the school.

Two major characteristics of adolescents such as role-confusion, ie the confusion as to how to behave in a situation, and openness of adolescents are clear through the example.

At the time of counselling Suresh said that actually he has respect for teachers, but the need for getting attention from others made him mischeivious in the classroom. He also wanted to exhibit his independent role. The counselling helped him to strive for the need for achievement, by which he succeeded very well.

Though Adolescents are in role confusion, they have the need for getting attention, need for independence, and need for achievement.

Biju and Raju are classmates, Mujeeb, Thomas and Shiju are in close company with them. They have common interest, dressing, hair style etc. Such type of group-peer groups-are very common among adolescents. Each member in a peer group has great concern and intimacy with other members of the group. They consider the opinions of their group members valuable than those of adults. So forming peer group is another characteristics of Adolescents.

Biological growth, appearance of secondary sexual characteristics, and sexual maturity are the other marked characteristics of adolescence. All-these push adolescents into extreme sensitivity, adjustment problems and insecurity.

Since, adolescent have peculiar characteristics, specific educational programmes are necessary to meet the needs of adolescents. We shall discuss this in the next section.

Check your progress 2.

The adolescent have adjustment problems and insecurity. Bring out the reasons for such adjustment problems and insecurity.

- Note :*
- a) Space is given below to write your answer;*
 - b) Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

.....

2.3 3 Effective Dealing of Adolescents.

We have already seen the very special nature and needs of adolescents. So let us try to develop a strategy for dealing with adolescents effectivity.

Jose, is a secondary school teacher, who has experience in dealing, with adolescents very effectively. Let us see, what he is doing in the classroom.

Among the group of students he appeared like a group member, guide and sometimes as an elder brother. He usually uses group investigation and discussion methods for instruction. He tried to give more responsibilities to his students, give opportunities for self expression and create an atmosphere that every one is in the centre of attraction. Grouping of students also is done within the classroom for group works. This grouping is done on the basis of peer group in which each student belongs. From his experience he said that counselling is the best way for dealing with adolescents effectively and praising is highly influential than punishment.

While analyzing the above example we could infer some important points in dealing with adolescents. We know that, many problems an adolescent facing are new to him. So we should be ways helpful to them in solving their worries, clearing their doubts, sharing our experience, and in satisfying their needs. We should also make special effort to give them responsibilities and freedom, Necessary guidance should be given to them and if necessary, to their parents also.

Check your progress 3

How can we deal effectively with the adolescents in the secondary level classroom.

- Note :**
- a) Space is given below to write your answer;
 - b) Compare your answer with the one given at the end of this unit.

.....

.....

.....

.....

.....

.....

2.4 EXCEPTIONAL CHILDREN

You know, each student is unique in nature. In this section we shall see the details about exceptional children. At first let us see who are exceptional children.

2.4.1. Who are exceptional children ?

The exceptional child is a child who deviates from average or normal child. This includes gifted children, backward children, mentally retarded, mentally ill, learning disabled, physically handicapped, deaf, blind and multiple handicapped. The gifted children are those who have high mental abilities the backward children are those who are not able to achieve as per their abilities. Mentally retarded children are those having low mental abilities. Learning disabled are those who have certain disabilities in learning. Multiple handicapped are those with more than one physical disabilities. At first let us see the characteristics of gifted children.

2.4.2 Gifted children - characteristics

Let us see how these children devite from the normal children.

- a) They show high interest in reading at an age before 6 years.
- b) They also participate in extra curricular activities much more than average students.

- c) Most of them have interest to take professional occupation in their future life.

You may have experienced a number of gifted students, in your career. It is very essential to identify the gifted students in your classroom, which helps you to organise peer teaching. Usually, you could employ intelligence tests and rating scales to identify giftedness. Let us examine the necessary programme for the education of the gifted children.

2.4.3 Education of gifted children.

Gifted students, usually need some additional works. You know that if they will not get additional activities, they would be a head ache for you. So it is essential to develop a special program for the gifted.

These activities include problem solving, discovery learning, individual techniques for learning and peer teaching.

You could use additional activities and problems to the gifted students. You should plan in advance to develop problems for gifted ones concerned with each unit. For example you may use the following problems for gifted students regarding the unit 'our environment.'

- a) "The absence of one trophic level affects the equilibrium of the ecosystem" Critically examine the statement with the aid of supplementary data.
- b) Construction of still models of food chain, Energy flow, and Biological pyramids.

Activities like this would help them to cater to their interest in learning.

Peer teaching is another activity which helps to deal effectively with the gifted students. You could utilise them to the benefit their class mates through peer teaching. Necessary guidance should be given to them before the conduct of peer teaching.

2.4.4 Backward Children

Backward children as you know are back ward in academic achievement. You may have experienced a variety of backward children.

Backward students are unable to achieve upto the level which is expected from them based on their level of intelligence. The causes of backwardness of students are follows.

- 1) Emotional factors such as anxiety, tension and depression
- 2) Un productive home environment.
- 3) lack of interest of students.
- 4) Factors concerning schools such as unsuitable method of teaching, inadequate learning activities, and insufficient accessory learning materials.

These are the major causes of backwardness in children. Now we shall see how we can identify such backward children.

Identification of backward children.

Achievement test is the easiest tool to identify backward children (Achievement test discussed in Block 6 U.2) Especially you should measure achievement in language, arithmetics and general knowledge. If achievement of a child does not reach upto the expected level, then he will be a back ward child. Assessing the level of intelligence of the child and predicting the possible level of achievement accordingly is a more scientific method for locating backwardness.

Observational rating scales, cumulative records (Discussed in Block 5 U.3) and case study (discussed in block 6 U.6) are other effective tools to identify backward children.

2.4.5. Dealing with Backward children

As the children have no mental disability, you could guide them to at least average level of achievement. The following points will help you in this regard.

- i) Encouraging backward children - simple encouraging comments such as 'good' 'you have done it well' 'well done' etc. will be very effective.
- ii) Adopting suitable method of teaching-we have seen that one of the causes of backwardness is lack of interest. So you should try to adopt methods of teaching which stimulate and sustain interest in students.
- iii) Learning by doing -you should provide more opportunity to the backward children to participate in learning activities.

These are the various procedures which help you to deal effectively with backward children. Now we shall see a category of children with more serious problem, that is learning disabilities. Before we pass on to that check your progress in this unit.

Check your progress 4

Effective dealing of gifted and backward children is very important for our educational system. Substantiate the statement.

- Note :**
- a) Space is given below to write your answer;
 - b) Compare your answer with the one given at the end of this unit.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

2.5 LEARNING DISABILITIES

In every class room, there can be at least one child who fails to keep up with other students in academic achievement. Such students may have learning disabilities. Learning disability can be of different types. Now, let us see what is learning disability.

2.5.1 What is learning Disability ?

Learning disability may be exhibited as a disorder in one or more basic psychological process involved in understanding or using spoken or written languages. These may be lead to disorders of listening, talking, reading, and writing. Learning problems due to visual, hearing, motor handicaps, and mental retardation do not come under learning disabilities. So learning disability may have occurred to perceptual handicaps or brain injury.

Perceptual handicap means inability in perception, say for example, a child with perceptual

handicap could not perceive a written page as such. He could not perceive even sentences or words, but only letters.

Brain injury, means injury and damage to brain cells before or after birth due to various reasons. The brain injured children may have normal intelligence, but they have learning problems due to their perceptual, conceptual or behavioural difficulties, which cause their lower achievement.

Certain children with learning disability may show distractibility hyper activity and lack of perseverance. Here, distractibility means inability to concentrate on a subject. Hyperactivity are purpose less, uncontrollable activities, shown by disabled children. And perseverance, is the ability to focus attention on a given task, until it is completed.

So in essence, learning disability is inability in understanding and using or performing various activities related to learning. Say for example, while you are listening to music, you must have listened its rhythm, words, back ground, voice modulation, etc. You could recite the music after once or twice you have exposed to the music. But a child with learning disability could not listen to music, as you do, and could not recite the music also.

Learning activity 3

Write a description of the learning disability you have experienced in your teaching life.

a) *space is given below for your answer.*

.....
.....
.....
.....
.....
.....

2.5.2 Dealing with learning Disabled Children

It is not an easy task to deal effectively with learning disabled children, because, each one of them has unique problem in learning. The first step you should do is to identify the children with learning disabilities. The identification should be done at an early stage of life. Then only, you could develop suitable plan for proper development of children with learning disabilities.

Examination of the learning activities of children and the mistakes made by them will help you to locate children with learning disability. Along with this specially designed tools are helpful to identify the disability and its extent.

Once you have identified the children with learning disabilities, you should adopt a suitable educational programmes for their benefit. It is better to give them instructions with the help of neurologists in the beginning, using appropriate methods, and parent involvement. Such education will help the disabled children to over come their difficulty to a greater extent.

So in essence, the time of detection of learning disability has crucial role in overcoming such difficulties.

Check your progress 5

'Learning disability is inability to make use of classroom instruction'. What are the causes of such difficulties ?

- Note :**
- a) Space is given below to write your answer;
 - b) Compare your answer with the one given at the end of this unit.

.....

.....

.....

.....

.....

2.6 LET US SUM UP.

We have discussed the important characteristics of learners at secondary level. Our discussion had thrown light on identification of children at different stages of cognitive development, and peculiarities of children at secondary level. We also discussed effective dealing of adolescent. In the last two sections we discussed on exceptional children and disabled children, and how to deal effectively with them.

Check your progress : Possible Answers

1. *The Children at concrete operational stage are able to reason out but only of familiar phenomena. They are able to observe and draw inferences, but that may be incomplete and unsystematic. That is their thinking is related to familiar objects only.*

Children at concrete operational stage are able to reason out concepts, express relationships, and we are able to abstract thinking. Because their cognitive structure is suited for these.

2. *Adolescence is a transitional period characterised by role confusion, biological growth, sexual maturity, needs for getting attention, independence and achievement. All these contribute to problems in adjustment and insecurity.*
3. *Treat them as independent individuals and give them opportunities for self expression, Adopting methods suitable for group work will be helpful. The teacher should be always acting as a guide and praising him as and when required.*
4. *Gifted children need additional activities, both inside and outside the classroom, otherwise they became problem children. Supplementary instruction is necessary for backward children, then only, they would be able to proceed with other children in the classroom.*
5. *Perceptual handicap, brain injury, distract ability, hyperactivity, lack of presurance and thereby inability in understanding and performing various activities related to learning.*

UNIT 3

TEACHING THE LEARNER

Contents

- 3.0 Objectives
- 3.1 Introduction
- 3.2 Needs of the learner.
 - 3.2.1 Needs on the basis of cognitive level.
 - 3.2.2 Needs on the basis of learning abilities.
 - 3.2.3 Special needs.
- 3.3 Selecting suitable teaching strategies.
 - 3.3.1 Basis for selection of teaching strategy
- 3.4 Let us sum up.

3.0 OBJECTIVES

You have already seen the peculiarities of secondary level pupils in Unit 2. In this unit we will see the important aspects of teaching the secondary level pupils. This includes identifying the needs of the pupils, and aspects of selecting suitable teaching strategies. So, at the end of this unit you will be able to

- * identify the needs of pupils at secondary level.
- * interpret the basis of selecting suitable teaching strategies.
- * identify the steps of selecting suitable teaching strategies.
- * practice suitable teaching strategies as per the needs of pupils.

3.1 INTRODUCTION

As we have to teach the learners, we should know the details of learners, their needs, and appropriate teaching strategies. So in this chapter we shall see the important needs of the learners, and suitable teaching strategies to be adopted according to the need of the learner.

3.2 NEEDS OF THE LEARNER

You know that learners have various needs. These needs can be categorised in to three. Such as needs on the basis of cognitive level, needs of the basis of learning abilities and special needs. Let us see each category in detail. Analysis of such needs would help us to chalk out suitable strategies of instruction.

3.2.1. Needs on the Basis of cognitive Level.

We have already discussed the characteristics of secondary school pupils in unit 1. So you are familiar with identifying learners belonging to particular cognitive level.

You will say that the learners at the secondary stage belongs to 12 + age group. So naturally they will be either at the end of concrete operations stage at the beginning of the formal operations stage.

More specially, majority of them may be at transitional stage between the two.

So children at this stage need special help from you to apply formal operations correctly. They have to get enough experience to perform formal operations. They also need help in problem solving. As many situations possible applying formal operations correctly. So the need of bridging the gap between these two stages is the major need of children at this stage.

They also have a need for continuous opportunities to interact with the environment. Unfamiliar situations and examples should puzzle the children at this stage and tempt them to act as in the previous stages of cognitive development.

The students at this stage should be properly motivated, then only they may try to solve newer problems using newer methods.

3.2.2 Needs on the basis of Learning abilities.

We already discussed about children with varied levels of learning abilities. And you know that each one has his own needs on the basis of his learning abilities.

It is familiar for us that the majority of students in our classrooms might be of average ability. Some of them may have special abilities and some others may have certain disabilities

Let us first consider the needs of children with special abilities, namely the gifted and talented children. The prime need of the gifted students is need for identification of their talents. If they did not get proper identification, they became problem children. Take the case of Basheer, a 10th standard student. He is the student having high I Q and special interest in electrical and electronics. When he was admitted to 8th standard he could not get any recognition for his talents. Soon he became a problem child, who lost his interest in study and started making disturbances in the classroom. His science teacher praised him for his performance at the upper primary stage, and enquired about area of interest and hobbies. By the end of that conversation, Basheer was able to regain his self confidence with the help of the science teacher. He developed and exhibited a project on electronics in the national science exhibition. Now he has high interest in reading also. This shows that when one got proper recognition and proper environment, he would have restored his academic achievement.

So the need of identification of abilities and proper environment for development are the two major needs of the gifted students.

In the case of backward children also identification is one of the basic need. You know that nobody is willing to consider himself as backward in any respect. So, a student with hearing disability will try to conceal his disability and sit among other students. They also may have a feeling of insecurity because of the reason of their backwardness. So need for emotional security and need for self confidence are the basic needs of disabled students. A need for special attention will be there in them, though, they wish for that, they would not try to demand it openly.

Therefore, we should be vigilant on the identification of children with special abilities and inabilities, along with average children and their needs.

Learning Activity 1.

List out any other needs of your students, which you feel to mention.

Note : a) Space is given below to write your answer;

.....
.....
.....

.....
.....
.....

3.2.3 Special needs.

You know that, the students at secondary level belongs to 12 + age group. This group is other wise called as teen age and psychologically as adolescence. We have already discussed on the very special nature of adolescents in Unit 2. As they have special nature, they also have special needs. Let us see what are their special needs.

You may be familiar with the peer group interaction among the adolescent. This peer group is a mile stone in the social development of children, naturally there occurs an intense desire for group formation. It can be inferred as a need for socialisation.

Adolescence is a period of emotional insecurity also. So there of course is need for emotional integrity. So it is your duty to safe guard this need of adolescents.

We all are very eager to establish our self identity. Like wise the adolescents also have a need for recognition. Some of them get it through academic achievement. Some others gained it through their achievement in sports, games, and other curricular activities. Yet others try to be known through students organisations. Some others get recognition as they are big or small physically. They might become problem children to establish their identity. So we could infer that the need for recognition is very strong in adolescents.

Check your progress 1

Consider that you are teaching to an adolescent group. What all learner need will you consider while teaching them ?

- Note : a) Space is given below to write your answer;
b) Compare your answer with the one given at the end of this unit.*

.....
.....
.....
.....
.....

3.3 SELECTING SUITABLE TEACHING STRATEGIES

Whatever we plan is meant for improving the instruction. We usually have to adopt a variety of teaching strategies. Your selection of a particular strategy is on the basis of certain aspects. Strategy means a preplanned set of activities, arranged in logical order to achieve a desired end. Now let us see the important aspects in the selection of teaching strategies.

3.3.1 Basis for section of teaching strategy.

Since, a teaching strategy is meant to teach a particular part of the topic, you may have to utilize more than one strategy to teach a single topic. The following are the basis for selection of teaching strategies.

- a) **Level of learners** - this is one of the aspects which helps to determine the teaching strategy. You have to consider the cognitive level of the learners. You cannot adopt the same strategy for students in different standards. The strategy we used should be helpful to develop formal operations of students. The exercise you given at this stage should be helpful to improve formal reasoning abilities. For example, you can give the following exercise in the unit 'Environment' make a study in the impact of pollution on environment.
- b) **Difficulty level of the topic** -you may be able to teach two different topics using the same teaching strategy, if they are not different in difficulty level. Say for example, the introductory lesson on environment could be developed using question answer and discussion strategies. A lesson on the lethal effect of pollution could be taught experimentally and using survey methods.
- c) **Needs of the learner** - We have already discussed about the gifted and backward children. Each of such children have difference in needs. Needs of the gifted children are far different from that of the backward ones. So you have to select and use strategies which are capable of satisfying the needs of the learners. For example, you may have to use peer teaching to cater the needs of the gifted and the backward ones. Additional exercises should be given to the gifted students and supplementary works should be given to the backward ones.

Check your progress 2

Appropriate teaching strategies are essential for the success of teaching. How do you select appropriate teaching strategies ?

- Note :*
- a) *Space is given below to write your answer;*
 - b) *Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

.....

3.4 LET US SUM UP

In this unit we discussed the needs of learners at secondary level. We discussed the needs in relation to

- * Cognitive level
- * Learning abilities, and
- * Special needs of adolescents.

In the last section we discussed the selection of appropriate teaching strategies.

Check your progress Possible answers

1. *Adolescents have special needs, such as need for socialisation, need for recognition, need for emotional integrity and need for achievement.*
2. *Selection of teaching strategy is based on*
 - i) *level of learners*

- ii) *difficulty level of the topic and*
- iii) *needs of the teachers.*

ASSIGNMENTQUESTION

1. *A secondary level learner demands greater psychological attention". Comment on this statement to bring out the characteristics of learners at secondary level.*

Note : a) *No Space is given for your answer so you should prepare your answer in separate sheets.*

SOURCES

1. **Bichler, R.F. (1974) *Psychology applied to teaching* Boston : Houghton mitflin Co,**
2. **Blair, G.M. John R.S. and Simson, R.H. (1975) *Educational Psychology* New York : Macmillan Pub. Co.**
3. **Dececco, J.P. & Crawford W.R. (1977) *Psychology of learning and Instruction***
4. **Hurlock , E.B (1973) *Adolescent Development* London MC Grow Hill.**
5. **Lindgran, H.C(1976) *Educational Psychology in the class room* New York:: john wiley & Sons.**
6. **Morse,W.c & wingo ,G.M (1968) *Psychology and Teaching*, Bombay Tarapurwala & Sons.**
7. **ReillyR.R. & Lewis, E.L. (1983) *Educational Psycholoy*, Canada, Coler Macmillan.**
8. **Ross, A.O. (1977) *Learning Disabilities* New York. MC Graw Hill.**
9. **Hang, M.C. Reynolds, M.C. & Walberg, H.J. (1990). *Special education Reserch and p ractice*. Oxford Pegman press.**
10. **Weiner, F. (1973) *Help for the Handicapped Child*. USA MC Graw Hill.**
11. **Weiner, I.B. & Elkind, D. (1972) *Readings in child Development* London : John Wiley & Sons.**

BLOCK 2

**PLANNING FOR TEACHING BIOLOGY
AT SECONDARY LEVEL**

UNIT 1. Long Term Planning and Unit Planning.

UNIT 2. Lesson Planning.

BLOCK 2 PLANNING FOR TEACHING BIOLOGY AT SECONDARY LEVEL

BLOCK INTRODUCTION.

There are two units in this block. Unit 1 tells you about long term planning and unit planning. Unit 2 talks about lesson planning.

In Block 1 we have discussed the psychological considerations of secondary level pupils. Accordingly, now we have to develop suitable plan for the instruction of pupils at secondary level. While developing a plan, we should consider the education programme, institution, and subject as a whole, then further plans should be developed for units and lessons in each subject.

In unit 1 we will discuss a) long term planning its meaning, components, steps and uses along with a format of long term plan b) Unit planning its meaning components, structure and a model unit plan.

In Unit 2 we will discuss lesson planning in detail, such as its meaning, components, steps in lesson planning and a model lesson plan.

UNIT 1 LONG TERM PLANNING AND UNIT PLANNING

Contents

- 1.0 Objectives
- 1.1 Introduction
- 1.2 Long term Planning
 - 1.2.1 Meaning of long term planning
 - 1.2.2 Components of a long term plan
 - 1.2.3 Steps in long term planning
 - 1.2.4 Uses of long term planning
 - 1.2.5 A format of long term plan.
- 1.3 Unit Planning
 - 1.3.1 Meaning of Unit planning
 - 1.3.2 Components of Unit Plan
 - 1.3.3 Structure of Unit plan
 - 1.3.4 A model unit plan.
- 1.4 Let us Sum up.

1.0 OBJECTIVES

Planning, essentially is the basis of good teaching. In this unit, we shall discuss the important aspects of a long term planning and unit planning. This includes the components and steps involved in long term planning and unit planning and also their uses. A model format of long term plan and a model unit plan also are included. At the end of this unit you will be able to

- * identify the major components of long term planning.
- * develop a positive attitude towards long term planning.
- * identify the major components of unit plan.
- * develop a positive attitude towards unit planning.
- * develop unit plans for the content in the biology syllabus.

1.1 INTRODUCTION

We are quite familiar with planning. We all know that for the success of any endeavor, planning is necessary for success in education also. Planning in education can be at different levels.

There can be broad educational planning for the whole nation and then for each state. There can be planning for the primary, secondary or tertiary levels of education. Each level of education is given through different institutions. Each institution have its own planning. Both long term planning and short term planning will be done in every institution at appropriate time. One of the major type of planning is planning for teaching. Teaching plan also have different levels. Planning can be for more than one year, for an academic year, for a term, and for a Unit. Such planning helps in better management of teaching.

We shall discuss in detail the important aspects of long term planning and unit planning, which have direct bearing on class room teaching.

1.2 LONG TERM PLANNING

Long term planning includes careful and purposive work of teaching. Let us see the important aspects of long term planning. Before you proceed try to give your own meaning for long term planning.

Learning Activity 1

Give your own meaning for long term planning

Note : a) Space is given below to write your answer;

.....

.....

.....

.....

.....

.....

1.2.1 Meaning of Long term planning

We use long term planning to refer the process of planning for an academic year or for more than one year. The duration of the plan is not so important. But aspects included and the nature of group work of teachers of the same subject sit together and chalk out the plan for the given period of time.

Now we shall discuss the components of a long term plan.

1.2.2 Components of a Long term Plan

The major components of a long term plan are number of teachers, number of standard and divisions, levels of teaching, units in each standard, time allotted to each standard, instructional strategies, accessory learning materials, scheme of evaluation, grading and promotion and co-curricular activities. Let us see these components in detail.

i) Number of teachers :

The total number of teachers in each subject in a particular institution is a major component of long term plan. This is because as you know the work is divided among all the teachers of a subject. So the number of teachers available is directly proportional to the work load of each teacher.

(i) Number of standard and divisions

The number of students in each division and the number of division for each standard in the institution are the second component of long term plan. You know that the difficulty in teaching increases with the increase in the strength of students.

iii) Levels of teaching

The levels of teaching such as primary, upper primary, secondary, and higher secondary (if any) levels are the third component of long term plan.

iv) Units in each standard

We all are teaching on the basis of prescribed syllabus. The syllabus of each standard is divided into different units. The number of units in each standard and difficulty level of units also is an important component of long term plan.

1.2.3 Steps in Long Term Planning:

In any type of planning, Planning board is the body having the right to develop the plan. In long term planning also, the planning will be done by council of teachers. There are councils in each subjects (ie Subject Councils)

So the first step in long term planning is as you know is the meeting of each subject council seperately.

The second step is the preparation of an outline schedule for the long term plan. A model long term plan is given in 1.2.5. The structure of the schedule is then subjected to thorough discussion before giving its final form. This is the third step.

The discussion on the existing facilities and necessities of the school and finalising the plan are the final step of long term planning.

1.2.4 Use of long term planning.

Learning Activity 2

What are the uses of long term planning in your view ?

Note : a) Space is given below to write your answer;

.....
.....
.....
.....
.....
.....

Now compare your suggestions with those that are discussed as below.

Long term planning is meant for an year or more than that as such it should be helpful in achieving the targeted change and long term objectives

The existing facilities in the institution and short coming could be realised by this type of planning. The thrust area requiring attention should be explored out.

The planning at the beginning of an academic year would be helpful to determine the instructional strategies. Strategies of evaluation, grading and promotion.

This is also useful in the preparation of accessory learning materials. The co-curricular activities such as science fair field trip, etc. can also be carried out effectively.

In short we could infer that long term planning will be helpful in the better management of instruction.

Check your progress 2

Trace out the uses of long term planning.

Note : a) Space is given below to write your answer;

b) Compare your answer with the one given at the end of this unit.

.....

.....

.....

.....

.....

.....

1.2.5 A format of Long term plan.

Let us examine the proposed format of a long term plan in figures 1,2,3 & 4.

Levels of Teaching	Standard	No. of Teachers	No. of Divisions	Work Load	Co-curricular Activities			
					Sci-fair	Science club	Exhibition	Field trip
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

Fig 1. Format of long term plan regarding the general aspects.

Standards	Units No Difficulty level			Instructional strategies Unit No.				
	Easy	Difficult	Very difficult	Lecture	Demonstration	Experimentation	Projects	Any other
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

Fig 2. Format of long term plan - Showing difficulty level and instructional strategies for each units of different levels of instruction.

Standard	Unit Numbers	Learning Aids,	Accessory learning materials
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Fig 3. Format of long term plan for details of Accessory learning materials in each unit at each standard

Standard	Units	Types of tests			Percentage of promotion
		Unit tests	Terminal exam	Annual exam	%
1					All pass
2					96 %
3					
4					
5					
6					
7					
8					80%
9					
10					

Fig. 4 Format of long term plan for the strategies of evaluation.

So a long term plan will give you, the whole picture of the institution regarding subject, teachers, instructional activities, accessory learning materials, evaluation strategies and co-curricular activities for a year. So you should use the format for long term plan to plan the activities of your institution for an academic year.

Check your progress 3

List out the important steps in developing long term plan.

- Note :**
- a) Space is given below to write your answer;*
 - b) Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

1.3 UNIT PLANNING

In long term planning, we could identify the difficulty level of units, instructional strategies to be adopted and necessary learning aids needed for instruction of each unit. It was a sort of generalized

planning. Let us see the meaning of unit planning.

Learning activity 3

Give your own meaning for unit planning

Note : a) *Space is given below to write your answer;*

.....
.....
.....
.....
.....
.....

1.3.1 Meaning of Unit Planning

We all know that learning materials are arranged as units. There may be a number of units of instruction in a given science course. The units as in 10th standard biology are nervous co-ordination senseorgans, chemical co-ordination, Environment, conservation of environmental resources and Health science. Teaching the content as units alone have instructional value, other wise each lesson should be conceived as unrelated facts. Unit planning is a detailed plan of selected materials organised for effective instruction for a particular class. The plan you make for teaching the unit sense organs in standard ten in an example for unit planning for teaching that unit. In short unit planning involves planning of all processes of classroom instruction.

1.3.2 Components of Unit plan

You have enormous experience in lesson planning. But in usual teaching profession the scope of Unit planning seems to be neglected. A good unit plan should have the following components.

- Introduction of** : The introductory part involves the name of unit, grade level of students, time needed to cover the unit and the time of commencement.
- Statement of objectives** : The objectives to be realised by the completion of the unit must be stated in behavioral terms. These includes specific understanding, skills and attitudes. The details of stating objectives are discussed in Block 6, Unit 1.
- Out line of content** : This component involves important concepts in the unit, problem to be solved, subject matter heading and projects to be completed.
- Learning activities** : A list of learning activities to be performed by pupils and teacher to achieve the pre stated objectives is to be prepared next. The approximate time required for each activity should be mentioned along with the sequential arrangement of such activities.
- Resources and materials** : The next component of unit plan is the resources and materials needed for the instruction of particular unit. These include printed materials, audio visual aids, list of consultants available in the community, and an outline of the necessary procedure to facilitate the use of out of class resources.

Evaluation procedures : This is final component of a unit plan. This includes a list of evaluation procedures to determine student's development and achievement of specific objectives for the unit, such as quiz, unit test, summaries, home assignment written and oral reports and pupil projects

Check your progress 4

Briefly trace out the components of a unit plan.

Note : a) Space is given below to write your answer;
b) Compare your answer with the one given at the end of this unit.

.....
.....
.....
.....
.....

1.3.3. Structure of unit plan.

We shall see here an outline of a unit plan. A model unit plan is given in section (1.3.4). Let us see the structure of a unit as schematically presented as follows

Unit heading	
I	Objectives
II	Previous knowledge
III	Major problems
IV	Content outline
V	Concepts to be developed
VI	Vocabulary
VII	Possible experiments/Demonstrations.
VIII	Possible discussion topics
IX	Audio visual materials
X	Areas needing further enrichment
XI	Teachers Bibliography.
XI	Students Bibliography
XII	Scheme for evaluation.

This is a proposed outline for a unit. A model unit plan developed as per this outline is given in the next section.

1.3.4. A Model unit plan

A teaching unit should be developed as the outline given in sub section 1.3.3. Here you will see a model unit in 10th standard biology. This model will help you to develop unit plan of your choice

UNIT OUR ENVIRONMENT Standard-10 time required 10 Hrs.
Time of commencement : October IIIrd week.

I OBJECTIVES : The student should be able to

1. interpret scientific facts.
2. analyse relationship between the relevant facts.
3. develop an awareness about the means of conservation of our environment.
4. develop a positive attitude towards population control.
5. develop a positive attitude against pollution.
6. develop scientific appreciation.

II PREVIOUS KNOWLEDGE

1. Knowledge of animal adaptation
2. Knowledge of food habits of animals.
3. Knowledge about elements needed for plant growth.
4. Knowledge about population growth and over population.
5. Knowledge about basic aspects of pollution.

III MAJOR PROBLEMS

1. What is the use of solar energy in an ecosystem ?
2. What are the components in a food chain ?
3. Why does energy flow from one level to the another ?
4. Why do Biogeo chemical cycles important for living beings ?
5. How does human involvement disturb ecological balance ?
6. What are the lethal effects of pollution ?

IV CONTENT OUTLINE :

Biosphere - Sun, source of energy - green plants, Herbivores, Carnivores - Autotrophs and Heterotrophs - food chain and food web - Energy flow - Bio-geo chemical cycles - Equilibrium in Ecosystem - Human involvement in eco system - pollution.

V CONCEPTS TO BE DEVELOPED

1. Ecology is study of animal and its relation ship with environment.
2. Ecosystem is composed of biotic and abiotic components.
3. Food web is an inter connection of different trophic levels.
4. The flow of energy is an unidirectional.
5. Bio geo chemical cycles are essential for existence of nature.
6. Human involvement leads to ecological imbalances.
7. Pollution is harmful to living beings.

VI VOCABULARY : The vocabulary should be grouped as A, B, C, etc. according to the order of sub sections in the unit.

A	B	C	D
Community	Autotrophy	Producers	Energy flow
Ecosystem	Heterophy	Consumers	Energy ladder
Biosphere	Trophic level	Decomposers	Pyramid of numbers
	Food chain	Saprophyte	Pyramid of biomass
	Food web		

E

Bio geochemical cycles
Carbon Cycle
Oxygen cycle
Water cycle
Nitrogen cycle

F

Acid rain
Aerosol spray proppalents
Pollution.

VII POSSIBLE EXPERIMENTS/ DEMONSTRATIONS :

1. Survey of living beings in an ecosystem and construct
(a) food chain (b) food web (c) Pyramid of numbers and (d) Pyramid of biomass.
2. Make a list of human involvement leading to ecological imbalances in your locality.
3. Survey of pollution at your locality.

VIII POSSIBLE DISCUSSION TOPICS

1. Importance of solar energy
2. Relevance of each trophic level in maintaining ecological balance.
3. Necessity of elements to be cycled in nature.
4. Hazards of ecological imbalances
5. Lethal effects of pollution.

IX AUDIO-VISUAL MATERIALS

1. Charts of food chain, food web, Energy flow, pyramid of numbers, pyramid of Biomass, Biogeochemical cycles.
2. Models of - Biogeochemical cycles, and energy ladder
3. Films on - Nature, and pollution.

X AREAS NEEDING FURTHER ENRICHMENT

1. Ecological problems in Kerala.
2. Pollution-a world wide problem
3. Nature of human involvement leading to destruction of ecosystem.

XI TEACHERS BIBLIOGRAPHY

1. Odum, E.P. - Ecology
2. Verma - Environmental biology

XII STUDENTS BIBLIOGRAPHY

1. Science magazines
2. Science articles

XIII SCHEME FOR EVALUATION

1. Home assignment
2. Quiz
3. Students project a) Survey on an ecosystem
 b) Survey to realise causes of pollution
4. Unit test.

This is a model unit plan for the teaching unit our environment.

Check your progress 5

Develop unit plan for a unit of your choice

Which all aspects will you include in the plan ?

- Note :**
- a) Space is given below to write your answer;
 - b) Compare your answer with the one given at the end of this unit.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

1.4 LET US SUM UP

This unit has discussed the important aspects of long-term planning and unit planning. The structural aspects had been given more importance. The main points are

1. Long term planning involves the planning of teaching for an year or more, involving aspects such as teachers, students, levels of teaching, teaching units, time allotted at each standard, instructional strategies, accessory learning materials, scheme of evaluation, grading and promotion and co-curricular activities.
2. Long term planning must be done in each subject separately.
3. Long term planning would help in achieving the targeted change.
4. A unit plan is planning of teaching a unit which includes components such as introduction, objectives, content outline, learning activities, resource materials and evaluation procedures
5. The illustrative model unit plan acts as an outline for unit developers.

Check your progress : Possible answers.

1. Long term planning involves components such as teachers, students, content and aspects of teaching. The number of teachers in each subject, number of divisions, levels of teaching, time allotted for each standard, instructional strategies, co-curricular activities, scheme of evaluation, grading and promotion. All these components are to be brought together in each subject to design a plan for the whole institution.
2. Long term planning helps to explore the facilities available and additional requirements. The thrust areas, instructional strategies, strategies for evaluation, co-curricular activities, etc. can be developed in advance using a long term plan.
3. Long term planning has four steps.

- i) Meeting of each subject council.*
- ii) Preparation of an outline schedule for long term plan.*
- iii) Discussion on the proposed schedule.*
- iv) Discussion on facilities and necessities of the school and develop the final plan.*

- 4. A teaching unit should have an introductory part to deal with the topic, level and time required for its instruction. Objectives are designed according to the content of the unit the resource materials required should be selected according to the learning activities needed for the unit. Evaluation procedure is the final component of the unit plan.*
- 5. While preparing a unit plan the following aspects should be included. They are objectives, previous knowledge, major problems, content outline, concepts, vocabulary, possible experiments, demonstrations possible discussion topics audio visual materials, area needing further enrichment, teachers bibliography, students bibliography and scheme for evaluation.*

UNIT 2 LESSON PLANNING

Contents

- 2.0 Objectives
- 2.1 Introduction
- 2.2 Aspects of lesson planning.
 - 2.2.1 Meaning of lesson planning
 - 2.2.2 Components of lesson plan.
 - 2.2.2.1 Statement of the topic
 - 2.2.2.2 Objectives of the lesson
 - 2.2.2.3 Outline of content
 - 2.2.2.4 Instructional methods
 - 2.2.2.5 procedure for evaluation.
 - 2.2.3 Steps in lesson planning.
 - 2.2.3.1 Division of lessons from Units.
 - 2.2.3.2 Identification of objectives
 - 2.2.3.3 Determination of previous knowledge
 - 2.2.3.4. Determination of content outline.
 - 2.2.3.5. Selection of the instructional methods
 - 2.2.3.6. Determination of the nature of learning activities.
 - 2.2.3.7. Selection of materials and resources
 - 2.2.3.8 Selection of evaluation procedure
- 2.3 Lesson plan an illustrative model.
- 2.4 Let us sum up.

2.0 OBJECTIVES

Compared to long term planning and unit planning, lesson planning has more importance in daily teaching. In this unit you will get the details of various aspects of lesson planning. This unit will also give details of major components of a lesson plan, criteria for selecting lessons, steps in preparing a lesson plan and an illustration for developing a lesson plan.

At the end of this unit you will be able to

- * identify the importance of lesson planning.
- * identify the components of a lesson plan.
- * state the steps in lesson planning.
- * develop lesson plans for the content in biology syllabus.

2.1 INTRODUCTION

We have already discussed the important aspects of long term planning and unit planning in unit 1 of this block. Further scaling down of a unit plan leads to a lesson planning. You know the amount of knowledge ways and means to knowledge increase day after day. So, there will be change in the content to be instructed also. Thorough planning is essential for effective instruction. As a science teacher, you should select and organize suitable methods and materials for classroom instruction. As a science teacher,

you should select and organize suitable ~~methods and materials~~ for classroom instruction. Usually, we divide the content of a unit as different lessons. So it is essential to plan for each lesson for effective instruction. The format of lesson plan has less importance. But the originality in thinking and the efficiency in planning by the teacher has more importance, as it directs him to identify most effective procedures for achieving the aims and objectives of the lesson.

We will see the important aspects of lesson plan and an illustrative model lesson plan in this unit.

2.2. ASPECTS OF LESSON PLANNING

In this section you will get the various aspects of lesson planning including the meaning components and steps in lesson planning. We have to see these aspects one by one.

Learning Activity, 1

Give the meaning of lesson planning

Notes : a) Space is given for your answer

.....

.....

.....

.....

.....

.....

.....

.....

2.2.1 Meaning of lesson Planning

You know the syllabus consists several units. Each of such units needs several hours of instruction. Lesson plan is a plan of activities which will be selected and organized to achieve pre stated objectives within the item of a lesson. Some of our teachers have lesson plan in their mind. But the constant advancement in science and science content make it necessary to revise the plan year after year in detailed manner. Most of the educationists are of the view that daily lesson plans are vital to both experienced and beginning teachers in improving their teaching efficiency.

2.2.2 Components of lesson plan.

We are familiar with the components of lesson plan. These include the following items such as statement of the topic, Objectives content outline, procedures of instruction and evaluation of the lesson. Let us see these components one by one.

2.2.2.1 statement of the topic

The statement of the topic can be done in different ways. It can be as a general heading, as a principle, concept of law. Say for example the introductory lesson on our environment can be stated as 'Ecology and Biosphere' of "Ecosystem" or 'living beings are closely related to nonliving materials' or "An ecosystems consists of all components in harmony".

2.2.2.2. Objectives of the lesson

.....
.....
.....

2.2.3 Steps in Lesson Planning.

We have already seen the components of a lesson plan. Now let us see the steps through which a lesson plan is being developed. At the beginning part of this unit we found that lesson planning is scaling down of a unit plan. So a lesson plan would takes its origin from a unit plan. Let us see steps in lesson planning.

2.2.3.1 Division of lesson from units

In Unit 1 of this Block, we have discussed a unit plan on the unit our environment. Each of such units consists of many lessons. So the first step is the breaking down of lessons from a unit. While taking a lesson from a unit depends on the length of the content, concepts to be developed and required learning procedures should be taken into consideration. The unit our environment involves lessons such as Biosphere, food chain and food web, Energy flow, biological pyramids, bio geo chemical cycles - Carbon cycles, Nitrogen Cycle, Water cycle, oxygen cycle. Balance in Ecosystem and pollution.

Learning Activity 2.

Select lessons from a unit of your choice.

Notes : a) Space is given for your answer

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

2.2.3.2 Identification of objectives

The second step in lesson planning is determining the scope of the lesson. The scope of lesson in turn helps to determine the objectives of the lesson. The objectives of the lesson would be helpful in determining the following steps of lesson planning.

2.2.3.3. Determination of previous knowledge

You know that learning of new things should be based on the old ones. That is then learning of anything requires, some previous learning. This in turn act as previous knowledge. Say for example for learning the lesson Biosphere. Knowledge about adaptations, community life of animals and their inter relations are necessary.

2.2.3.4. Determination of content outline

As a first step in lesson planning, we divided a unit into lessons. In each lesson, then the selected content should be arranged as concepts or principles or laws. For example biosphere is composed of living and nonliving materials.

2.2.3.5 Selection of instructional methods

The next step is the selection of suitable methods of instruction. Instructional method means procedure adopted for instruction. Instructional methods should be based on the nature of the content of the lesson. Say for example the lesson on pollution can be instructed using discussion, problem solving and group investigation methods. Likewise suitable methods can be selected accordingly.

2.2.3.6. Determination of the nature of learning activities.

The nature of content and instructional method determine the nature of learning activities. Learning activities means selected activities used for learning. A variety of learning activities can be involved in an instructional method. For example the instructional method problem solving can include learning activities like observation, discussion, experimentation, verification etc. The selection of learning activities also depends on the facilities available, personality of teacher and nature of students

2.2.3.7 Selection of materials and resources

Teaching of each lesson needs certain necessary learning materials. The number and variety of such materials will depend upon the nature of content, instructional methods and learning activities. Say for example, a lesson on pollution needs resource materials such as photographs, charts and films. Direct observation and survey also will be useful. So certain community resources are also necessary for effective instruction on pollution.

2.2.3.8 Selection of evaluation procedure

The final step of lesson planning is selection of evaluation procedure. You know, proper evaluation is essential to determine the degree of learning. Usually we evaluate learning by the nature of pupil response. There are many methods of evaluation for classroom learning. It is the teacher, who has the right to select the appropriate procedure with respect to the student and the content.

Check your progress 2

Briefly comment on the steps in learning.

- Notes : a) *Space is given for your answer*
 b) *Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

2.3 LESSON PLAN - AN ILLUSTRATION MODEL

A model to illustrate lesson planning is given below.

OBJECTIVES

The pupils will be able to

1. Recall the meaning of ecosystem, natural resources, exploitation of nature, and equilibrium of nature.
2. Identify the negative effects of over population
3. Develop positive attitude towards conservation of nature.

Previous knowledge

1. Preliminary knowledge about ecosystem
2. Knowledge about interactions between animals and their surroundings.
3. Knowledge about hazards of over population
4. Knowledge of environmental destruction.

Content out line :-

The lesson begins with the following statement. Though we are employing advance technology and fertilizers, the rate of production decreases year after year.

After analysing this statment the following concepts will be discussed.

1. Living beings in a particular locality maintain an equilibrium by means of instruction
2. Exploitation of nature and natural resources disturb the equilibrium. of nature
3. Over population and technological developments lead to ecological unbalance

Instructional methods :- Group investigations is the major method along with discussion and lecture methods. Investigation should be guided and directed to understand the concepts well. A field trip is to be conducted to survey the disturbance, that have been made by human beings in an ecosystem. The observations will be concluded in the subsequent class periods.

Learning Activities :-

The learning activities including questioning, discussing, observing, analysing and experimenting.

Materials and Resources :-

Accessory learning materials such as charts, news clips, photographs and films will be used.

Community resources such as pond, river and forest also used to investigate the nature and causes of ecological imbalances.

Evaluation procedure :-

Through out the lesson, the evaluation is to be done by observing the nature of pupil response. Teacher will give guidance for the investigation and direct the discussion. Meanwhile the teacher will evaluate students ability to make observation and draw inferences. Analysis of studnets opinions during

discussion will help to evaluate scientific attitude such as open mindedness, judgement ability willingness to try experiments etc.

Remedial works :-

There will be ofcourse some slow learners in a mixed ability class. So remedial work for those who do not attain learning upto expected level has to be made. The points of difficulty can be identified through evaluation. (The details of remedial teaching is given in Block 6 U8)

2.4 LET US SUM UP.

In this unit, we have tried to see the details of daily lesson planning, the focus was particularly on the necessary structure of lesson plan. The main points are as follows.

1. The major components of lesson plan are, statements of the topic, objectives, content outline, instructional method, and evaluation procedure.
2. The essential steps in lesson planning are division of lessons identification of objectives, determination of previous knowledge of content outline selections of instructional methods, learning activities, resource materials and evaluation procedure.

Check your Progress - Possible answers

1. The major components of lesson plan are :

- a) Statement of the topic.
- b) Objectives of lesson.
- c) Outline of content.
- d) Instructional methods and
- e) Procedure for evaluation.

2. The steps in the lesson planning are

- a) division of lesson from unit.
- b) identification of objectives - determine scope of lesson.
- c) determination of previous knowledge
- d) Determination of content outline.
- e) selection of instructional methods
- f) determine the nature of learning activities
- g) Selection of materials and resources.
- h) Selection of evaluation procedure.

ASSIGNMENT QUESTION

The success of teaching depends on planning. Briefly explain the different types of planning and their advantages in teaching biology.

Notes : a) No space is given for writing the answer.
So you should prepare your answer in separate sheets.

SOURCES

Falk D.(1971), *Biology Teaching Methods* New York : John Wiely. sons

Kilinkmann, E. (1971) *Biology teacher's Handbook*. New Delhi Wiley Eastern.

Mathur, L./M. (1975) *Science Projects and School Science projects* New Delhi University of Delhi.

Merholt, E. Wein B.P.F. & joseph A (1988) *A source book for Biological sciences* Brace & World Inc.

Nair, C.P.S (1971) *Teaching Science in your schools* New Delhi.

Nedlsky L.(1965) *Science Teaching and Testing*. New York : Harcourt Brace & World Inc.

Sayal, N.K. (1977) *Science Education*. New Delhi : S. Chand & Co.

Schwab J.J. (1965) *Biology Teachers Handbook* BSCS, New York. John Wiely & Sons Inc

Sharma, R.C. (1981). *Modern science teaching* New Delhi: Oxford & IBH.

Washton N.S.(1976). *Teaching science Creativity*. London : W.B. Saunders & Co.

**BLOCK 3 PEDAGOGICAL ANALYSIS OF SECONDARY SCHOOL
BIOLOGY**

Unit 1 Principles for Pedagogical Analysis

Unit 2 Illustrations of Pedagogical Analysis.

BLOCK 3 PEDAGOGICAL ANALYSIS OF SECONDARY SCHOOL BIOLOGY.

BLOCK INTRODUCTION

There are two units in this block. Unit 1 deals with principles for pedagogical analysis and Unit 2 discuss illustrations of pedagogical analysis.

In Block 2 we have discussed planning for teaching. Pedagogical analysis is the succeeding step of planning. We have to analyse the pedagogy, so that we could identify the hidden concepts sub concepts, necessary examples, teaching strategy and problematic situations while teaching the content.

In Unit 1 we are going to see the principles for pedagogical analysis.

In Unit 2, we will discuss two illustrations of pedagogical analysis, using selected content area of secondary level biology.

These two units together will give you a clear picture of pedagogical analysis.

UNIT 1 PRINCIPLES FOR PEDAGOGICAL ANALYSIS

Contents

- 1.0 Objectives
- 1.1 Introduction
- 1.2 Pedagogical analysis
 - 1.2.1 Pedagogical analysis - meaning.
- 1.3 Pedagogical Analysis - Principles.
 - 1.3.1 Meta cognition
 - 1.3.2 Identification of teaching strategies.
 - 1.3.3 Content Analysis.
 - 1.3.4 Identification of attributes.
 - 1.3.5 Exemplar planning
 - 1.3.6 Identification of problematic situations
 - 1.3.7 Mediator planning.
 - 1.3.8 Anticipation of errors and preventive measures.
- 1.4 Let us Sum up.

1.0 OBJECTIVES

In this unit you will see the important principles for analyzing pedagogy. At the end of this unit you will be able to.

- * identify the important principles for analyzing pedagogy
- * identify the steps in pedagogical analysis
- * apply the principles for analyzing pedagogy in teaching biology.

1.1 INTRODUCTION

In your daily teaching, the lesson plan has high importance as we have seen earlier. While planning a lesson we must have to analyze the specific content area of that lesson. You all know that there are different techniques for analyzing the content. Each of such techniques should be based on appropriate principles for analyzing the pedagogy. It is hoped that proper understanding of this unit will help you to, analyze the content more easily and systematically.

1.2 PEDAGOGICAL ANALYSIS

Pedagogical analysis may be a new term for you. So first of all we shall discuss the meaning of pedagogical analysis. Then we shall discuss the important principles which are the essential elements of pedagogical analysis.

1.2.1 Pedagogical Analysis Meaning.

Analysis of pedagogy is not a new technique. But the new term pedagogical analysis is a new terminology for a very old approach. Here pedagogy means, a content area, which is to be instructed in any class. Say for example, the content area for eighth standard biology can be termed as eighth standard biology pedagogy. So any given content area for any grade level can be pedagogy for the particular grade level

While preparing the lesson plan, we should analyze the given content, for the sake of dividing them as lessons. We have already discussed the details of lesson planning in Block 2. U 2. This unit specially deals with one activity of lesson planning, i.e. analysis of the content.

You may identify the new terms, facts, concepts and principles in a lesson while you analyze the content. But now with the identification of the term pedagogical analysis the depth and breadth of the analysis of the content has increased to a greater extent. This analysis will help the teacher to understand the essential elements of the lesson and how these elements give rise to concepts. He should also get an insight about the application of the hidden concept to new situations. Such a thorough analysis exposing all the essential elements in the lesson such as experiments, related theories, related principles, and related opinions is necessary for mastery learning. The teacher who analyzes the pedagogy in such depth, will be able to know the pros and cons of the content.

So in essence, pedagogical analysis can be said as the essential input for the teachers, which may include the lists of all experiments, all related principles, all related opinions and all related theories necessary for mastery learning. A teacher could promote mastery only if he has all the necessary information about all the essential elements of the content to be instructed. So thorough analysis of the each of those elements is necessary. If any element is missed, mastery does not occur. As teachers you should internalize all principles of pedagogical analysis. These principles are described in detail in sub-section 1.3 as follows.

Check your progress 1.

Explain briefly, how does pedagogical analysis promote mastery learning.

Check your progress 1.

- Notes :
- a) Space is given for your answer
 - b) Compare your answer with the one given at the end of this unit.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

1.3 PEDAGOGICAL ANALYSIS - PRINCIPLES

We have already discussed the meaning of pedagogical analysis. And now, we shall discuss the important principles of pedagogical analysis. All the principles are equally important while analyzing the pedagogy.

1.3.1 Metacognition

This is the first principle of pedagogical analysis. Metacognition means to know how to cognise. The details of cognitive development was discussed by us in the Block 1, Unit 1. Certain additional

aspects to cognitive growth and concept attainment will also be discussed in Block 4 , Units 1 and 4..

We have already seen that our cognitive structures assimilate the familiar experience and should strive to accommodate new experiences. One cannot accommodate the new knowledge, till it is linked with the existing knowledge. Here as a teacher you must know your students existing level of knowledge. Then only you could help your students to cognise new information. Say for example we could not teach about computer programme to a student , who does not know what is a computer.

In order to develop the cognition of your students, you should develop the new information on their existing experience. So you should know how to link the new information with the existing ones, i.e., you should know how to cognise your students.

Learning Activity 1

What techniques are you using in classroom to connect new information with the existing information.

- Notes :
- a) *Space is given for your answer*
 - b) *Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

You may have written, that questioning and narrating incidents are the techniques usually adopted in classrooms for this purpose. Of course, probing questions and narration of incidents are two commonly used techniques in this regard. Along with this you should do other techniques such as, listing of students existing experience, providing cues, showing a diagram or a model or actual object, group discussion providing real life situation or verbal explanation of the situation are effective.

Whatever technique may be scheduled, you should first understand the developmental stage of students and their previous knowledge. It acts as a platform, only on which we could do the further analysis of the pedagogy. Now we pass on to the second principle of pedagogical analysis.

1.3.2 Identification of Teaching Strategies.

We have already discussed the first principle of pedagogical analysis, which envisages that you should know how to cognise. In addition to the facts explained in the first principle. The details of the following principles also are essential for meta cognition.

In the second principle you should identify the teaching strategy. Suitable teaching strategy can be selected by analyzing the pedagogy of lesson and learners.

The lesson can be of various types. In a single unit itself, there can be different types of lessons. The major types of lessons are lecture lessons, experimental lessons, discussion lessons demonstration lessons, laboratory lessons and field study lessons. Now the question arises that how do we identify the

type of the lesson ? We should simply analyze the pedagogy to identify the information present in the content, which in turn helps us to identify the type of the lesson.

Suppose, for example you are going to teach the unit, heredity and variation'. The introduction lesson in the unit can be taught through a lecture type lesson. The lesson on laws of heredity can be taught through discussion, lesson on monohybrid ratio and dihybrid ratio can be taught through experimental method. field study and observation would help you to conclude the unit.

Along with the types of lesson, learners also are the determining factor of teaching strategy. So while selecting the strategy, you should take care of learners mental level, their awareness in the process of science and their attitude towards scientific inquiry. If you would not consider the above aspects while selecting the teaching strategy, mastery learning will not occur.

Say for example, you cannot teach the unit hereby and variation to those who don't know the basis of genetics. If your students are un aware of the process of science you could not select experiment and field study.

So in essence, both, type of lesson and learners are determinants of teaching strategies.

Check your progress 2.

Bring out the important factors influencing metacognition and selection of teaching strategies.

- Notes :
- a) *Space is given for your answer*
 - b) *Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

1.3.3 Content Analysis.

Now we shall pass on to the next principle of pedagogical analysis. After the identification of teaching strategy you should analyze the content of the lesson. The main purpose of the content analysis is to identify the major concepts of the lesson. So while analyzing the content, you should concentrate to bring out major concepts; you know that what a concept is. A concept is the major idea of the given content area. In other words, a content area is developed on the basis of an idea namely concept.

Suppose, for example you are going to teach the lesson heredity and variation you should go through the content of the lesson and identify the concepts in the lesson are heredity, variation and genetics. These concepts can be further explained as follows.

- Concept 1 heredity is transmission of characteristics from parents to the off spring.
- Concept 2. Variation is those differences exhibited by the off spring from their parents.

Concept 3 genetics is the study of heredity and variation.

Learning Activity . 2

Consider that you are going to teach the lesson, law of inheritance to standard IX students. Analyze the content and bring out the major concepts in the content.

Notes : a) Space is given for your answer

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

We have seen the necessity of content analysis as to identify the major concepts in the content. Identification of concept is important in the sense that our students are required to internalize the concepts through learning. Now we shall pass on to the next principle of pedagogical analysis.

1.3.4 Identification of Attributes

This is the fourth principle of pedagogical analysis. We may know how to identify the major concepts and now you should analyze the concepts further to identify the subconcepts or attributes. Sub concepts or attributes means the essential elements or essential parts of the concept. Say , for example consider the concept 'two wheeler'. In order to differentiate a bicycle from a tricycle you should know the essential elements or parts of the concept two wheeler and should also be able to understand the essential elements of three wheelers. The essential elements of two wheeler are the two wheels, handle, arrangement of seat and the mode of connection between the front and back wheels.

The colour, shape, size, texture, content, and taste are the essential elements or attributes of fruits, difference in these attributes helps us to distinguish between different types of fruits.

You should analyze the identified concept in order to findout both the essential and nonessential attributes. Now let us see what are the essential and nonessential attributes. See an example to make clear the difference between the two. The essential attributes of two wheelers are the two wheels, the body form, and the mode of connection between the front and back wheels. The handle size, colour of the body, size of the seat, sound of the horn are non essential attributes. These are called so , because these elements or attributes are not necessary to identify the concept of two wheelers.

So the essential attributes are the essential element or characteristics that help us to identify a concept and the non essential elements are those which are not necessary to identify the concept.

Check your progress - 3

What are attributes ? Bring out the significance of attribute analysis in contrast with content analysis.

Notes : a) Space is given for your answer
b) Compare your answer with the one given at the end of this unit.

can be used as mediators to develop the concept of heredity and variation.

So the mediators help us to develop the concept completely. Which results in mastery of the given content

Learning Activity 4.

Try to select mediators for the instruction of a topic of your choice.

Notes : a) *Space is given for your answer*

.....

.....

.....

.....

.....

.....

.....

.....

1.3.8 Anticipation of Errors and Preventive Measures.

This is the eighth and last principle of pedagogical analysis. There of course may occur certain errors while learning a content. You have to anticipate the probable errors in learning and to find out the preventive steps to correct those mistakes. In other words you should find out all the possible errors in advance that can happen while learning the content. In order to locate these errors the content should be thoroughly analysed. After anticipating the errors, you should develop the preventive measures to correct those errors. So a problem will arise that how to anticipate the possible errors? In order to anticipate the errors you should analyse the content thoroughly and locate the points at which errors can occur. Otherwise it leads to wrong learning as in the case of the following example:

A teacher tries to explain the lethal effects of alcohol to human beings through an experiment. He took two worms in a test tube and poured about five ml. of alcohol into the test tube. Soon the worms died. Learners got the idea that alcohol is good for distracting worms. Usually errors can occur in this way. As a result our students learn just opposite to what we instruct.

Suppose, for example you are going to teach heredity and variation; let us examine the possible errors that can happen while learning the content.

- 1) Pupils may think that heredity is different among men and women. They also think that some have girl child because of the mother's hereditary characters. You could give the details of chromosomes as preventive measure here.
- 2) The difference between heredity and variation may not be clearly distinct. You should make it clear by using life like examples.

Check your progress 5

What is the significance of mediator planning in pedagogical analysis

Notes : a) *Space is given for your answer*
b) *Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

1.4 LET US SUM UP

In this unit we have seen the meaning of pedagogical analysis and the important principles of pedagogical analysis.

The major principles are as follows.

- i) Metacognition
- ii) identification of teaching strategies.
- iii) Content analysis.
- iv) identification of attributes.
- v) Exemplar planning.
- vi) Identification of problematic situations.
- vii) Mediator planning and
- viii) Anticipation of possible errors and preventive measures.

Check your progress - Possible answers.

1. *Pedagogical analysis explores almost all essential elements of a lesson, required for its mastery such as experiments, opinions, principles and theories related to the lesson.*
2. *The factors influencing metacognition are the knowledge of students' previous knowledge end the techniques used for connecting new knowledge with existing knowledge. Identification of teaching strategy depends on the type of lesson and mental level of learners.*
3. *Attributes are the essential elements or essential parts of a concept. Content analysis means analyzing the content for identifying concepts in the given content. Attribute analysis is essential for concepts in the given content. Attribute analysis is essential for identifying essential parts of a concept which in turn help the learning of the concept.*
4. *i) Exemplars means examples. There are positive examples and negative examples. Positive examples contains the attribute and negative or non examples do not contain them. The negative examples help for the clear understanding of the attributes by comparing them with the positive examples.*

ii) If you are able to anticipate problematic situations in the learning of a concept, your students will be able to apply the concept in new situation.
- 5 *i) Mediator planning should be done by the teacher on the basis of learners and the content. This type of planning helps to attain the complete mastery of a concept.*

UNIT -2

ILLUSTRATIONS OF PEDAGOGICAL ANALYSIS

Contents

- 2.0 Objectives
- 2.1 Introduction
- 2.2 Illustrations of pedagogical analysis
 - 2.2.1 Chemical co-ordination in plants
 - 2.2.2 Environmental pollution.
- 2.3 Let us sum up.

2.0 OBJECTIVES

In this unit we shall discuss two illustrative models of pedagogical analysis. These illustrations are developed on the basis of the principles, which we have already seen in block - 3 Unit I

At the end of this unit you will be able to

- * identify the steps in pedagogical analysis.
- * develop a positive attitude towards pedagogical analysis
- * apply the principle for analyzing pedagogy of secondary level biology.

2.1 INTRODUCTION

We have already discussed the major principles of pedagogical analysis. In this unit you will see two illustrations explaining how to analyse the content area using these principles. Some content from the secondary level biology is taken for the purpose of analysis.

2.2 ILLUSTRATIONS OF PEDAGOGICAL ANALYSIS

We shall discuss certain selected areas of tenth standard biology content as pedagogically analysed, so that you will get an insight into pedagogical analysis and its principles. We will discuss the topics such as chemical co-ordination in plants and environmental pollution. Now let us see each of these in detail.

2.2.1 Chemical Co-ordination in plants

We shall analyse the pedagogy of the above topic in the light of the major principles for analysis. We will proceed through the following steps.

Step 1 Meta Cognition

Students should know growth and flowering of plants. They may have noticed that plants near a pond should grow in a curved manner. So first of all test the existing knowledge; then with the aid of diagrams and verbal explanation, the concept of chemical co-ordination can be linked to pupil's existing knowledge.

Step 2 Teaching strategy

The lesson we have chosen is a discussion type lesson. So discussion oriented teaching strategy can be used for instruction.

Step 3 Content analysis

At this step you should read the content thoroughly. Reading should be directed to bring out the concepts hidden in the content. The concepts at this content area are as follows

- (I) Plant growth is influenced by - hormones
- (II) Hormones influence movements of plants.

And now we pass on to next step.

Step 4 Analysis of Attributes

You should analyse the concepts to sub concept level/attribute level to identify the essential and non essential attributes or elements of concept. In the case of the first concept identified the essential attributes regarding plant growth and hormones are as follows.

- a) Regarding plant growth :- The progressive changes in the plant since its germination through flowering and seed formation. Hence increase in size, number and size of leaves, strength of the stem are essential attributes. The number of male and female flowers, leaves shed per day, and the number of seeds produced are non essential attributes.
- b) Hormones :- The changes that occur in plants due to the scarcity or abundance of hormones. Here the essential attributes are number of flowers, length of growing regions of plants (stem and root) and the size of fruits. The non essential attributes are the colour and size of flowers and number of petals in flowers. Now we pass on to the next step of pedagogical analysis.

Step - 5 Pre-planning of Examples.

Now you should select the appropriate examples including familiar examples, positive examples and negative examples. The familiar examples for then plant growth are germination of seeds and its further growth, the growth of new buds, when the main stem is damaged. A positive example can be in the form of germinating seeds in a laboratory setting. Negative example for plant growth are fertilization and pruning of plants. So you should thoroughly plan the examples to make clear the concept.

In the case of hormones familiar and positive examples are those which are used to flowering of plants, and to emerge roots on plants. Negative examples are pesticides.

Step 6 Anticipation of problematic situations

At this stage you should identify all the situations in which the concept is further applied. Our context of plant growth has application on various settings such as cultivation of agricultural plants, flowering plants, and the plants cultivated for other purpose. The term hormones have application to the field of agriculture, human development and medical science. Now we shall pass on to the next step in pedagogical analysis.

Step 7 Pre-Planning of mediators

At this step you should plan the various mediators through which learning of the concept can be made. The suitable mediators for teaching the concept above plant growth and experiments on seed germination and its further growth, root formation on onion bulbs anecdotes on huge giant trees and providing real life settings to know that different kinds of plants will grow to different size. Hormonal influence on plant growth also can be developed through the experiment as the chief mediator. Experiment can be conducted with the removal of extra provision of certain hormones to plants. Influence of hormones on animal also can be utilized in this regard.

Step 8 Anticipating possible errors and developing preventive measures.

The possible errors while learning plant growth are the following.

- (1) All kinds of plants grow at the same rate regardless of seasonal and geographical considerations. You should give different examples to make the difference between the difference in growth of plants with regard to its species, season and geographical peculiarities.
- (2) Hormones can be used at any time of plant growth. The function of each plant hormone and the amount of which to be use at the time could be made clear to your students. You should also give them directions that naturally addition of hormones is not necessary.

Check your progress. 1

What are the steps in analysing the pedagogy of chemical co ordination in plants.

- Note :**
- a) Space is given below to write your answer;
 - b) Compare your answer with the one given at the end of this unit.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

2.2.2 Environmental pollution

We have already discussed one illustration of pedagogical analysis. Now let us try to analyse the topic environmental pollution of tenth standard biology. We shall proceed through the similar steps of the previous example.

Step 1 Metacognition

Testing the existing experience of pupils is the first activity to be done in this regard. The pupils may have previous knowledge about various pollutants, and human involvement in the biosphere. You could use probing questions, verbal explanations, diagrams of biosphere destruction and news paper articles on pollution for cognising the existing information.

Step 2 Teaching strategy

Environmental pollution is a field study type lesson. So the teaching should involve survey, observation, investigation and analysis of various pollutants and human involvement which leads to pollution.

Step 3 Content Analysis

A thorough reading of the given content of the topic will help us to identify the hidden concept. We should identify the following concepts.

- (1) Environmental pollution causes destruction of biosphere.

- (2) Various pollutants and human invasion leads to pollution.

Step 4 Analysis of attributes

At this step you should analyse the identified concepts into sub concepts or attributes. The first concept identified is environmental pollution causes destruction to biosphere. Now let us examine the essential and non essential attributes of concepts.

1. Essential attributes are pollutants such as lethal gases, pesticides, detergents, chemicals, plastics and ionising radiations, production and dispersal of pollutants (for example lethal gases are by products of our industries, which disperse through air) and the lethal effects of pollution such as different diseases, destruction of animal and plant communities, destruction of buildings and scarcity of pure water and air.

The non essential attributes are the scientific formulas of pollutants, the amount of area polluted, the number of animals and plants effected.

The second concept identified is human invasion leads to pollution. Let's examine the attributes are as follows.

- 2) The essential attributes are as follows
 - a) Nature and type of human invasion - such as destruction of natural resources, production of lethal chemicals, construction of dams, improper dealing with industrial and biological wastes.
 - b) Area of invasion - here area referred to the total area affected and the type of area whether it has direct effect on air, land or water.
 - c) Amount of invasion - The amount of human involvement is another attribute. Say for example one man smokes 10 cigarettes a day and almost 40% of the world population are smokers. So altogether the smoke released to the air everyday is in huge amounts.

The non-essential attributes are the number of employees working in the industrial sector, their wage conditions, the number of shops selling cigarettes, etc.

Step 5 Pre planning of examples

Now we pass on to the fifth step in which you should select appropriate examples involving familiar examples, positive examples and negative examples.

The familiar examples for environmental pollution should be selected from our own locality

Positive examples are land pollution by pollutants such as plastics, metals, industrial wastes, and biological waste; air pollution such as Bhopal tragedy and Acid rain at many places of Europe and holes in ozone layer also can be used as positive examples.

Deforestation, hunting and destruction of different animals changing of paddy fields, and backwaters to land are non-examples or negative examples.

Step 6. Anticipation of problematic situation

At this stage you should identify the situations in which the concepts can be further applied. The context of pollution have application to the field of agriculture, industry, health and sanitation, community life and education. It also has further application to the fields of conservation of nature and natural resources, and deforestation. Now we pass into the next step of pedagogical analysis.

Step 7 Pre-Planning of mediators

At this step you should determine the mediators through which learning of concepts can be made.

Survey on various pollutants, survey on the nature of pollution at your locality, project work on environmental pollution, field trips to polluted areas, and anecdotes on harmful effects of pollution at the different parts of the world can be used as effective mediators.

Experimental studies on the effect of pollution on biosphere also is an effective mediator. Now we pass on to the final step of pedagogical analysis.

Step 8 Anticipating possible errors and developing preventive measures.

You may have think of possible errors, that may occur during the learning of the content at this stage. Let's see what are those errors and how do we prevent such errors.

1. One may think that if I put a plastic bag on soil, it will not destroy the texture of soil, as bag is very small when compared to the soil mass.

You must remind pupils through examples, that such 'ones' unite together to put hundreds of kilograms of waste materials to the soil.

2. Another error may be at the point that fertilizers and pesticides are essential for agriculture. Of course they are essential but the amount to be used, how to use and when to use are highly significant as far as pollution is concerned. You could prevent this error by highlighting biological control of pest, and natural framing of crops through discussion.

These may be the possible errors that may happen while learning the content.

2.3. LET US SUM UP

In this unit we have discussed two illustrations of pedagogical analysis.

- 1) Chemical Co-Ordination in plants.
- 2) Environmental pollution.

Check your progress - possible answers.

I. The steps in analyzing the pedagogy chemical co-ordination in plants are

- 1) *meta cognition*
- 2) *Teaching strategy*
- 3) *Content analysis*
- 4) *Analysis of attributes*
- 5) *Pre - Planning of examples*
- 6) *Anticipation of problematic situations.*
- 7) *Pre-planning of mediators and*
- 8) *Anticipating possible errors and developing preventive measures.*

ASSIGNMENT QUESTION

Analyse the pedagogy of the following secondary level biology topics.

- 1) Nervous Co-Ordination in man.
- 2) Pest control
- 3) Photosynthesis

Note : No space is given for writing your answer. So you would prepare your answer in separate sheets.

SOURCES

Falk, D. (1971) *Biology Teaching methods*. New York: John Wiley & Sons Inc.

Schwab, J.J. (1965) *Biology Teacher's Handbook*. BSCS, new york : John wiley & sons Inc.

Waston, N.S. (1967) *Teaching science Creatively*. London: W.B. Sauners & Co.

ii) Anticipation of errors that may happen while learning will help the teacher to develop preventive measures will in advance. so that she could lead her students towards correct learning.

x x x x x

BLOCK 4
INSTRUCTIONAL STRATEGIES IN BIOLOGY

Unit - 1	Concept Attainment Model
Unit - 2	Advance organizer Model
Unit - 3	Biological Science Inquiry Model
Unit - 4	Cognitive Growth Model
Unit - 5	Group investigation Model
Unit - 6	Mastery Learning.

BLOCK -4 INSTRUCTIONAL STRATEGIES IN BIOLOGY

BLOCK INTRODUCTION

After seeing the method of analyzing pedagogy, now it is time to know the major instructional strategies possible in biology.

This block deals with appropriate instructional strategies in biology, certain teaching models are discussed in this block in order to understand the suitable models for teaching biology. A Model of teaching is a plan or pattern which can be used to design curricula, instructional materials and to guide instruction. A model of teaching aims at the improvement of instructional effectiveness.

There are six units in this block, each dealing with a teaching model in detail along with the illustration. They are unit 1 concept attainment model of teaching, Unit 2 advance organizer model, Unit 3 Biological science inquiry model, Unit 4 Cognitive growth model Unit 5 group investigation model and unit 6 Mastery learning.

Each model has structural details such as syntax, Social system, Principles of reaction, and support system. Syntax of the model comprises of the phases of model. Each model has different phases. Social system describes the role of students and teachers. Principles of reaction explain the procedure by which teacher deals with the reactions of the students.

Support system deals with the use of other teaching aids, human skills and technical facilities required for the instruction of the model.

Along with these details application and effects of each model also are discussed.

UNIT 1 : CONCEPT ATTAINMENT MODEL

Contents

- 1.0 Objectives
- 1.1 Introduction
- 1.2 Concept attainment model.
 - 1.2.1 Concept attainment meaning
 - 1.2.2 The model of teaching
 - 1.2.2.1 The nature of concepts
 - 1.2.2.2 Role of the teacher
- 1.3 Types of concept attainment model.
 - 1.3.1 Reception - oriented model
 - 1.3.2 Selection - oriented model
 - 1.3.3 Unorganized materials model
- 1.4 Illustrative lesson on concept attainment model
- 1.5 Let us sum up.

10. OBJECTIVES

We all use different models of teaching in our daily teaching. You also know that each model of teaching is used in specific situations. In this unit we will see the details of concept attainment model of teaching. At the end of this unit you will be able to

- * interpret the meaning of concept attainment
- * identify the goals of the teaching model.
- * identify the procedure of using concept attainment model.
- * develop a positive attitude towards concept attainment model of teaching.
- * apply concept attainment model of teaching in the class room.

1.1 INTRODUCTION

A 'Concept' is familiar term for us, but the term concept attainment may be new one. In this unit you will see the different aspects of concept attainment. This model of teaching is proposed by J. Brunner. He proposes this model to develop a concept by prescribing its examples and non-examples. This unit also includes the essential elements of the model, application and effects of the model. So, as teachers, all of us should understand the essential aspects of the concept attainment model, the details of which is given in this unit.

1.2 CONCEPT ATTAINMENT MODEL

This model belongs to the information processing family of models. This family includes models that help students to process information received from their environment. This model includes methods and theories which are specifically helpful to processing information. Now let us see the meaning of

concept attainment.

1.2.1 Concept attainment - Meaning

The major function of schooling is helping children to learn concepts efficiently. Concept as you know is an idea constituted by facts. The learning of anything involves thinking, so also the learning of concepts. Brunner, et.al. describes thinking as categorizing. Let us see an example to understand categorizing.

A teacher is trying to teach about mammals. He presents the major characteristics of mammals. Then he gives list of animals and asks the students to choose the mammals from the list. They are able to point out the mammals by grouping the animals into different groups based on the characteristics.

This categorizing involved identifying and classifying of item on the basis of certain criteria. Such categorizing leads to concept formation. In the above example the concept is that of mammals. Thus in general, categorizing means understanding a concept, which is the first step of concept attainment. Concept attainment means identify concepts by all its details and able to describe it in one's own words.

1.2.2 The model of Teaching

The concept attainment model of teaching considers mainly two aspects :

- i) The nature of concepts, and
- ii) Thinking process to learn concepts

First of all we shall discuss the nature of concepts.

1.2.2.1. The nature of concepts

You know that structure of knowledge is comprised of concepts. Brunner suggests five elements for any concept. Let us see them one by one.

i) Name : It is a term standing for the concept ie name of the concept, Fruit, bird, vehicle, etc are names.

ii) Examples: This refers to the positive and negative examples of the concept. For concept attainment, recognition of positive examples and distinguishing them from negative examples is necessary. Suppose we put an array of mangoes of same variety, but one or two apples and oranges also are placed among them. Here apple and oranges are, negative examples for the concept of 'Mangoes'. The next element is attributes.

iii) Attributes : Attributes means common characteristics or features of an object. These attributes help us to identify such objects and classify it into a particular concept. Say for example we say orange, mango, apple and grape are fruits among the group of potato, cabbage, beans and radish. Here we identify certain common or distinguishing or essential characteristics of fruits, which help us to attain the concepts of fruits such as fleshy, sweet, changes colour while ripe etc. So concept attainment involves distinguishing essential attributes from non-essential ones. Now we shall see the next element.

iv) Attribute Values : Each essential attributes have a range of value in itself, which help us to distinguish it. The colour of apple has a range of values from green to yellow, golden to red etc. To say it is ripe and eatable. If these colours had not appeared, we consider them as uneatable. So, colour shape size and any other attribute of objects may vary between a range. And this range is referred to as the attribute values.

Now we pass on to the final element of concepts.

v) The rule :- A rule as you know is a definition or statement of a concept. Say for example, Fruits are fleshy juicy and edible is a rule of the concept 'Fruit'. The rule involves towards the end of the concept attainment process and it indicates all the essential attributes of a concept.

We have already discussed the five elements of a concept and now we shall have look at the duties of a teacher while presenting a concept.

1.2.2.2. Role of the teacher

We have already seen that attributes play an important role in distinguishing one concept from another. The difference in combination of attributes help us to distinguish between orange and apple. Here your role is to identify all the five elements of the concept. Among these elements we should first identify the essential attributes and differentiate from the non-essential attributes. Then carefully choose the positive examples, which should include all the essential attributes. Some negative examples also should be selected. You should take care to eliminate all the unnecessary or noisy information from the examples. These examples should be designed in such a way that all the essential attributes will be clearly present in them. You should select some additional examples also to facilitate the concept attainment process.

If you want to check whether pupils attain the concept you should ask them to describe the concept in terms of their essential attributes, to distinguish between examples and non examples, and to generate their own examples. If they are able to do these, we should decide that they have attained the concept.

It is the role of the teacher to determine the appropriate thinking strategy for concept attainment, we shall have a brief discussion on this in the next sub-section.

Check your progress - 1

Trace out the role of the teachers in analysing the five elements of a concept.

- Note :*
- a) Space is given below to write your answer;*
 - b) Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

1.2.3. Thinking strategies for concept attainment.

Here strategy means the decision making activity to attain a concept. We should follow certain thinking processes, which is termed as decision making. Such thinking strategies are always different for different types of concepts. In simple terms, thinking strategy means the various activities that are done by an individual to learn a concept meaningfully. Say for example the concept of weight difference of different object can be attained using different activities such as (i) comparing weight of one object with all other objects, or (ii) find out the weight of each object and understand the difference or iii) Comparing the weight of each item with a standard weight.

These are three thinking strategies, which help a learner to attain the concept. Thinking strategy can be different from concept to concept and learner to learner. In concept attainment teaching two learning conditions are in use, namely reception and selection. Let us see what they are.

Reception conditions :- In this condition teacher provides examples of a concept, by marking them 'yes' or 'no', depending on the presence or absence of the concept in the example. (Here 'yes' stands for positive example and 'no', for negative example). Here pupils' effort will be minimum as they have to receive what is given by the teacher. Say for example teacher decided to teach the concept tap root system. She may provide examples of tap root system and fibrous root system marking 'yes' and 'no' respectively. Differentiating between the two will be then easy for the pupils.

Selection conditions :- It is, as the name indicates, selecting positive and negative examples ('yes' and 'no') from a group of examples which are not marked as 'yes' or 'no'. Here pupil have to select each example and should inquire whether it is positive example, teacher may give some plants to her pupil to attain the concept of tap root system. The plants given as examples are both with the tap root system and fibrous root system. So pupils have to inquire on each example by matching it with the essential attributes, in order to identify it as a positive or negative example.

Learning activity 1

Give one instance each for selection and reception learning conditions.

Note : a) Space is given below to write your answer;

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

The reception strategy will help us to teach the elements of concepts well. But if you want your pupil to apply their own initiation and control, selection strategy is useful. And of course a third condition for 'real life unorganized data' will help the pupils to transfer concept theory in to real life situations. Now we pass on to the application and effects of this model of teaching.

1.2.4 Application of the model.

Now let us trace out the various applications of this model. The various applications are as follows.

1. The model is applicable to all age levels and grade levels. The reception model is more advantageous for elementary learning and the selection and unorganized material model are better for secondary and higher levels.
2. This model helps inductive learning.
3. This model is also used as an effective tool for evaluation. It helps us to determine whether students have mastered the ideas that are already taught to them.
4. This is also helpful to encourage inquiry in students.

These are the major application of concept attainment model of teaching.

Now we shall see the effects of concept attainment model.

1.2.5 Effects of concept Attainment Model of Teaching

We have adopted this model to obtain certain specific instructional effects. This model is designed for instruction on the nature of concepts and on specific concepts. So this will help the students to analyse the concept in all its details. Along with it, the model encourages students to improve their thinking strategies and to developing awareness in alternative perspective of learning concepts. These are the effects of concept attainment model of teaching.

Check you progress - 2.

List out the major application and effects of concept attainment model of teaching.

- Note :**
- a) Space is given below to write your answer;
 - b) Compare your answer with the one given at the end of this unit.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

1.3 TYPES OF CONCEPT ATTAINMENT MODEL

There are three types of concept attainment teaching models namely reception oriented, selection oriented and unrecognized material model. Each model involves Syntax, social system, principles of reaction and support system.

1.3.1 Reception oriented Model of concepts Attainment.

This model has three phases, let us see them one by one. The portion of the model is terms as syntax.

Syntax : This involves three phases.

Phase-I Presentation of data and identification of concepts.

You should arrange the examples and non-examples (in which the attributes of the concept will not be present) in such a way, that the pupils should be able to identify the attributes and thereby the concept. Let us see an example. Teacher is trying to develop the concept petals of a flower. Teacher informs his students that certain passages are given on the basis of a concept in his mind. Some examples are marked 'yes' and others marked 'no' on the basis of whether the concept is present or not in the example.

Example - 1

'Yes' A part of flower which is the most attractive part of garden plants.

Example -2.

'No' Leaves, fruits, tubers, and stem of plants have various uses and have

economic importance according to the demand.

Example - 3

'Yes' They appear in beautiful colours. But those at night are usually white in colour. The only function is to attract pollinating agents.

Example - 4

'No' The sepals are unattractive in colour and shape, but have an important role to play by supporting other parts of the flower.

From these examples, your pupils should be able to identify the concept in your mind, as the petals of flowers.

Phase II Testing Attainment of concepts

In this phase you should present unlabeled examples and ask the students to identify the correct examples. Then they are directed to develop examples of their own. This will help the child to get confirmation about the concept.

Phase III Analysis of thinking strategies

At this stage your students try to analyse the thinking strategies used to attain the concept. They themselves should test and verify which strategy is appropriate and at what time. Here strategy stands for the methodology by which one could attain the concept easily. (We have already discussed this in subsection 1.2.3).

Social system :- This describes your role in teaching with reception model. You should select the concept first, then organise the material into positive and negative examples and put them in sequential order. While designing the examples, you should take utmost care to make clear the attributes of the concept. You should also record students responses and provide additional information if required.

Principles of reaction :- This part of the model describes how you should react to the responses of the students. You should give a supportive environment for students, while you are teaching with reception model. You should help the students to test their thinking strategies and encourage them to attempt various strategies, for the attainment of the concept.

Support system :- This part of the model describes the additional supports and aids necessary for teaching through the model. Concepts are embedded in concept attainment lessons. So the student's role is to attain the hidden concepts, with the aid of positive and negative examples. The students are also directed to note down the attributes of the examples given to them. Hence well-chosen examples will be the essential supports for this model.

This is the structural outline of reception - oriented model.

Check Your Progress - 3

Briefly describe the different structural aspects of reception - Oriented model.

- Note :**
- a) Space is given below to write your answer;
 - b) Compare your answer with the one given at the end of this unit.

.....

.....

.....

.....

.....
.....
.....
.....
.....

1.3.2. Selection Oriented Model of Teaching.

The selection Oriented model is similar to that of reception model in many respects, but there are differences in some respects of phase I of the model. The differences are as follows :

- (i) In selection model the examples are unlabeled.
- (ii) The students should enquire into the examples to know whether, it is 'yes' or 'no'
- (iii) It is the duty of the students to sequence the examples.
- (iv) Responsibility for concept attainment and attribute tracking is in the hands of the student's

Suppose for example, the teacher is going to develop the concept of fleshy fruits. So, a variety of fleshy fruits such as mango, apple, papaya etc. are provided along with cashew nut and beans as unlabeled examples. Then the teacher asks his students to identify the concept in her mind from the given objects. By comparing the important characteristics (here essential attributes) of the given examples, the students could identify that many of the examples belong to one group (i.e here fleshy fruits). So, in order to understand the correctness of their conclusion, students take each example and categorise it as a positive example or negative example. The teacher will say 'yes' or 'no' according to the correctness of students' claims. By the end of this process, students will be able to identify the concept and essential attributes so as to facilitate concept formation. Finally the teacher can introduce the name of the concept.

Phase II and III are similar to the Reception Oriented model.

1.3.3 Un organised materials Model.

We have already mentioned what is unorganized materials model. Here the student's are exposed to real life situations or to unrecognized (un arranged, unlabeled) data. The syntax of the model has only two phases. Phase I description of concept as it is used.

In this phase the students' are required to locate and label concept. They should also identify the attributes of the given concept.

Phase II Evaluation of concept. In this phase the students have a discussion on the adequacy and appropriateness of the concepts used. They should also compare the examples with other data to check the appropriateness of the concept.

The social system, principles of Reaction and support system are similar to that of the reception model.

Unorganized material model is usually used for the instruction of adult learners. So the learning task should be in the form of assignment questions or self work exercises. Individual students can work on such questions by collecting data from all available sources. Because these data are spread out in all these all sources, they are unorganized. Hence it is called as unorganised material model. Each one should analyse the data obtained from various sources and conclude their findings as a concept.

A sample assignment title for this model is as follows :

'The use of biological control as a means of pest control'

Before we pass on to the illustrative model check your progress in this unit.

Check your progress - 4

Bring out the difference between selection model and an organised material model.

- Note :**
- a) Space is given below to write your answer;*
 - b) Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

1.4 ILLUSTRATIVE LESSON ON CONCEPT ATTAINMENT MODEL

You should listen to the audio for the illustration for the reception - oriented concept attainment model.

The lesson was on the reception - Oriented model of concept attainment. You may have noted the different phases of the model in illustration. Phase I, ends at the point where the pupils correctly state the concept. Phase II begins at the point where the teacher presents unlabeled examples and ends with the pupils' own examples. Phase III begins at the point where pupils explain how they understood the concept.

1.5 LET US SUM UP

In this unit we have discussed the important aspects of concept attainment model of teaching. Concept attainment means identifying concept by all its details and becoming able to describe it in one's own words. We have also seen the nature of concepts in terms of its name, examples, attributes, attribute values and the rule. Teacher has to play an important role in this concept attainment. Two thinking strategies such as that for reception conditions, and selection conditions, were also discussed. Reception model of concept attainment has three phases. Phase I is presentation of data and identification of concepts, phase II testing attainment of concept, phase III analysis of thinking strategies. We have also discussed selection and unorganized material model of concept attainment. This model helps the instruction of concepts, develop thinking strategies of students and lets them know about alternate ways of learning a concept.

Check you progress - Possible Answers

- 1. Teacher has to identify the five elements of a concept and identify both essential and non-essential attributes. Teacher has to plan suitable examples, (positive and negative) additional examples also should be planned to facilitate concept attainment .*
- 2. Concept attainment model helps inductive learning. This will also encourage inquiry. This model is also used as an effective tool for evaluation.*

The effects of this model are that :

- i) *It improves thinking strategies of students.*
 - ii) *Helps to develop concept building strategies, and*
 - iii) *Helps to develop an awareness on alternative ways of learning concepts.*
3. *Reception oriented model proceeds through syntax, principles of Reaction, social system and support system. Syntax has three phases, Phase I presentation of data and identification of concepts, Phase II testing the attainment of concept, and phase III analysis of thinking strategies.*
4. *In selection model examples are unlabeled, but pre arranged. Students should identify positive and negative examples. In unrecognized material model, unarranged and unlabeled data are given. Students should locate and label the concept. They should also discuss the adequacy and appropriateness of concept using other data also.*

UNIT -2 **ADVANCE ORGANISER MODEL**

Contents

- 2.0 Objectives
- 2.1 Introduction
- 2.2 Advance organiser meaning
 - 2.2.1 Advance organiser model of teaching
- 2.3 Advance organiser model of teaching
- 2.4 Illustrative lesson of advance organiser model.
- 2.5 Let us sum up.

2.0 **OBJECTIVES**

In this unit another model of teaching that could be used in biology classes name: 'advance organizer' model is discussed. This also includes various aspects of the teaching model and an illustrative model of advance organizer teaching. At the end of this unit you will be able to

- * state the meaning of advance organizer.
- * identify the goals of the teaching model
- * identify the procedure of using this model.
- * develop a positive attitude towards advance organizer model of teaching.
- * apply advance organizer model of teaching in the class room.

2.1 **INTRODUCTION**

'Advance organizer' may be really a new term for you. In this unit you will see the different aspects of advance organizer. This model is proposed by David P. Ausubal. Ausubal put forth his model to help to convey large amount of information as meaningfully and efficiently as possible. His model aims at strengthening student's learning ability. It is essential for teachers to understand the various aspects of advance organizer to improve the lecture type presentation. The details of advance organizer and the teaching model are the following.

2.2 **ADVANCE ORGANISER MODEL**

We have already discussed the concept attainment model of teaching. Advance organizer model also belongs to the information processing family of teaching model. Before we go into the details of the model we should first of all discuss the meaning of advance organizer

2.2.1 **Advance Organiser - Meaning**

Advance organizer are introductory materials present ahead of the learning task which aim to relate the concepts with the already developed concepts. It acts as a bridge between the already learned material and the new material to be learned. The advance organizer may be concepts terms, and appropriate illustrations.

Suppose, for example, you want your students to acquire information about the food chain. You will not present the matter directly to the students. Instead of that you will say about different types of animals and their feeding habits and the categories of herbivorous, carnivorous and omnivorous animals. All these things we refer to as previous knowledge that are necessary to learn the new material. Brushing up of these previous knowledge help your students to internalize the new and additional information. So in simple terms advance organizer is the bit of information which is already familiar for learners and presented ahead of new information

Ausbel proposed two types of advance organizers on the basis of familiarity of students with the material. They are expository and comparative advance organizers.

Expository Advance Organiser

Expository organizers are used with unfamiliar material. Here a general outline is given as advance organizer. Say for example if we want to instruct about groups of trees, first of all begin with kinds of forests, then sub-forest, different types of trees and plants and the land area in which specific trees are seen. Then only you should introduce group of trees. Here the expository advance organizer help to introduce un familiar information in a deductive manner.

Comparative advance organizer

This is used mostly with relatively familiar material. They aim at integrating new concepts with the already existing concepts. They are also designed in such a way to discriminate between old concepts ie, by exploring its similarity and differences. Suppose you are going to teach respiration in man you could use comparative advance organizer in this regard. Respiration in fishes is familiar to students, which could be used to explore the details of respiration in man, compared with that of fishes.

Ausbel proposed advance organizer to increase the effectiveness of lectures and thereby promote meaningful learning. And according to him, an introductory portion in the form of advance organizer is essential for meaningful verbal learning.

Now we pass on to the details of the model.

Check your progress I

Write the differences between expository and comparative advance organizer and bring out the meaning of advance organizer.

- Note :**
- a) Space is given below to write your answer;*
 - b) Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

2.3 ADVANCE ORGANISER MODEL OF TEACHING

Now we shall discuss the various aspects of advance organizer model of teaching. The structural details of the model is the same as that of the concept attainment model such as syntax, social system, principles of reaction, and support system Let us discuss one by one.

Syntax : The advance organizer model has three phases.

Phase I Presentation of advance organizer

At this phase you should present the advance organizer. First of all you should explain the aims and objectives of the lesson. This is helpful to get students' attention and help them to facilitate meaningful learning.

Then you should present the advance organizer. While presenting the organizer you should take care of the following aspects.

- (i) You should not confuse the organizer with your daily lesson introduction.
- (ii) Determine whether it is expository or comparative in which the essential features of the concept would be pointed out. The presentation of the organizer should be short.
- (iii) The essential attributes should be highlighted.
- (iv) Example should be used to explain the attributes.
- (v) You should repeat many times the new or special terminology.
- (vi) The awareness of learner's prior knowledge would be prompted, to develop the necessary cognitive structure of the student. These are the activities to be performed by the teacher in phase I.

Now we pass on to the phase II.

Phase II Presentation of learning task.

The actual learning material is presented at this phase in the form of lectures, discussion, films, experiments or reading. You should take care of two tasks at this phase. They are

- (i) to maintain students attention and
- (ii) the logical organisation of learning material.

Various techniques such as discussions, films, and experiments will be helpful to maintain students' attention.

Now we pass on to the third phase of the model

Phase III strengthening cognitive organization

At this phase you could test the relationship of learning material to the existing ideas. You should do four activities in this respect. Those activities are as follows:

- a) Promoting interrogative reconciliation
- b) Promoting active reception learning
- c) Principle Approach to Knowledge
- d) Clarification.

Integrative reconciliation means intergration of new information with the existing cognitive structure. You should adopt several ways to facilitate reconciliation. They are.

- (i) to remind students of the ideas presented
- (ii) to ask the students to give the summary of major attributes of new learning material
- (iii) to repeat definitions precisely and
- (iv) to ask the students to bring out the differences between different aspects of the material

You could promote the **active learning** also using some activities. Let us see some of those

- (i) Asking students to describe, how the new material is related to the existing knowledge

- (ii) Asking students to give additional examples.
- (iii) Asking students to give the essence of the new material in their own words.
- (iv) Asking the students to examine the material from alternative points of view.

All these activities are done by the students after receiving the material from the teacher hence it is reception learning though it is actively done.

^{guid}Principle approach to knowledge can also be promoted in this model. In this respect, you should the students to recognise assumptions or inferences of the learning material. And also to judge and challenges these inference.

Clarification of various aspects should be done by the teachers. Students should have doubts about additional or new information or application of any idea. At this stage you have to give response to clarify the needs of students. The teacher has other roles also to play while teaching with advance organizer. Before we pass on to that will you check your progress in this unit ?

Check your progress 2

List out the important elements of the syntax of advance organizer model of teaching.

- Note :*
- a) Space is given below to write your answer;*
 - b) Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Role of the teacher

As a teacher you have to play some very important roles. The most important role is to develop the advance organizer. While developing an advance organizer you should identify the concept in the new learning material. At first you would be thorough with the new learning material and its organisations. You must decide the sequencing of information in the given subject area. The similarities, differences, essential attributes and examples should be selected suitably. While developing the learning material you should consider the experiences and intellectual background of your students. And at the final stage you must give enough support to your students so that they could internalize the new information meaningfully.

These are some of the important points that you should bear in mind while teaching using advance organizer model. And now we shall pass on to the social system of the model.

Social system

In social system you have control of the structure and have to relate continuously to the new learning material. You should give enough help to the students so that they could differentiate new information from existing information. In the third phase of the model it turns out to a more interactive sessions as students may raise many questions and comments. The success of this model depend on the learner's desire to integrate the new information with the existing knowledge and on the nature of your presentation and organization of material.

Check your progress 3

Explain briefly the role of teacher in advance organizer teaching model

- Note :**
- a) *Space is given below to write your answer;*
 - b) *Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Principles of Reaction

The teacher's responses to the learner's reaction will be directed for clarifying the meaning of new learning material. Differentiation between the aspects should be made clear. The reconciliation of new information with the existing information also is very important. This will help your students to develop a critical approach to knowledge. Here also students have the initiative role in learning the new material. Now we shall pass on to the support system of the model.

Support system

We have already discussed that a well organised material is the back bone of this model. So the material itself is the support requirement. The advance organizer used for the meaningful learning of the information is developed in such a way that it will integrate with the existing knowledge, the success of which depends on the relationship between the organizer and the content.

Application of the model

The various instructional application of the model are given as follows.

- (1) The advance organizer model is useful to instruct systematically the key ideas of a topic in a step wise manner.
- (2) This is helpful to increase learner's factual information.
- (3) You should teach the skills of effective reception learning. The students should apply this techniques by their own.
- (4) Advance organizer is useful for the presentation, renewal and clarification of ideas or information.

And now we pass on to the effects of the model.

Effects of the model

You are familiar with the instructional effects of the model. They are the strengthening of conceptual structures and meaningful assimilation of concepts and ideas. Ausubel also points out that it helps to foster inquiry and precise thinking habits.

2.4 ILLUSTRATIVE LESSON OF ADVANCE ORGANIZER MODEL.

You should listen to the audio for the illustrative lesson of advance organizer model.

You may have noted the different phases of the model in the illustration. Phase I ends by stating of food chain' by the teacher. Phase II begins at the point where teacher starts describing the details of food chain and ends at the point where teacher concludes the description of food chain. Phase III begins at the point where teacher demands for examples from students.

2.5 LET US SUM UP

In this unit we have discussed the important aspects of advance organizer model of teaching. There are two types of advance organizers, namely expository and comparative advance organizer. Advance organizer is the material given at the beginning of a learning task, in order to link the new idea with the existing ideas.

The syntax of this model has three phases

- Phase I Presentation of advance organizer
- Phase II Presentation of learning task, and
- Phase III Strengthening cognitive organization.

The role of the teacher is very crucial in this model as he is responsible to develop the advance organizer. The success of this model depends on the presentation and organization of the material.

The model is helpful in the instruction of large classes. Systematic instruction should be given systematically using this model.

This model helps to the strengthening of conceptual structures and meaningful assimilation of concepts and ideas.

Check your progress : Possible answers

- 1) *In expository organizer a general idea is given as advance organizer, Un familiar information is deducted from the general idea in expository organizers. In comparative organizer a familiar example is used for the instruction of unfamiliar information.*
- 2) *The syntax of advance organizer model have three phases. Phase I is presentation of advance organizer, Phase II presentation of learning task and phase III strengthening cognitive organization. There are four activities in phase III. They are integrative reconciliation, active reception learning, principle approach to knowledge and clarification.*
- 3) *Most important role of the teacher is to develop the advance organizer. Information should be sequenced according to its importance. At the final stage of learning, teacher should support students to internalize the new information.*

UNIT - 3

BIOLOGICAL SCIENCE INQUIRY MODEL

Contents

- 3.0 Objectives
- 3.1 Introduction
- 3.2 Biological science inquiry model.
 - 3.2.1 Inquiry - meaning
 - 3.2.2 How to develop inquiry attitude
- 3.3 The model of teaching
- 3.4 Illustration of biological science inquiry model
- 3.5 Let us sum up.

3.0 OBJECTIVES

Another model of teaching which is useful for teaching biology is 'biological science inquiry model'. This unit will give you the important aspects of teaching model. This also includes an illustrative model of biological science inquiry teaching. At the end of this unit you will be able to :

- * interpret the meaning of biological science inquiry.
- * identify the goals of the teaching model.
- * identify the procedure of using this model.
- * develop a positive attitude towards biological science inquiry teaching.
- * apply biological science inquiry model of teaching in the class room.

3.1 INTRODUCTION

In this unit you will get the various aspects of biological science inquiry model. This model is proposed by Joseph Schwab. This model is entirely meant for biology teaching. The approach is based on the Biological science curriculum study. So as biology teacher, you should be able to understand the important aspects of biological science inquiry model. The details of this model is following.

3.2 BIOLOGICAL SCIENCE INQUIRY MODEL

We have already discussed two models of teaching. unlike those two, this model of teaching is exclusively meant for teaching biological science. We shall discuss different aspects of the model here. First of all we shall discuss the meaning of inquiry.

3.2.1 Inquiry - Meaning

You know, now a days science is considered as a process. So the process of the ways of acquiring knowledge is important that the product or results of it. Suppose, for example, when some of your students were playing on the ground, they incidentally noticed stones here and there on the ground. When they removed the stones, they noticed that the colour of the grass under the stones changed into yellow. Why does it happen so ? What is the truth behind this ? These are the questions to be answered. In order to answer these questions we should thoroughly inquire into the different aspects of the incident. So the search for what had happened can be termed as inquiry. The essential attribute of science is inquiry. Inquiry helps us to explore the details of the various aspects of a process and there by its product.

Learning activity . 1

How do you develop inquiry attitude in your students?

Note : a) *Space is given below to write your answer;*

.....
.....
.....
.....
.....
.....

3.2.2 How to develop Inquiry Attitude

Now we shall discuss about how we can develop inquiry attitude in our students. In the previous example, we saw a problem situation and need to solve the problem invites our students to inquiry. So while you are teaching science, always begin with a problematic or puzzling situation and then help your students to explore the process behind this situation.

Say for example you are going to teach human respiratory system. You could narrate an incident. A five year old boy, whose ball fell into pond. he jumped into the pond, though he couldn't swim. What will happen then? Your students will say, that he will be die. "Why does he die?" is the next problem. Thus a situation has been created, and now you should guide or direct your students to inquire into the various aspects of the situation.

In addition to this you could invite your students to inquiry with the aid of specially designed statements, which express the tentative nature of science. The following statements are useful in this regard "We do not know", "We have been unable to discover how this happens", "The evidence about this is contradictory"/ "It needs further inquiry", "There exists difference of opinion". All these statements are helpful to express the changing nature of science and thereby to promote inquiry attitude

Organization of laboratory works will help you to foster inquiry. Every child should inquire individually and in groups with reference to the nature of the problem. Say for example, if your students are directed to find out the value of soil samples of different areas of your locality, the students can do this work individually or in small groups. Such experiments have profound influence in promoting inquiry.

These are the various activities that can help to promote inquiry attitude in your students.

Check your progress 1

Enlist activities which are helpful to foster the attitude of inquiry.

Note : a) *Space is given below to write your answer;*
b) *Compare your answer with the one given at the end of this unit.*

.....
.....
.....
.....
.....
.....

3.3 THE MODEL OF TEACHING

The model of teaching aims to involve your students in inquiry by inviting them to any area of investigation. You, the teacher should help them to identify the problem and design the ways to solve the

problematic situation. This type of inquiry will help your students to internalise the systematic ways to knowing. Now, let us see the different aspects of the biological science inquiry - model. As in the case of two models, discussed earlier, this model also proceeds, in the same format. Inquiry may be direct towards process, collection of data, analysis of data and interpretation of data.

Syntax

The syntax of this model includes four phases. Each of these phases may have different sequences. Now let us see those phases.

Phase I Posing an Area of investigation.

At the first phase an area of investigation is revealed to the student. You should give directions for various methodologies to be used for the given area of investigation.

Suppose, for example you have selected the area of investigation, 'soil pH and agricultural crops'. Here the methodologies such as laboratory work, experimental method survey of different locality and crop production can be successfully done.

Phase II Structuring of problem

At this phase, you should give necessary directions to your students to structure the problem and to identify the difficulty in the investigation. The difficulty on which the investigation is to be done might involve the sources of data, the collection of data, method of data collection, data interpretation and hypothesis testing.

Phase III Identification of problem in the Investigation

At this phase the students are asked to speculate about the problem. This speculation will help them to postulate a tentative solution for the problem. The difficulties to solve the problem and to attain the final solution could be realised at this phase.

Say for example, when your students are asked to speculate about the problem of soil pH and crop production they will be able to feel the actual problem related between soil pH and crop production involved in the inquiry.

Phase IV Suggesting ways to solve the problems

At this phase your student are asked to think about the ways to solve the problem. They should decide the methodology to be adopted. And if necessary, they should redesign the experiment, organise new ways to generate data and collection of data. Here they do not conduct actual investigation, but only speculate on it. Using either of these ways the students have to clear up the problematic situation.

And now we pass on to the social system of the model.

Check your progress 2

Bring out the important activities in the syntax of biological science inquiry model.

- Note :**
- a) Space is given below to write your answer;***
 - b) Compare your answer with the one given at the end of this unit.***

.....
.....

.....
.....
.....
.....
.....
.....

Social system

While you are teaching with this model, the classroom climate will be co-operative in nature. Here the students are invited to inquiry. Teacher acts only as a guide or facilitator of learning. The students have the major role to play. They have to formulate hypothesis, develop inquiry designs and should redesign as and when required.

Principles of Reaction

In this model you have the role of a director, a guide or a promoter of instruction i.e. here inquiry. You should give necessary directions to the students to channelise the inquiry to the right path. You should also help them to formulate hypothesis, locating sources of data, collection and interpretation of data.

Support system

The support system first of all demands a flexible and skilled instructor (here you) to the process of enquiry. You should be flexible in the sense that you should be able to differently mobilize your plans as per your students' needs and should also have a masterly approach to inquiry. Secondly the model demands the real life like areas of investigation and problems. In addition to these there will be need of necessary sources of data.

learning Activity 2

Write one example for a problem of your choice which can be clarified using inquiry model.

Note : a) *Space is given below to write your answer;*

.....
.....
.....
.....
.....

Application of the model

This model has applicability, but unfortunately, we are not exploiting this in our class rooms. Since it is inquiry oriented we usually try to keep it away, as we have to save time.

This model can be applied to design our text books. We could design them as invitation to inquiry type texts.

This model will help you to design the instructional material in such a way to maximize learning.

This model has applicability to other disciplines also. But a precondition is there that the instructors must be knowledgeable in practising this model.

instructors must be knowledgeable in practising this model.

Effects of the model

This model is primarily designed to teach the process of science and thereby research in biology. Your students will have to develop a commitment to scientific inquiry through this method. They of course have chances to develop open-mindedness through this model. In addition to these, this model fosters a spirit of co-operation and ability to work with others.

These are the major effects of the biological science inquiry model. Now we shall pass on to an illustration of this model.

3.4 ILLUSTRATION OF BIOLOGICAL SCIENCE INQUIRY MODEL

You should listen to the audio for the illustration of biological science inquiry model.

You may have listen both the illustrations given in the audio. The first one is an example for data collection and the second one is an example for data interpretation. You may have noticed the different phases of the model in the illustration. In the first illustration Phase I ends by reading out of passage by teacher. Phase II begins at the point where teacher asks about the problem hidden in the passage read out by the teacher. Phase III begins at the point where the teacher enquire about pollution in their village and ends by the details of inquiry needed. Phase IV begins with the discussion of methodology needed.

In the second illustration, Phase I ends when teacher invites student for inquiry. Phase II ends with student's opinions about the evolved gas. Phase III ends with student's statement of problem to be inquired into. And phase IV begins at the same point and ends at the end of the class.

3.5 LET US SUM UP.

In this unit we have discussed the important aspects of biological science inquiry model. Inquiry means systematic search of truth (knowledge). Inquiry attitude can be developed by providing necessary activities including laboratory work. The model of teaching involves syntax social system, principles of reaction and support system. The syntax have four phases. Phase I is revealing the area of investigation. Phase II structuring the problem, phase III identification of the actual problem difficulty, and Phase IV suggesting ways to solve the problem.

Class room climate for this model should be co-operative. Teacher should be a guide in this model. The support system demands highly flexible and creative instructor.

Biological science inquiry model has many applications. Text books can be developed with in built invitation to inquiry. Inquiry promotes mastery learning, and can be applied to other disciplines also. This model mainly aims to teach process of science, and to develop co-operation, open-mindedness, and inquiry attitude.

Check your progress - Possible Answers

1. *There are various activities to foster inquiry attitude.*
 - (i) *Begin the class with problematic or puzzling situation.*
 - (ii) *Invite students for inquiry by specially designed statements.*
 - (iii) *Organizing laboratory work.*

2. *There are four phases in the syntax of biological science inquiry model. Phase I is stating the area of investigation. Teacher presents problem area and gives directions about various methodologies of investigation. Phase II is structuring of problem. Teacher should give necessary directions to structure the problem. Phase III is identification of the actual problem. At this phase students are directed to speculate on problem difficulty. Phase IV suggesting ways to solve the problems, students should suggest ways to solve the problems (They are not conducting the actual inquiry).*

UNIT 4 **COGNITIVE GROWTH MODEL**

Contents

- 4.0 Objectives
- 4.1 Introduction
- 4.2 Cognitive growth model
 - 4.2.1 Cognitive growth - Meaning
 - 4.2.2 Principles of teaching.
- 4.3 The model of teaching
- 4.4 Illustration of Cognitive growth model
- 4.5 Let us sum-up.

4.0 OBJECTIVES

In this unit we will see the important aspects of 'Cognitive Growth model' of teaching. This also includes an illustrative model of cognitive growth teaching. At the end of this unit you will be able to

- * interpret the meaning of cognitive growth.
- * identify the goals of the teaching model.
- * identify the procedure of using this model.
- * develop a positive attitude towards cognitive growth model of teaching.
- * apply cognitive growth model of teaching in the class room.

4.1 INTRODUCTION

We have already had a discussion on cognitive development in Block - 1. In this unit you will get an idea of the important aspects of cognitive growth. This model is developed by Jean Piaget. This unit involves a teaching model, which fosters the cognitive development of your students based on the principles of cognitive growth. This unit also involves the important aspects of the teaching model, its application and effects on students. It is necessary for us teachers to have an understanding of cognitive growth model to cater to the intellectual needs of students at the secondary level. The details of this model is following.

4.2 COGNITIVE GROWTH MODEL

We have already discussed three models of teaching belonging to the family of information processing teaching models. This model is also based on the cognitive abilities of the learner. The description of cognitive growth model is given in the same order as that the other models discussed so far. Let's first of all discuss the meaning of cognitive growth.

4.2.1 Cognitive Growth - Meaning

We have come across the different stages of cognitive development in Block - 1, Unit - 1. We have discussed the various aspects of cognitive development in that unit. So here at first we shall try to brush up what you had learned about cognitive development already there.

According to piaget cognitive development is the transition from one cognitive stage to next and

thereby reaching the final stage of development. In the course of life one comes across varied experiences as assimilated into their present behavior pattern, and new information triggers change in the existing cognitive structure and thereby promotes cognitive growth.

So the change in cognitive structures to accommodate the new information can be termed as cognitive growth. The cognitive growth is age dependent, and has direct relation to the environment in which the individual exists.

Say for example, a three year old baby does not know the details of music, but he could respond to the familiar music and differentiate new or strange music. If the child does not get any opportunity to listen to music, he cannot understand it.

In essence cognitive growth means expansion of cognitive structure of an individual which helps his development from one cognitive developmental stage to the other. While you are teaching, you must provide appropriate environment for your pupils to promote their cognitive growth.

Learning Activity -1

Write one example to show the role of experience on cognitive development.

Note : a) *Space is given below to write your answer;*

.....
.....
.....
.....
.....
.....

4.2.2 Principle of Teaching

On the basis of the piagetian theory of development, we have to consider the following principles while teaching through this model.

1. Development is the function of experience and maturation :-

We have already discussed that experience is essential for development. Along with experience, physical maturation also is essential for development.

Suppose, for example, you give tricycle training to the young child. The child will not ride the tricycle properly until he is physically mature, to do that.

2. Teaching is creation of environments :- This is the second principle to be borne in mind while teaching for cognitive growth. Our aim isto give necessary experience and practice to students in specific mental operations.

When we are teaching a new term, we should recite it a number of times so that our students are able to spelt it correctly.

3. Learning is an active process :- The third principle says that learning occurs only when the learner is active. We should give as much examples and objects to keep the students active. See, when you intend to teach about the parts of a flower, the learners become very active if you bring some flowers into the class.

4. Different types of knowledge require different learning situations :- According to piaget knowledge is of three types namely physical, social and logical. And the learning situation for each type of

knowledge is different from one another. You should teach the physical knowledge about flowers such as its colour, smell, parts and season, by using the actual object, or its figure. But is there any social knowledge for flowers ? Think of the uses of flowers in social situations. So the social knowledge is its uses for decoration, marriages, etc. Now, what is the logical knowledge ? Social knowledge is received by free interaction with others, but logical knowledge is obtained through experimenting and questioning.

These are the major principles, to be considered while teaching for cognitive growth.

Check your progress - 1.

In the light of the meaning of cognitive growth examine the major principles of teaching.

- Note :**
- a) Space is given below to write your answer;*
 - b) Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

4.3 THE MODEL OF TEACHING

This model of teaching is based on the principles of piagetian theory. In this model you have to give tasks to students to determine the cognitive development stage of each child. Once you have determined the cognitive development stage of children you could teach your children with the model, with the following aspects.

Syntax

The syntax of this model consists of three phases. Let's see the phases one by one.

Phase - I Confrontation with stage relevant tasks

At this phase you should present a puzzling situation to the students. While developing the situation, you should take care of the following aspects. The situation should be designed in accordance with the learners' developmental stage. The context of the situation should contain familiarity and newness at the same time. This will help the students to assimilate the existing experience and to accommodate the new experience.

Phase II Inquiry

In this phase your students are required to make responses in connection with the puzzling situation to which they are exposed in Phase - I. Then the students are required to forward their justifications in connection with their responses.

At this time you should direct the students by probing questions and counter suggestions.

4.4 ILLUSTRATION OF COGNITIVE GROWTH MODEL

The illustration of cognitive growth model is given in the audio. You should listen to the audio now.

You may have listened to the illustration in the audio, and be able to locate different phases of the model. Phase -I ends by questioning of teacher after reading out the news, and Phase-II begins with students response to it. Phase II ends with teachers' conclusion statement after the discussion about frog's skin and, Phase-III begins at the point where students remark about the other animals living in water and ends at the end of the class.

4.5 LET US SUM UP

In this unit, we have discussed the details of cognitive growth model. Cognitive growth means expansion of cognitive structure. We have discussed the principles of teaching on the basis of the piagetian theory. They are :

- i) development is the function of experience and maturation
- ii) teaching is creation of environments
- iii) learning is an active, process, and
- iv) different types of knowledge require different learning situations.

This model also has syntax, social system, principles of reaction and support system. The syntax has three phases. Phase -I is confrontation with stage relevant task, Phase -II inquiry, and phase -III transfer.

Cognitive growth model is applicable for cognitive development and social development.

Check your progress - Possible answers

1. Cognitive growth means expansion of cognitive structures. Therefore, certain principles are to be followed for teaching. The major principles of teaching are :

- i) *development is the function of experience and maturation,*
- ii) *teaching is creation of environments,*
- iii) *learning is an active process, and*
- iv) *different types of knowledge require different learning situations.*

2. The syntax of cognitive growth model has three phases. Phase - I is confrontation with stage relevant task, a puzzling situation is presented at this phase. Phase -II is the phase of inquiry. At this phase students should respond to the puzzling situation and put forth their justifications. Phase - III is the transfer phase. At this phase teacher should present similar situations and ask students to reason out and provide their justifications.

Teacher should create suitable environment for learning. Teacher should have three roles such as an organizer, assessor and initiator. A conducive environment is required for teaching using this model.

UNIT 5 GROUP INVESTIGATION MODEL

contents

- 5.0 Objectives
- 5.1 Introduction
- 5.2 Group investigation Model.
 - 5.2.1 Group Investigation - meaning
 - 5.2.2. Basic concepts of group investigation.
- 5.3 The model of teaching.
- 5.4 Illustration of group investigation model.
- 5.5 Let us sum up.
- 5.0 OBJECTIVES**

Another model of teaching which is effective in biology teaching is group investigation model. This unit will give you the details of group investigation model, and also an illustrative lesson of group investigation teaching. At the end of this unit you will be able to:

- * interpret the meaning of group investigation
- * identify the goals of the teaching model.
- * develop a positive attitude towards group investigation teaching.
- * apply group investigation model of teaching in the classroom.

5.1 INTRODUCTION

Man is a social being, he cannot live without the help of other members in his community. In this unit you will get the details of a model of teaching, which operates in such a social set up. The proponent of this model is Herbert Thelen. In addition to this you will get in this unit, the details of group investigation, important aspects of group investigation model, its application and effects. As teachers it is essential for you to understand the important concepts of group investigation model of teaching, the details of which follow.

5.2 GROUP INVESTIGATION MODEL

We have already discussed four models of teaching belonging to the information processing family. Now we shall discuss a model belonging to the social - interaction family. The model has the same structural aspects as the other models. Before we pass on to the details of the model we shall discuss the meaning and basic concepts of group investigation.

5.2.1 Group Investigation - meaning

According to Thelen, man is a social being, who cannot live without the assistance of other members of the society. Similarly our classrooms are also considered as a society which has its own social characteristics. Which has its own characteristics. Since the class room is a society, the learning process will naturally be a group activity. Thelen considers class room as miniature democracy also so naturally the principles of democracy should be followed in learning also. Here the learners as a group should identify the problem and investigate on it. All the students should have to play a role in such investigation.

5.3 THE MODEL OF TEACHING

This model of teaching has the same structural details of the models we have already discussed. Now we shall discuss each of these aspects in the same sequential order.

Syntax

The syntax of this model is fairly longer than those we have discussed earlier. It has six phases.

Phase I Confrontation of Puzzling situation

Phase I is the same as that of the phase I of cognitive growth model. Here also students are exposed to a problematic situation at first. The presentation of the situation may take place verbally or it may be an actual experience.

Say for example, you are going to introduce sunlight is essential for photosynthesis by creating a situation. You could say the experiment verbally or you could conduct the experiment in your class room. In the latter case students are exposed to the actual situation.

Phase II Exploration of reactions

At this phase you should invite various reactions of your students regarding the puzzling situation. You should help the students to draw their attention to the difference in reactions made by them.

Say for example, in the case of the experiment light is essential for photosynthesis, reactions such as temperature is essential, and light is essential may have forwarded by your students. You have to draw everyone's attention to each of these reactions.

Phase III Formulation and structuring of the problem.

While listening to the difference in opinions your students will be interested to explore the true knowledge from these relations. At this phase, you should direct them to formulate and structure the problem. While formulating the problem, students should be aware of what is to be inquired. (i.e the actual problem). When structuring the problem, different aspects of inquiry, and difficulties of the inquiry may be taken into consideration.

Take the example of sunlight is essential for photosynthesis. At the third phase you should help the students to formulate the actual problem and plan what all steps are to be involved and what all materials are necessary to investigate into the problems.

Phase IV Independent and group study

After formulating and structuring the problem the students analyse, each one's roles to organise the activities required for each role. Then they should act as per their roles, and find out their results and report it.

In the experiment for sunlight is essential for photosynthesis, each one can investigate into a single reaction mentioned in phase II to find out the correct solution. Then report the result of each one's observation.

Phase V Analyse Progress and process

At this stage the group analyses the findings of different individuals and the process by which

they reach to the final solution.

The group analyses the results of each individual's inquiry, i.e. the experiments to see whether wind is essential or temperature is essential or light is essential. And they also analyse how each of them carried out the enquiry.

Phase VI Recycle activity

At this phase the group is exposed to a new puzzling situation or a problem raised while investigating the previous problem. The same process is repeated to find out the new knowledge.

In our example, a new problem arising may be any other factor essential for photosynthesis or a new problem can be identification of a gas evolved during photosynthesis.

Learning activity 1

Write one example of your choice for representing all the phases of the syntax of group investigation model.

Note : a) Space is given below to write your answer;

.....

.....

.....

.....

.....

.....

Social system

The social system is democratic type. So the relation between the members of the group is very important. Activities of the group is important than that of individuals. The teacher do not interfere much in the structuring of the group investigation. The status of both students and teacher is the same. Because in democracy there is no status differentiation.

Principles of reaction

You have to perform the role of facilitator of learning in the forms of a Counselor, Consultant and a friendly critic. You should help them to understand the difference in the reaction made by them, help them to the formulation and structuring of the inquiry and to guide them to conduct the investigation the right way. In addition to these you should guide them to internalize the experience of the group in three levels namely.

- (i) Problem solving level (Nature of problem, and factors involved in)
- (ii) Group management level (How do we get the information ? How can we organise ourselves to get the information ?)
- (iii) Individual meaning level (How do you feel about this conclusions ? What is your opinion in this regard ?)

Say for example in the example discussed in the syntax of the model, you should say the problem is of experimental in nature and the factors involved in are sunlight, Chlorophyll, Carbon dioxide and water. In conducting the experiment each one should be directed to do a specific activity in the experiment. For those who feel difficulty to internalize the knowledge emerging through the inquiry you should help them by asking probing questions and comments such as "What is your opinion about sunlight is essential for photosynthesis?", "Wind was not having any effect on photosynthesis", "temperature does not have

groups and Phase VI begins with teacher's question about further investigation and ends at the end of the lesson.

5.5 LET US SUM UP

In this unit we have discussed the details of group investigation model of teaching. Group investigation means inquiry on a problem by a group. The basic concepts of group investigation are (i) inquiry (ii) knowledge, and (iii) dynamics of the learning group.

The model of teaching has syntax, social system, principles of reaction and support system.

The syntax has six phases. Phase I is confrontation of puzzling situation, Phase II exploration of reactions, Phase III formulation of structuring of the problem, Phase IV independent and group study. Phase V analysis of progress and process and Phase VI recycle activity.

The status of student and teacher is similar in this model of teaching. Teacher is a facilitator, Counsellor and consultant. A good environment for learning and investigation is required for the success of this model.

Students will get opportunities to social interaction, decision making and independent inquiry through this model of teaching. It also promotes interpersonal interaction and respect for individuals.

Check your Progress - Possible Answers.

- 1. The basic concepts of group investigation are inquiry, knowledge and dynamics of the learning group. Inquiry is the systematic way to find out the truth. According to the concept of group investigation knowledge emerges as a result of inquiry. Dynamics of the learning group means a group of teachable students of ten or fifteen who are aware of systematic investigation. In the light of these concepts, group investigation means systematic inquiry by a group of students for exploring knowledge.*
- 2. This model also has structural details such as syntax, social system, principles of reaction and support system. The syntax has six phases. Phase I is confrontation of puzzling situation in which a problem is posed. Phase II is exploration of reactions, in which students' reactions are invited. Phase III formulation and structuring of a problem in which problem is structured. Phase IV is independent and group study in which student should analyse each ones role in the investigation and carry out the investigation. In Phase V each group analyses their progresses and process of investigation and draw conclusions. Phase VI is the recycle activity, in which a new problem area occurs and investigation is repeated through the same steps.*

UNIT 6 MASTERY LEARNING

Contents

- 6.0 Objectives
- 6.1 Introduction
- 6.2 Mastery learning strategy
 - 6.2.1 Mastery learning - Meaning
 - 6.2.2. Concept of aptitude
- 6.3 The teaching strategy
 - 6.3.1 Aspects of teaching strategy
 - 6.3.2 Steps in mastery learning.
- 6.4 Illustration of mastery learning
- 6.5 Let us sum up.

6.0 OBJECTIVES

mastery learning is a new step in the world of teaching. In this unit we will see the important aspects of mastery learning strategy of teaching. This also includes an illustrative model of teaching. At the end of this unit you will be able to :

- * interpret the meaning of mastery learning.
- * identify the components in mastery learning.
- * identify the procedure of using this model.
- * develop a positive attitude towards mastery learning strategy.
- * apply the mastery learning strategy.

6.1 INTRODUCTION

This unit provides some major considerations of mastery learning. This is not a model of teaching, but it is an approach for organizing instruction. The proponents of this model are John B. Carroll and Benjamin S. Bloom. Mastery learning provides an ample opportunity for more students to attain satisfactory level of performance in school subjects. According to Carroll learning is directly dependent on learner's aptitude. The concept of "aptitude" is the amount of the time required to learn a material. On the basis of this concept Bloom and Carroll developed a strategy to organise the class room in such a way that the students will get optimum time, good instruction and assistance in understanding learning tasks. So, as a teacher you should understand the basic concepts of a mastery learning and its implications to classroom learning. You should also understand, how to develop mastery learning strategy for classroom instruction. details of the above mentioned ideas are given below.

6.2 MASTERY LEARNING STRATEGY

We have discussed five teaching models so far. From those models, mastery learning has many differences. It does not appear as a model of teaching, but it is an approach for organizing instruction. As it is different from other teaching models, there will not be any typical format of a teaching model in mastery learning. Instead of that there are some important steps. Before we pass on to the details of the

mastery learning strategy. Let us see the meaning and basic concepts of mastery learning.

6.2.1 Mastery learning - meaning.

You are very much familiar with learning. But mastery learning will be a new term for you. You will have a number of years' experience of teaching in secondary schools. So you can remember that some of your students were able to learn quickly almost all aspects of the learning materials. We usually conduct our classes for such fast learners. When they get mastery over the given material, we proceed to the next task without considering the majority. So mastery learning means learning almost all aspects of a learning material completely within a time span which is different from individual to individual. Now it is clear that the amount of time taken for mastery over a material is different from individual to individual. The details of which can be seen in the following subsection 6.2.2.

6.2.2 The concept of aptitude

We have already seen that time taken for mastery over a material is different for different persons. So mastery learning can be referred to as a function time. According to John Carroll, the aptitude of the learner is directly linked to learning. Since aptitude is essential for learning, the difference in time required for mastery learning is due to the difference in aptitude. So Carroll defines "Aptitude as the amount of time required for learning the given material". If one student required to master over a material, he should spend enough time which is required for getting mastery over that material. This is the basic concept of mastery learning.

Learning Activity 1

Recall and write down one incident in your teaching life, which explains mastery learning is a function of time.

Note : a) Space is given below to write your answer;

.....

.....

.....

.....

.....

.....

.....

.....

6.3 THE TEACHING STRATEGY

The teaching strategy for mastery learning highlights the following aspects such as time allowed for learning, learners' perseverance, the quality of instruction, student's ability to understand instruction and his aptitude. Let's see these aspects one by one.

6.3.1 Aspects of teaching strategy

We have already discussed the importance of **time allotted for mastery learning**. From your own experience it is clear that different individuals need difference in time to learn given material, so if you want all of your learners to master the given material, you should give enough time for them.

The second aspect is **learner's perseverance** here perseverance stands for learner's interest, his attitude towards learning and persistence of motivation. If the learner does not have interest in learning, he could not master over the material. From your own experience you might have noticed that students without interest for learning would be poor learners.

Quality of instruction is the next aspect which influences mastery learning. Quality of instruction is influenced by factors such as competence of the teacher, efficiency of learning situations, variety of learning experience and mental level of learners, If your instruction takes care of all these aspects, then it will be of good quality.

Student's ability to understand instruction is the next aspect of mastery learning. If your students are not able to understand what is being instructed to them, they could not learn the material and would not get mastery over the material. Say for example, elementary school children will not have the ability to understand the structure of DNA.

The final and most important aspect of mastery learning is learner's aptitude. We have already discussed the details of aptitude and defined it as the time required for learning.

Check your progress 1

Briefly explain the major aspects, that influence mastery learning.

- Note :**
- a) Space is given below to write your answer;
 - b) Compare your answer with the one given at the end of this unit.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

6.3.2. Steps in mastery Learning

Mastery learning has five major steps. These are put forth by Bloom. Let us see these steps one by one.

1. Formulation of Objectives

The purpose of the learning unit in terms of objectives should be formulated at first. You are familiar with objectives of the lesson even from your B. Ed. Training. For any lesson, there will be a list of pre-stated objectives, which determine the purpose of the lesson.

Suppose for example, you are going to teach a lesson on food chain. Then you will prepare a set of objectives. (Details of objectives is given in block 6 U.1)

Learning Activity 2

Prepare the objectives for the lesson food chain.

- Note :**
- a) Space is given below to write your answer;

.....

.....

.....

.....

.....
.....
.....

You may have prepared the following objectives. The student will be able to

- a) recall the important terms such as producers, consumers, decomposers and trophic level.
- b) recognise the difference between different trophic levels.
- c) interpret plants as producers and animals as consumers.
- d) classify organism on the basis of feeding habits.
- e) apply the information in to new situation.
- f) develop scientific appreciation.

2) Dividing learning units to small units

Now we have stated the objectives of the lesson in behavioral terms. And you should arrange the learning material in to small, short sections. Each small section deals with a single objective, so for the mastery of the material one should master each of these small steps or sections.

For example, in the lesson on food chain can be divided into small sections such as producers, consumers, decomposers, trophic levels and feeding habits.

3. Identification of learning materials and instructional strategy :-

At this step you should identify the learning materials necessary for the instruction. Then you should select the instructional strategy to master the learning task.

Say for example, the learning materials such as charts, models, and real objects, can be the materials selected. Once you determine the learning material you should select the suitable instructional strategies. Here you should adopt survey type strategy or lecture cum discussion strategy to teach the lesson on food chain. The design of the proposed instructional strategy should be then practised in the classroom.

4) Diagnostic tests

We have already determined the strategies of instruction. Each unit of the content is accompanied by a brief diagnostic test. These tests are used to measure, students' progress in learning and also to identify the particular problems faced by each student. These tests help to know whether each student is able to attain the satisfactory level of performance. Some students may have certain difficulties in attaining the desired level of performance. So this test will help us to locate the actual difficulty of the students.

5) Supplementary Instruction

We will get the data about the progress of each student and his weak points or difficulties by administrating the diagnostic tests. you should analyse the data obtained and provide necessary supplementary instruction or remedial teaching in order to help the students to overcome his difficulties and to attain mastery learning.

You should take care to give enough time to individual students to fit to the aptitude of each student.

Check your progress 2

Briefly explain the steps in mastery learning

- Note :**
- a) Space is given below to write your answer;
 - b) Compare your answer with the one given at the end of this unit.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

6.4 ILLUSTRATION OF MASTERY LEARNING

You should know one thing that we could easily implement mastery learning in the usual class rooms, if we are well prepared to understand our children and give enough time for learning to each of them. Special learning materials such as multi-media packages, programmed learning materials etc. are very much useful in mastery learning.

An illustration of mastery learning in the form of a self instructional unit in print is given as follows.

MASTERY LEARNING-ILLUSTRATIVE MODEL

A self learning unit developed on the topic 'Food and health's is given below as an illustration for mastery learning model of teaching.

FOOD AND HEALTH

1. OBJECTIVES OF THE UNIT

At the completion of this unit the student will be able to :

- 1. identify different components of food.
- 2. distinguish between body building components and energy giving components in food.
- 3. identify resources of different components of food.
- 4. use of principles of balanced diet in daily life.
- 5. develop a positive attitude towards balanced diet.
- 6. identify the importance of vitamins and minerals in diet.
- 7. develop a positive attitude towards avoiding hypervitaminosis.

II OUTLINE OF THE CONTENT

1. Food resources
 - 1.1 importance of food
 - 1.2 different component of food
2. Balanced diet
 - 2.1 meaning of balanced diet
 - 2.2 factors influencing the quantity of food needed
 - 2.3 importance of balanced diet.
3. Malnutrition and hyper vitaminosis.
 - 3.1 Effects of malnutrition
 - 3.2 Hyper vitaminosis.
4. Let us sum up

III INSTRUCTIONAL STRATEGY AND LEARNING MATERIALS

Instruction of given unit is through self learning materials. Necessary learning materials are developed for their learning of the content listed above for realising the objectives.

1. FOOD RESOURCES

Food resources are those materials which are used as our food. You are familiar with a variety of food resources. So write down some food resources.

Learning Activity 1

Write down some of the food resources you are using regularly.

Note : a) Space is given below to write your answer;

.....

.....

.....

.....

.....

.....

.....

.....

You may have listed out resources such as rice, wheat, fruit, tubers, milk, egg, fish, meat, etc. Among these resources, you could identify two types on the basis of the origin. That is vegetarian and non-vegetarian food resources. So we depend upon vegetarian and non-vegetarian food items. Now we shall see the importance of food.

1.1 Importance of food

We are usually taking food three or four times daily. Actually, what is the importance of food ? Food help us to drive away hunger. Now let us see what is the use of food ? Food gives us energy for our work. More over, food helps us to build our body and promotes growth. Are the components that give us energy and build our body the same ? Now let's see the components in our food.

1.2 Different components in food

There are different components in our food. Among them there are energy giving components

and body building components. In addition to these components, vitamins and minerals also should be the essential components of food. We shall see each of these components in detail.

Energy giving components

The energy giving components in our food are carbohydrates, fats and lipids. Carbohydrates are different sugars contained in different food resources such as rice, tubers, milk etc. Fats and lipids are oil content that we get from different food resources such as milk, meat, oils etc.

Body building components

Proteins, vitamins and minerals are the body building components in our food. Proteins are bigger molecules used for building body parts, that is cells and cell organelles. We get enough proteins from cereals, beans, milk etc.

Vitamins are vital elements needed for proper growth and functioning of our body. leaves, vegetables, fruits, fish, egg and milk etc. are rich sources of vitamins. Minerals are elements which are needed in small amounts for the proper development and functioning of our body. As in the case of vitamins minerals are seen in abundance in leaves, vegetables, fruits, fish, egg and milk.

Now we have seen the different components of our food. So, before you proceed to the next section, please answer the following question.

Check your progress 1

Which are the essential components in your food ? What are the important resources of such components?

- Note :*
- a) Space is given below to write your answer;*
 - b) Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Now we shall pass on to the next section namely, balanced diet.

2. BALANCED DIET

Diet as you know, is the food we take at a time. We are going to discuss in detail the concept of balanced diet, factors influencing the quantity of food a person needed per day and the importance of balanced diet for a healthy life. First of all we shall discuss the concept of balanced diet.

2.1 The concept of balanced diet.

Common balance is a familiar instrument using for measurement of weight. Suppose you went to a shop and asked for two kilograms of rice. how do you know that, the shopkeeper gives you the same quantity as you demanded? you may be eagerly looking at the balance to see whether the amount of rice taken is well balanced with two kilogram iron piece. Here the amount of rice taken should be the same quantity of the weight we put on the other side. In the case of diet also, the quantity as well as the quality of food materials we take a day should be well balanced with our bodily needs. The quality of food can be determined in terms of the nutrients contained in it. So, we can define balanced diet as the diet which involves all necessary components for the healthy growth of our body in adequate quantity and proportion.

Various components in our food are already discussed in section - 1. The quantity and proportion of each food item is determined by several features which we shall discuss as follows.

2.2 Factors influencing the quantity of food a person needs.

You may have known some of the factors influencing the quantity of food a person need per day.

Learning Activity 2

Write certain factors influencing the quantity of food a person needs per day.

Note : a) Space is given below to write your answer;

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

You may have written age of a person and his body size are the factors influencing the quantity of food he needed a day. Of course, the age and body size are two of such factors. In addition to these, factors such as sex, bodily conditions, climate and vocation are also influencing the quantity of food one needs a day. We will see each of these factors in detail.

(i) **Age :** Requirement of nutrients is different from person to person on the basis of age. You known that babies and aged persons need small quantities of food, but with rich nutrients and easily digestible. Other wise they may have developed indigestion problems.

(ii) **Body size :** A large sized body demands more food than normal body to maintain the functions of the body.

(iii) **Sex** Quantity of food one needs is determined by sex of the individual also. Usually men eat more than women. But due to certain physiological conditions such as menstruation, pregnancy and breast feeding a woman needs highly nutritious food in more quantities than that of a normal woman. you know that during these conditions extra amounts of nutrients are necessary.

(iv) **Climatic conditions ;** Do you ever noticed the relationship between climate and our food in take ? Of course there exists a relationship between the two. You may felt that you need more food in winter season than that of summer season. What will be reason for this ? You may have studied that extra energy is required to maintain our body temperature during winter. That is why we have to take more food in winter.

(v) **Vocation** You may know that the amount of energy one needs is directly related to his vocation. That is, for example, a shopkeeper and a carpenter need different amounts of energy. Because the latter needs more energy for his work.

2.3 Importance of Balanced diet

We have discussed the factors influencing quantity of food required for different persons. So one can determine the quantity and quality of one's own food on the basis of these factors influencing our food intake. What will happen, if you do not give attention to the quantity of our food intake?

There will be two possibilities either malnutrition or hypervitaminosis and obesity. Both of these conditions will lead to different diseases. So it is essential to take a balanced diet for healthy life. Now we shall have a discussion on malnutrition and hypervitaminosis. Before we pass on to that, check your progress in the learning of this unit.

Check your progress 2

- Note : *a) Space is given below to write your answer;*
b) Compare your answer with the one given at the end of this unit.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

3. MALNUTRITION AND HYPERVITAMINOSIS

Now we shall discuss in detail mal nutrition and hypervitaminosis. First of all, we shall see the aspects of malnutrition.

3.1 Malnutrition

We have seen that different nutrients are required for necessary growth and development of our body and body systems. If, the nutrients are inadequate amounts in our food, it would affect the proper functioning of our body and body systems. So, malnutrition is the condition in which the amount of nutrients required for our bodily needs are not obtained through our food. This condition will lead to ill health.

Now we shall see the details of hypervitaminosis.

3.2 Hypervitaminosis.

Hypervitaminosis is the condition which is opposite the malnutrition. The abundance of various food components in our food will lead to deposition of fats at different parts of the body. So this will lead

to obesity. Obesity in turn causes fat deposition inside the blood vessels. This will lead to high blood pressure and heart diseases. So, it is also essential to control our diet, for not to increase the nutritious value of food above the required level. Routine exercises also will help us to escape from the lethal effects of hypervitaminosis.

Check Your Progress 3

Bring out the difference between malnutrition and hypervitaminosis

- Note :**
- a) Space is given below to write your answer;
 - b) Compare your answer with the one given at the end of this unit.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

4. LET US SUM UP

In this unit we have discussed the aspects of food and health. The main points of our discussion can be summarized as follows :

- i) Food is essential for healthy life.
- ii) Sugars and fats are energy giving components and proteins and minerals are body building components.
- iii) Green leaves, vegetables, fruits, beans, milk, egg and fish are rich sources of important components of food.
- iv) Age, sex, body size, climatic conditions and vocation are the factors influencing the quantity of food needed a day.
- v) Balanced diet is the diet involving all the necessary nutrients in adequate quantity and proportion.
- vi) Malnutrition is deficiency of nutrients and hypervitaminosis is extra deposition of nutrients in the body.

Check Your Progress : Possible answers

- 1. *The essential components in our food are energy giving components such as carbon hydrates & fats, body building components such as proteins, minerals and vitamins. Green leaves, vegetables, fruits, beans, mild, egg, fish etc. are rich in body building components.*
- 2. *Balanced diet is the diet that includes all the necessary nutrients in adequate quantity and*

proportion for the proper growth of a person. The factors influencing the quantity of food one needed are age, sex, body size, climatic conditions and vocation of the individual.

3. *Malnutrition is a condition caused by deficiency of essential nutrients in one's body. But hypervitaminosis is a condition in which nutrients are deposited in abundance one's body.*

IV. DIAGNOSTIC TEST.

The learning material for food and health is given above. You should give the material to your students and allow them to learn till each one gets mastery over the material. Once they had completed learning the unit you should fix the criteria for successful completion is eighty percent or more marks in the test. You should give supplementary instruction to those which have not successfully completed the unit. (The details of preparing diagnostic test is given in Block-6 unit - 8.) However a sample test question paper is given as follows.

QUESTION PAPER

Unit: Food and Health
Standard IX

Duration :40 Minutes
Marks: 20

- I. Fill in the blanks using appropriate word or words (1/2 x 4 = 2)
1. Food gives us.....
 2. Energy giving components of food are.....
 3. body building components in food are.....
 4. Deficiency of nutrient is.....
- II Write you answer in one or two sentences (1 x 5 = 5)
5. What is Hypervitaminosis ?
 6. What is the importance of food in our life ?
 7. What are the factors influencing the quantity of food needed a day ?
 8. What is balanced diet ?
 9. What is the effect of malnutrition ?
- III Give your answer in three or four sentences (2 x 5 = 10)
10. In which condition women need more nutrients ? Why ?
 11. How does hypervitaminosis lead to different diseases ?
 12. Why do we eat more during winter ?
 13. Balanced diet is important for a healthy life. Why ?
 14. Malnutrition and hypervitaminosis are the two sides of the same coin. Explain.
 15. You are going to prepare a balanced diet schedule for your family. (1 x 1= 1)
What all factors should you taken into consideration ? Which resources should you include in the diet ? Explain.

This is only a sample question paper. You should prepare so many test items to test each element discussed in the unit. Then only you could know whether your students get mastery or not. After evaluating the answer sheet of students you may have seen that most of them have acquired mastery over the material. If there is anybody who do not get mastery, you will give them supplementary instruction. So that those students also will acquire mastery over the unit.

V.SUPPLEMENTARY INSTRUCTION

In order to conduct supplementary instruction, you should use the same unit along with some

necessary learning materials such as charts, photographs, articles, and talks.

Charts showing different food resources and quantity of food required to each should be used.

You should collect photographs of diseased people due to malnutrition and obesity.

You should then assign your students with the duty to collect articles regarding food and health from news papers and magazines.

Along with these supplementary learning materials, you should give explanation of the essential aspects of the unit. Then again conduct a test on the same unit and verify whether all students get mastery over the unit. If needed, you should use some more additional instruction.

5.5 LET US SUM UP

In this unit we have discussed in detail the mastery learning strategy of teaching mastery learning almost all aspects of a material with a time span which is different from individual to individual. The basic concept of mastery learning is the concept of aptitude. Aptitude is the amount of time required for learning means learning all aspects of a material. Mastery learning strategy has the following aspects, such as time allowed for learning, learner's perseverance, quality of instruction, learner's ability to understand instruction and his aptitude. The steps in mastery learning also are discussed.

They are,

- i) formulation of objectives.
- ii) dividing learning unit to small steps
- iii) identification of learning material and instructional strategy.
- iv) diagnostic testing and
- v) supplementary instruction.

An illustrative model also is given in the unit.

Check your progress - Possible answers

The major aspects influencing mastery learning are

- i) *time allowed for learning.*
- ii) *learner's perseverance*
- iii) *quality of instruction*
- iv) *student's ability to understand instruction, and*
- v) *learner's aptitude (amount of time required for mastery learning).*

There are five steps in mastery learning

- i) *Formulation of objectives*
- ii) *Dividing learning unit to small sections.*
- iii) *identification of learning materials and instructional strategy.*
- iv) *Diagnostic tests.*
- v) *Supplementary instruction.*

ASSIGNMENT QUESTION

Develop a lesson each for teaching using the models listed below with a topic of your choice.

Concept attainment model

- (ii) *Advance organizer model*
- (iii) *Biological Science Inquiry model*
- (iv) *Cognitive growth model*
- (v) *Group investigation model and*
- (vi) *Mastery learning.*

Note : a) No space is given for writing the answers. So you should prepare your answer in separate sheets.

SOURCES :

1. *Joyce, B & Weil M. (1985) Models of teaching (2nd edn) New Delhi : Prentice Hall India Pvt. Ltd.,*
2. *Passi, J.C. Singh, L.C. & Sansan Wal (1987) Inquiry Training model of teaching. Agra : national Psychological Corporation.*
3. *Siddqui, M.H. & Khan, M.S. (1991) Models of teaching Theory & Research, New Delhi : Ashish Pub.*

BLOCK 5 MEDIA AND MATERIALS FOR TEACHING BIOLOGY

UNIT 1 Laboratory

UNIT 2 Learning Aids

UNIT 3 Accessory Learning Aids

UNIT 4 Community Resources

UNIT 5 Extended Curricular Activities

UNIT 6 Resource Units.

BLOCK 5. MEDIA AND MATERIALS FOR TEACHING BIOLOGY

BLOCK INTRODUCTION

As you know, no teacher can rely on oral communication alone to carry out the teaching strategies discussed in Block 4. Effective teaching requires the support of appropriate other media and materials also. This block provides you with an outline of such media and materials necessary for teaching biology. This block has six units. They are;

- 1) **Laboratory**
- 2) **Learning Aids**
- 3) **Accessory learning Aids**
- 4) **Community Resources**
- 5) **Extended Curricular Activities**
- 6) **Resources Units**

Unit 1 discusses various aspects of Science laboratory. The features of a Science Lab, its designing and management and safety precautions have been discussed in this unit.

Unit 2 and 3 discuss the various aids to learning. Major types of aids such as auditory, visual and audio visual are covered in unit 2. Various accessory learning aids such as Science museum aquarium, terrarium and green house have been discussed in Unit 3.

Unit 4 deals with community resources, its meaning, scope, procedures to utilise resources and the major community resources.

Unit 5 discusses the details of extended curricular activities such as science club, Science fair, Science quiz, field trip and science projects.

Resource unit, its components, steps in developing a resource unit and an illustrative model have been covered in unit 6.

UNIT 1. LABORATORY

Contents

- 1.0 Objectives
- 1.1 Introduction
- 1.2 Aims and Objectives of Science laboratory
- 1.3 Science Laboratory - Features
- 1.4 Designing Science laboratory
 - 1.4.1 Factors influencing the design of Science Lab
 - 1.4.2 Design of the Science Lab
 - 1.4.3 Components of a Science Lab
- 1.5 Safety precautions in a science laboratory
- 1.6 Management of Science Laboratory
- 1.7 Let us sum up.
- 1.0 **OBJECTIVES**

you know that laboratory is essential for teaching biology. A laboratory must have essential equipment and materials necessary for instruction. In this unit we will see the important aspects of a science lab; and safety precautions in a lab. At the end of this unit you will be able to

- * identify the aims and objectives of Science laboratory
- * identify the important equipment necessary for a science laboratory.
- * apply the knowledge of the major features in designing science laboratory.

1.1 INTRODUCTION

Every one, who has interest in science teaching would agree that laboratory has immense role in Science teaching. Teaching through laboratory or teaching using a laboratory is essential for good science teaching. As a Science Teacher you should know the major aspects of a Science lab. In this unit we will see the various aspects of Science lab; features of Science lab, design of a Science lab, components in a Science lab and safety precautions in a Science laboratory. These aspects are presented in detail in this unit.

1.2 AIMS AND OBJECTIVES OF SCIENCE LABORATORY

You know well that laboratory work is essential for complete learning of theoretical lessons. So the theory and practicals act as complementary to each other. As you know the need of laboratory work, you should develop detail plan for the utilisation of laboratory facilities.

Through laboratory work we aim to facilitate learning by doing, learning by observation, discovery learning, and group investigation approach to learning. Say for example, you are going to teach differences between animal cells and plant cells. So you could provide slides of the cells and direct your students to observe them using microscope and note the difference between them. This is a mode of discovery learning. Such learning would be retainable for long periods and also helps to mastery learning. So maximising learning, is the aim of laboratory in science teaching.

Among the objectives of laboratory work, the following are important.

First one is to provide concrete illustrations for scientific understanding. Let us see an example. Cell division is an abstract idea for students, hours long lecturing may not be helpful in concretising the idea. So instead of lecturing you can utilise lab facilities. Cell division can be visualised using a microscope. Growing roots of onion could be easily use for this purpose.

Second objective is to develop scientific concepts and principles. The concept of factors controlling photosynthesis could be effectively developed with the help of laboratory facilities only.

Scientific skills, scientific attitude, and interest could be developed through laboratory work. The specific nature of laboratory work would be helpful into develop observation skill, analyzing skill, and skill in judgement.

A laboratory is a place for learning scientific method and then the process of science, i.e., active experimentation and verification. Laboratory work is also helpful to arouse curiosity in natural phenomena, which in turn inspire learning science.

Besides these objectives you can list out many minor objectives of your own for instructional purpose.

Check your progress 1

List out the major objectives of a science laboratory.

*Note : a) Space is given below to write your answer;
b) Compare your answer with the one given at the end of this unit.*

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

1.3 SCIENCE LABORATORY - FEATURES

usually, majority of us do not pay much time for arranging the laboratory. This may be due to many reasons, such as lack of enough time, lack of enough space, lack of co-operation from others etc. Still many of you are interested to use the laboratory in maximum possible ways and situations. So you should know the features of a science laboratory.

Learning Activity 1

What will be the essential features of a laboratory

Note : a) Space is given below to write your answer;

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Now let us see the following features in contrast to your answer.

- a) A good laboratory should have enough space for the free movement of pupils during laboratory work.
- b) The physical conditions such as fresh air, light, and ventilation should be adequate to give a conducive environment for laboratory work.
- c) The structuring of the lab should be appropriate to conduct demonstrations, lecture cum demonstrations, individual and group work. Say for example, you have to demonstrate budding technique along with lecturing. Enough facilities should be given for pupils to observe the demonstration and repeat it by themselves.
- d) Learning materials such as actual specimens, preserved specimens and materials required for learning should be provided in a science lab.
- e) Accessory learning materials such as black board, wall charts, visual aids and display board should be present in the lab. This would be helpful to maximize the efficiency of instruction.
- f) The lab should be designed in such a way to facilitate teacher supervision. You know, it is essential to supervise each student, while they are in work.
- g) Enough storage facilities should be provided to store lab equipment, accessory learning materials and chemicals.
- h) There must have enough water, gas and electric connections wherever they are necessary. Sufficient number of taps and sinks and proper drainage facilities ensure the cleanliness of the laboratory.
- i) Different types of experiments are to be done in a laboratory using chemicals. So there must be precautions against any harmful situation in a laboratory. So safety measures such as fire extinguisher, emergency exit, first aid kit etc. should be provided in a science lab.

Check your progress 2

Bring out the essential features of a science lab.

- Note :**
- a) Space is given below to write your answer;
 - b) Compare your answer with the one given at the end of this unit.

.....

.....

.....

.....

.....

.....
.....
1.4 DESIGNING SCIENCE LABORATORY

The science laboratory should be designed in such a way to consider all the factors related to instruction. You know the importance of thorough planning in providing any educational situation. Here also you should plan thoroughly for designing a science laboratory. Before we pass on to the actual design, let us have a look to the important factors, which could be considered at the time of design.

Learning Activity 2

What will be the factors influencing the design of a science lab.

Note : a) Space is given below to write your answer;

.....
.....
.....
.....
.....
.....

1.4.1.Factors influencing the Design of Science Lab

There are various factors, influencing the design of science lab. Let us examine them one by one.

- a) **Area** - The first one is the number of pupils working at a time. This would help to determine the actual space required for the work area. The space for demonstration and storage could be considered while determining the total area of the laboratory.
- b) **Location** - Location of the lab is the second factor which is to be considered at the time of design. It is preferable to locate the lab at the ground floor. The lab should be such a place to ensure easy utilisation. In our schools, the sharing of space and equipments is required. So lab should be located in a convenient place.
- c) **Flexibility** - We use flexibility here to denote the facilities for adopting various activities such as different methods of teaching, activities of science club, facilities for audio-visual projection, space to develop improvised learning materials, etc. So you should plan for a multi purpose laboratory.
- d) **Furniture** - Necessary furniture such as demonstration table, students tables, storage shelves and chairs are essential in a lab. The tables could not be of huge size. Moderate type table should be preferable. The demonstration table should be placed on some height from the ground level so that students should be able to see the demonstration well.
- e) **Lighting** - Enough lighting should be provided by utilising the day light to the maximum extent. In order to utilise day light, doors and windows should be placed in accordance with the entry of light. But care should be taken to avoid excessive lighting. Light colours should be used to paint the walls, which reduces the light intensity.
- f) **Safety** - You know it is very important to involve safety measures in a science lab. There will be chances of fire, breakable glass wares and harmful chemicals in a lab. So while developing a design for a lab safety measures must be included in it.

Check your progress 3

What are the factors influencing the designing of a science lab

- Note : a) Space is given below to write your answer;
b) Compare your answer with the one given at the end of this unit.

.....
.....
.....
.....
.....
.....

1.4.2. Design of a science Lab

We have already discussed objectives of laboratories and factors influencing the design of a laboratory. Now let us develop a design for a model science lab.

The science laboratory in a secondary school could be a multi-purpose study room, rather than a laboratory. Since, we have no separate laboratories for physics, chemistry and biology, we have to share the facilities and utilise it as per the needs of the subject.

learning Activity 3

According to you, what will be the components of a science lab ?

- Note : a) Space is given below to write your answer;

.....
.....
.....
.....
.....

- A. AQUARIUM
- C. CHAIRS
- D. DOOR
- D.T. DISSECTION TABLE
- EE - EMERGENCY EXIT
- S - SINK
- T - TABLE
- V - VENTILATOR
- W - WINDOW

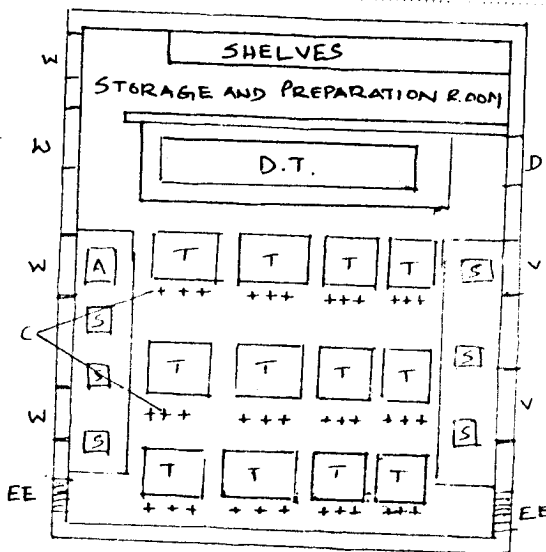


Figure 5 A proposed design of a science laboratory

1.5 SAFETY PRECAUTIONS IN A SCIENCE LABORATORY

We know that accidents may take place at any time in the laboratory. So it is very essential to involve certain safety precautions in a science lab. Let us see the major precautions to be practised in the lab.

a) Training for students

You know that children are always children. So they will be exposed to dangerous situations while they are in the lab. It is essential to give necessary training for the students in dealing with various equipment. Instructions to operate each equipment should be given properly. Such instructions should be printed and attached with each instrument. You may have seen such instructions on the equipment that we use. Other instructions for handling chemicals, glasswares, etc. should be exhibited on the walls of the lab and on tables. Say for example instructions like "Handle with Care" should be pasted on the storage shelves and practical table, which is found very effective. Instructions such as "Keep your table clean", "Chemicals are costly, use them vigilantly", "Prevent fire", "Water is precious" etc., would be helpful to maintain discipline in the lab. Such steps should be helpful to reduce accidents in the lab.

b) First aid kits and training

Every school should have first aid kits, since injuries are common. We should keep a separate first aid kit in the lab, as it is an accident zone. The first aid kit should include cotton, plasters, dressing cloth, medicines for injury and burns, and medicine which reduces the chemical action of strong acids. The kit should be placed in such a place so that every one could see it and use it as and when required.

You should give necessary first aid training for students. This would be helpful to reduce anxiety during the events of accidents.

c) 'Keep -Safely' Principle

You know that many chemicals and objects are dangerous to pupils. So we do not allow them to play with such injurious objects. The list of such injurious things should be longer one in the lab. So, you should make a list of objects which are to be kept away from students. Separate list is preferable for chemicals, glass wares and instruments. After making the list you should keep all those objects safely in your custody.

d) Control Unit

We use control unit here to denote the on, off and regulation units of electricity, and water connection. This unit should be fixed in a convenient corner. You should let the students know the master on and off switches. This would be helpful in the event of accidents, if any. Along with such a unit, proper fuses and earthing of the electrical appliances should be made correctly.

e) Emergency Exit

We are usually unwilling to fix many exits, but at the time of an accident we may feel that these exits are not enough. Thus it is highly essential to have emergency exits at the places where people are assembling especially, when it is in doors. Otherwise, you know, the struggle to get out from the accident place itself causes accidents. So you should include one or two emergency exits in the design of your laboratory.

f) **Fire extinguisher**

A science lab should have facilities to prevent fire. Usually fire extinguishers, or sand or water sources are used to prevent fire. It is essential to provide facilities for prevention of fire in a science lab

These are the various safety measures which should be taken into consideration, while we design a science lab.

Check your progress - 5.

How could we maintain the safety measures , in a science lab.

- Note :** a) *Space is given below to write your answer;*
 b) *Compare your answer with the one given at the end of this unit.*

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

1.6 MANAGEMENT OF SCIENCE LABORATORY

We all should know that better management leads to better result. As a science teacher What activities do you follow for the better maintenance of a Science lab ? Make your response against the following learning activity.

Learning Activity - 4

List out the activities that you should follow for the better maintenance of a science lab.

- Note :** a) *Space is given below to write your answer;*

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

You may have suggested that, routine cleaning, arrangement of items in the lab, etc will be helpful for better management. Of course, routine cleaning of the equipment and lab room is essential for better management. Logical arrangement of specimens, equipment and chemicals also surely contribute to the proper management of science lab.

Co-operation of other teachers and students is also helpful to maintain a lab. You should seek co-operation of other teachers and students in collection, preservation, arrangement and storage of specimens and conducting experiments in the lab.

You should entrust members of science club for the better maintenance of the lab. In addition to these, various documents also are essential for maintaining a science lab. Documents such as Stock Register, purchase Register, alphabetical lists of equipments, specimens and chemicals and a register to record activities in a lab also are necessary.

We all know that lab is designed for providing practical experience. So regular use of lab facilities is the most important aspect which contribute to the maintenance of a science lab.

Check your progress - 6.

Enumerate the activities for the better management of a science laboratory.

- Note :**
- a) Space is given below to write your answer;*
 - b) Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

1.7 LET US SUM UP

This unit discussed the various aspects of science laboratory. The main points are as follows.

- i) Science lab is useful in developing scientific abilities, attitude and interest.
- ii) The essential physical facilities for a science lab are space, lighting, electrification, water and gas connection
- iii) The factors influencing the designing of a science lab are area, location, flexibility, furniture lighting and safety.
- iv) The essential components of a science lab are rooms, storage shelves, ventilation, lighting equipments and water connection.
- v) A variety of safety precautions are to be practiced such as training for students, first aid kits, control unit, emergency exit, fire extinguisher and keep-safely principle.
- vi) Various activities such as routine cleaning, neat arrangement, co-operation with other teachers & Science Club members, maintaining records and regular use of the lab help the proper management of a science Lab.

Check your progress - Possible answers

- I. The major objectives of a science lab are to,**
 - i) Provide concrete illustrations for scientific understanding*
 - ii) develop scientific concepts and principles*

- iii) *develop scientific skill*
- iv) *develop interest in science, and*
- v) *to develop scientific attitude*

2. *A good science lab will have enough space, physical facilities and structure. Learning materials and accessory learning materials should be provided and enough storage facility is necessary. Facilities for experimentation and supervision also necessary. These are the essential features of a science lab.*
3. *The factors influencing the design of a science lab are its area, location, flexibility, furniture, lighting and safety measures.*
4. *Essential components of a science lab are room, storage shelves, ventilation, lighting, equipment, seating facilities and water connection.*
5. *Safety measures can be adopted by giving training for students, to practice safety measures and for using first aid, using keep safety principle and providing control unit, emergency exit and fire extinguisher.*
6. *Routine cleaning of equipment and neat arrangement co-operation of other teachers and students, participation of Science Club members, keeping of registers and regular use of the lab are the important activities helpful for the management of a science lab.*

UNIT - 2

LEARNING AIDS

Contents

- 2.0 Objectives
- 2.1 Introduction
- 2.2 Learning aids
 - 2.2.1 Learning aids - the concept
- 2.3 Types of learning aids
 - 2.3.1 Visual aids
 - 2.3.2 Auditory aids
 - 2.3.3 Audio - Visual aids
- 2.4 Improvisation of learning aids
- 2.5 Effective utilization of learning aids
- 2.6 Let us sum up

2.0 OBJECTIVES

Various types of learning aids can be used to facilitate our teaching. The nature and type of learning aids may be different according to the difference in the nature of the subject. As teachers, you would have to feel difficulty to provide learning aids at many times due to their unavailability. Improvised aids can be effectively used in such situations. At the end of this unit you will be able to :

- * interpret the meaning of learning aids
- * identify the major types of learning aids.
- * apply the principles of improvising learning aids
- * identify the ways to use learning aids effectively.

2.1 INTRODUCTION

Teachers are aware of the use of different types of learning aids from the very beginning of their experience with the career. Learning aids are very essential for effective learning. The learning aids are mainly classified into audio, visual and audio-visual aids. In this unit we shall discuss learning aids in detail.

2.2 LEARNING AIDS

During instruction we use many materials and resources to facilitate the process. It can range from a piece of paper to highly sophisticated equipment like computers. Whatever it is, there is no controversy over the fact that these materials are essential for complete learning. What do we call such materials ?

2.2.1 Learning aids - The concept

The materials and resources which are used to enhance the process of instruction is referred to as learning aids. They are also termed as audio-visual aids, since they stimulate our auditory and visual

senses. As they are used to facilitate learning, they are called learning aids.

Learning Activity 1

What are the major types of learning aids, according to you

Note : a) Space is given below to write your answer;

.....

.....

.....

.....

.....

2.3 TYPES OF LEARNING AIDS

You know that learning aids are of a wide variety. But as far as our schools are concerned all them are not relevant. So, here we will discuss only those which are relevant and available in our school. You may remember that, the following is an incomplete list of learning aids.

Learning Aids

Visual Aids	Auditory Aids	Audiovisual aids
<p>A</p> <p>Non-projected aids</p> <p>a) Actual materials</p> <p>b) Pictorial</p> <p>c) Mobiles</p>	<p>a) Radio</p> <p>b) Record & Record Players</p>	<p>a) Cine-sound film & Projector</p> <p>b) Video Cassettes</p> <p>c) Television.</p>
<p>B</p> <p>Projected Aids</p> <p>a) Overhead projector</p> <p>b) Film strip/slide projector</p>		

Fig.6. Types of Learning aids available in our school

From the figure 6 it is clear that there are three categories of learning aids such as visual aids, auditory aids and audio-visual aids. Now let's see each one in detail.

2.3.1 Visual aids

Visual aids are those materials which we can see. A flower, its diagram, or photograph or slide or transparency, will be a visual aid. Among the visual aids there exists two groups such as non-projected aids and projected aids. You know that it is not practical to make an image of diagram on the screen with the help of light through a chart. If we need to make an image of an object, we will use slides, film or transparencies. These could be projected using light. So the visual aids which can be projected are called projected visual aids and those cannot be projected are non-projected visual aids.

A. Non- Projected Aids

These include actual materials, black board, charts and mobiles when we compare a non-projected

aid with a projected aid, we can easily understand the advantage of a non-projected aid. Non-projected aids are more common and widely used in educational practise. Is there any need for explaining the importance of black board? Because all of us utilize it extensively. Black board can be used at one and the same time to present new ideas and also for revision and summing up of the lesson. The matter presented to the black board can be verbal, pictorial, or diagrammatic.

a) Actual materials

Actual materials includes, specimens either in live condition or preserved specimens. As a teacher, you may have used varieties of specimens which are easily available. If such actual materials are not available we should utilize other type of aids.

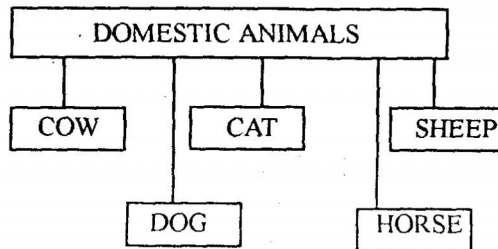
b) Pictorial aids

Pictures of various types are used for class room instruction. They are the second important type of visual aids. The pictorial aids include charts and pictures which serve as valuable visual aids. We can have a wide variety of charts. For eg: we can produce charts for each lesson. As for the unit 'our environment' we can use charts for showing animal interactions, food chain, energy flow, pollution, energy, ladder, and pyramid of energy. Such pictorial presentation will be helpful in facilitating learning. Along with charts, still pictures and photographs are also used as pictorial aids. These will help in understanding seasonal changes and natural phenomenon. For example, the photographs of a particular locality during different seasons, would be helpful to identify the changes occurring in different seasons.

c) Mobiles :

A mobile is a wall chart, but with a difference with natural charts. The difference is in respect of the organization. There are no pictures, instead of that, symbols or words are arranged independently and hanging separately on threads, on which they can move freely. So they are termed as mobile. Through the following example the concept should be made clear.

Eg: The mobile of Domestic animals.



Mobiles of animals in a foodweb, energy flow, etc. can be developed and used easily.

B. Projected aids

You have several experience with projected aids. In our schools, mainly two types of projected aids are supplied. They are overhead projector and slide projector. In projected aids a bright light is passing through a transparent picture and by means of a lens the enlarged picture is project in to screen. The projected aids are more advantageous than non-projected ones, as it attracts more attention of viewers. The major projected aids such as over head projector and slide projector are described below.

a) Overhead projector

The overhead projector is used to project large transparencies. This helps the teacher to present the matter while facing the class. The transparencies are specially developed for overhead projector. Transparencies of living organisms, and the various aspects of living beings are supplied to our schools. These colorful transparencies, will reduce the effort of the teacher. Now we will have a discussion on slide projector.

b) Slide projector

The slide projector is very useful device to provide real, life like presentation of the content. A wide range of slides are provided to schools in each subject. For eg. in biology, the slides on internal organs help a lot in the process of instruction. These create greatest inspiration among children to learn.

Check Your progress -1

Briefly comment on the important visual aids, which can be utilized in our class rooms.

- Note : a) Space is given below to write your answer;
b) Compare your answer with the one given at the end of this unit.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

2.3.2 Auditory aids

We have already seen the important visual aids. Now we will discuss some ideas regarding auditory aids. Aids in this group stimulate our audition. The major auditory aids are Radio and tape recorders. Let us consider Radio firstly.

a) Radio is one of the cheapest electronic medium, which has ample educational importance. You know that now a days, there are special educational broadcaste for the benefit of pupils as well as teachers. As an Aid, radio act as a supplementary material. Generally two types of radio lessons are broadcaste for benefits of students. They are enrichment lessons and direct teaching. Some lessons are not directly on the content, but are related to the curriculum, these are enrichment lessons. The lessons on direct on certain areas in school syllabus are called direct teaching.

The Radio lessons are not a teacher substitute. So teacher must prepare supplementary notes and materials to help the student for better understanding of the lesson. For the effective utilization of Radio lessons, teachers must be vigilant about the Radio programme. Say for example, usually radio lessons for students, are broadcast at 7.35 am. Through our radio. So the teacher, can direct the students to listen to the programme, and to note down the points, which are not clearly understood. Then a discussion on the lesson in the class room will be helpful for better understanding. Sometimes radio lessons are used along with other projected aids. This would increase the efficiency of the lesson.

Check your progress - 2

Bring out the advantages of radio as an effective learning aid.

- Note : a) Space is given below to write your answer;

b) Compare your answer with the one given at the end of this unit.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

b) Records and record players

We all are familiar with a wide range of audio records. The popularity ranges from its maximum to film songs and declines slowly to educational audio cassettes. The records can be easily reproducible and long lasting. The record player is the device (Hardware) used to reproduce the recorded material. Among school subjects, more number of cassettes seem to be highly effective to get mastery over recitation of the poems. Many teachers now utilize this facility in our schools. Unfortunately, the use of audio cassettes in other subjects, is a dream now a days, even though it has many advantages.

Check your progress 3

What are the educational values of records and record players.

- Note : a) Space is given below to write your answer;
b) Compare your answer with the one given at the end of this unit.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

2.3.3 Audio-visual aids

In this section, we will see those aids which have both an auditory and visual appeal. Since they have bearing on two senses, they are highly effective than other types of learning aids. You know that, these aids are costly and they need skillful co-operation also. The major audio-visual aids, which are useful for our school purpose are cine sound films, video cassettes and television. Let us consider cine sound film and projector.

a) Cine-Sound film and Projector

There are enormous number of films, which provide resources for education. The film helps to communicate complex ideas easily and directly. Films are also helpful in presenting ideas which otherwise can not be expressed in the classroom. Say for example the life of Antarctica cannot be verbally explained clearly. But a sound film on the life of Antarctica would serve the function very well. The newer developments in technology will help to visualize certain biological process, and phenomena, which are otherwise invisible to human eye. The films can also show certain actions more clearly by slowing down its speed, and also reproduce the events already happened. There are short films an 'our nature' supplied

to our school, but more number of films must be developed and supplied to the schools. These films can exhibited only with the aid of sound motion picture projector. While using the projector, care should be taken in cleaning and operation. The threading should be done as per the threading diagram. The projector should be placed on an immovable table and focussing on the screen should be adjusted before projection.

Learning Activity 2

According to you, what is the use of video cassettes

Note : a) *Space is given below to write your answer;*

.....
.....
.....
.....
.....
.....
.....
.....
.....

b) **Video Cassettes**

Recently, electronic video cassettes exhibit marked advantage over film systems due to their flexibility in self - operation and interaction. Though the video cassettes are costly they have become more important now a days. When we consider our school environment it is not even possible to think of the use of such cassettes due to many financial and technical reasons in our country educational video cassettes for the secondary level is limited. Though it is valuable aid for instruction, the lack of enough cassettes and the costly nature of hardware make it difficult to use it in our school system. We hope that in the near future video cassette will be contributing much to our instructional strategy.

c) **Television**

The role of television in education is similar to that of radio in many respects. But if it has the same disadvantages of video cassettes. In addition to that, as it is a transmitted medium transmission time may be inconvenient and inflexible. Despite of these disadvantages television acts as a highly effective teaching aid. But, educational broadcasts for secondary school pupils are very scarce. The television lesson, if utilized for instruction, should be proceeded with teacher's comments and follow up discussion. The role of television in education should be more developed in our country.

Check your progress - 4

Bring out the educational importance of sound projector, video cassettes and Television.

Note : a) *Space is given below to write your answer;*
b) *Compare your answer with the one given at the end of this unit.*

.....
.....
.....
.....
.....

.....
.....
.....
.....

2.4 IMPROVISATION OF LEARNING AIDS

We have already discussed a number of learning aids. But most of them are costly equipments. So we need to find out similar types of aids at a relatively lower cost. By improvisation we can develop learning aids using low cost, easily available materials. Say for example, you are going to teach about pH value. Usually litmus paper is essential. You could make blue litmus paper, by pasting a hibiscus flower on a white paper. You could change into red litmus by pouring a few drops of lemon juice on it. Like wise you can develop many learning aids as per your context. You may also develop learning aids other wise which are otherwise not available. You can make the improvisation as students' projects. i.e the collection of resources for learning aids and their development with the help of your students. The following pattern will help you for improvisation of learning aids.

Step. 1. Identification of the type of aid

We have discussed pedagogical analysis in Block 3 Unit 1. While analyzing the pedagogy we can identify the nature and type of learning aids. Say for example, you are going to teach cell organelles in eighth standard. There of course is the need of models of cell as a whole and different cell organelles. So identification of type of aid is the first step.

Step 2 Identification of resources required

You should identify the natural resources required to develop the learning aids. For example you should make a list of resources such as, old news paper, cloths, empty match boxes, sticks, leaves, and flowers of plants, stones, sand etc. everything can be included in this list.

Step 3 Development in learning aids

Using the collected materials you should develop the learning aids, as per the need of the given area. You should make a diagram of the material to be developed. Then using the selected resources develop the material as per the design made earlier.

Check your progress - 5

"It is essential to improvise learning aids". S substantiate the statement.

- Note :** *a) Space is given below to write your answer;*
 b) Compare your answer with the one given at the end of this unit.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

2.5 EFFECTIVE UTILISATION OF LEARNING AIDS

You are familiar with the selection of appropriate teaching methods, suitable for achieving the

prestated objectives, as the characteristics of your students. Each of such teaching methods needs inclusion of certain learning aids. Selection of appropriate learning aids and their effective utilisation, is a skilled activity. So before selecting a particular aid the teacher must ask himself about the kind of aid, the source of its availability, and the effectiveness. After you have selected an aid, you should become familiar with the aid in all its details. Then you have to make a plan about, at what point of the lesson, the aid is to be introduced, usually many aids can be introduced at different points of the same lesson. So you have to plan separately for each aid. After you have a plan about introducing an aid, you have direct your students to obtain maximum benefit using that aid, say for example, before using a microscope, the teacher should explain how to operate it. Instructions to view also should be given. Then comes the actual process of presentation. The presentation should be as good as possible. Certain aids need follow up discussion after presentation. For example, the students are directed to look at the slide of human blood through the microscope. Once, the presentation is over a discussion on the material will enable to develop a better understanding of the material. As a teacher you must have to follow the directions given above for effective utilisation of learning aids.

Check your progress - 6

How do you utilize learning aids effectively ?

- Note :**
- a) Space is given below to write your answer;***
 - b) Compare your answer with the one given at the end of this unit.***

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

2.6 LET US SUM UP.

In this unit, we have discussed the major types of learning aids, the advantages of each, improvisation of learning aids and means for effective utilisation of learning aids. The main points of the discussion can be summarized as follows.

- i) The learning aids can be categorized into visual aids, auditory aids and audio-visual aids.
- ii) Visual aids involves non-projected aids such as pictorials and mobiles and projected aids such as film strip projector and overhead projector.
- iii) Auditory aids involve record and record players, and radio.
- iv) Audio-visual aids involve cine projector, video cassettes and television.
- v) Improvisation of learning aids is of low cost and invites active student's participation.
- vi) A detailed plan about the type of aid, when to use, how to use and purpose of using will help us for the effective utilisation of learning aids.

Check your progress - Possible answers.

Visual aids can be mainly of two types, non-projected aids and projected aids. Non-projected aids involve actual specimens, picotrials and mobiles. Projected aids involve film/slide projector and overhead projector.

Radio helps to provide supplementary instruction. Sometimes enrichment lessons also broadcast through radio. Other than direct lessons and enrichment lessons help students to get mastery over the lessons when the content is learnt in the classroom.

Records are helpful in language teaching. Now a days, audio cassettes are mostly produced in Malayalam poetry. These will help to attain recitation mastery.

Audio-visual aids have marked advantage over other types of aids. Sound films are helpful in instructing many complex idea easily and directly. Natuaral phenomena and various other phenomena which are otherwise cannot be instructed. Could be instructed using such films. Though, costly video cassettes also are highly helpful in this regard. The T.V. watching habit of pupils could be channalized into watching educational programmes by providing recent information in its various dimensions.

Learning aid are essential for maximizing learning. Usually, we need a wide variety of learning aids. In most cases, a teacher himself should develop learning aids of this choice. A teacher may not be able to afford expenses for develop learning aids by using materials that have a little or no cost. Pupils also can participate in developing learning aids, which is turn inc, eases their interest in learning.

Effective utilisation of learning aid is a skilled activity. Before introducing a learning aid, teacher should familiarize with that and she should plan when to introduce an aid and how to use it. Teacher should also give necessary directions to students before presenting the aid. Follow up discussion should also be done if necessary.

UNIT - 3 ACCESSORY LEARNING AIDS

Contents

- 3.0 Objectives
- 3.1 Introduction
- 3.2 Accessory learning aids meaning
- 3.3 Science museum
 - 3.3.1 Purpose of Science Museum
 - 3.3.2 Inclusions in a Science Museum
 - 3.3.3 Specimen - Narcotisation and Preservation
 - 3.3.4 Herbarium.
- 3.4 Aquarium
 - 3.4.1 Scope of aquarium in Science Teaching
 - 3.4.2 Construction of an aquarium
 - 3.4.3 Guidelines to maintain an aquarium.
- 3.5 Terrarium
 - 3.5.1 Setting a terrarium
 - 3.5.2 Planing and maintenance
- 3.6 Green House
 - 3.6.1 Components of a green house
 - 3.6.2 How to build a green house
 - 3.6.3 Instructional uses of a green house.
- 3.7 Let us sum up.

3.0 OBJECTIVES

You have to use different accessory learning aids to facilitate teaching - learning process. These are different type of accessory learning aids, which are useful in biology teaching. In this unit we will see the major accessory learning aids such as museum, aquarium, terrarium and green house and also their components. The use of these in biology teaching also is given in this unit. At the end of this unit, you will be able to :

- * interpret the meaning of accessory learning aids.
- * identify the major accessory learning aids
- * identify the uses of the accessory learning aids in biology teaching.
- * identify the techniques for specimen preservation.,
- * apply the procedures of specimen preservation.
- * develop to positive attitude towards constructing an aquarium.
- * apply the procedure in constructing an aquarium.
- * develop a positive attitude towards designing a terrarium
- * apply procedures in designing a terrarium.
- * develop a positive attitude towards designing a green house
- * apply procedures of designing green house.

3.1 INTRODUCTION

Usually we are using a different types of learning aids. We have discussed the major types of learning aids in the last unit (Unit 2). Now we shall discuss about yet another type of learning aids namely, accessory learning aids. Accessory learning aids involve those aids which can be used for instruction, in addition to the types of aids discussed in Unit 2. These aids include aids which are used in association with laboratory. In this unit we will discuss in detail about accessory learning aids such as museum, aquarium terrarium and green house.

3.2 ACCESSORY LEARNING AIDS - MEANING

We have already discussed different types of learning aids. Now, we shall discuss about a very special type of learning aids, named as accessory learning aids. Accessory learning aids means those aids which could be used effectively for instruction, by direct observation from outside the classroom setting. They are permanent setting, usually in association with science laboratory. So, we cannot bring them into the class room, instead you can guide your students them for direct observation of different aspects of life and life process. Say for example, take the case of aquarium, you should direct your students to observe breathing and feeding habits of fishes, the ecological conditions of aquarium, etc.

We shall discuss different accessory learning aids such as museum, terrarium and green house one by one.

3.3 SCIENCE MUSEUM

Museum is an integrated part of science instruction. You may have several experience of the importance of museum in science teaching. Science museum has various purposes. Let us examine the major purposes science museum. Before that you shall do the following learning activity.

Learning Activity I

According to you what is the purpose of science museum.

Note : a) Space is given below to write your answer;

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

3.3.1 Purpose of science Museum

Usually a museum is a place to store and exhibit various types of accessory learning materials. So the purposes of museum are as follows.

- a) Collection, storage and exhibition of various specimens which have instructional importance.
- b) Development of various accessory learning materials such as models, charts, maps etc.
- c) To develop specimen collection and organization skill in students.

- d) To develop interest in science and helping to sustain the interest.
- e) A museum is usually developed as educational workshop. This can be effected by directing students to take part in various activities.

In additions to these purposes, you may have to suggest some other purposes for science museum. You can try to test purposes of your own. Now, let us discuss about the important inclusions in a museum.

3.3.2 Inclusions in a Science Museum

You may know the important inclusions in a museum. We shall discuss the items to be included in a museum as follows. We can collect and preserve any item in the museum, but the materials which have close integration with instruction is preferable. The materials can be dry exhibits such as seeds, leaves, roots, weeds, minerals etc. and wet specimens such as plants, fishes, snakes, etc. certain living beings such as birds and large animals should be stuffed and preserved.

Models of various materials should be developed and protected in the museum. The models can be still models or working models and organs could be made using clay, plaster of Paris, sponge etc. Charts and maps of selected topics also may be prepared.

Usually the museum is seen in connection with the laboratory. Enough shelves should be provided in the museum to arrange all the specimens systematically. Work tables also should be provided in a museum to prepare different types of accessory learning materials. Now we shall discuss the important aspects of specimen collection and preservation.

3.3.3 Specimen -Narcotisation and preservation

Here we consider the case of wet specimens. We have already see that plants, invertebrates and vertebrates could be preserved as wet specimens. You know that preservation of plants is easier than that of animals. The selected plants should be collected ad preserved in a suitable medium. But preservation of animals have two stages namely 1) narcotisation and ii) Preservation. Let us see each one in detail.

A. Narcotisation of animals

Narcotisation means killing an animal in an unconscious stage, that is with the application of certain chemicals, which make the animals unconscious and then kill them. Different types of chemicals are used for this purpose. Let's see some of the useful ones.

i. Menthol

This is helpful to kill invertebrate animals living in aquatic medium. A ten percent (10%) solution menthol is enough to narcotise and kill an aquatic invertibrite within half an hour.

ii) Magnesium Sulphate:

This is very effective to narcotize and kill most of the marine and fresh water forms. Selected animals are to be put in water and then place a few crystals of magnesium sulphate. It will gradually dissolve in water, which leads to the narcotisation of animals.

iii) magnesium Chloride : This is also a useful chemical for narcotizing aquatic forms. In the case of marine animals 7.5% solution of magnesium choloride with an equal part of sea water is useful. And for fresh water forms 2.5% solution is sufficient.

3.4 AQUARIUM

Aquarium has a high ornamental value. We all are familiar with this ornamental value. Along with such a value, aquarium is a very effective tool for instruction of certain topics also. It can also be used to conduct project work for students of different standards. Now, we will discuss the scope of an aquarium.

3.4.1 Scope of Aquarium in Science Teaching.

Aquarium has influence in teaching even at elementary stage. It helps to make the students active, while they are learning. Since acquiring present actual life situation, it reduces our work to a greater extent.

Learning Activity 3.

List out the instructional significance of aquarium.

Note : a) Space is given below to write your answer;

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

you could assign certain problems to students and guide them to solve the problems by thorough observation of aquarium. It is an effective medium to understand the changes in ecosystem and effect of various factors in an ecosystem. This is also a best device to conduct project work for students of different abilities. Say for example, the difficulty level of the project could be progressively upgraded from low ability students to student with higher abilities. Many experiments also can be conducted using an aquarium. For example, cyclic nature of elements, feeding habits of different types of animals food of living things in the aquarium, necessity of the hygienic surrounding, etc. could be experimentally proved using an aquarium. You should design and conduct experiments of your choice.

3.4.2. Construction of Aquarium

We all are familiar with aquarium, but all of us are not so familiar about the construction of an aquarium. The following items are required to set an aquarium.

a) glass jar - A clear glass jar is the most important part of an aquarium. Usually rectangular glass jars are used for this purpose. Glass jars in many shape are using now. If separate glass pieces are use to construct the acqurium, the joint should be sealed in such a way to prevent water leak.

b) Clean sand and stones

The sand should be washed many times to avoid mud particles in the sand. Along with sand, attractive stones should be collected and cleaned. These are used to decorate the floor of the aquarium with a little slope from front side to back side.

c) **Aeration facility**

You may have seen different sized and shaped aerators used in aquariums. You should select aerators in accordance with the size of the glass jar you selected. You should provide electric supply to the aerators, otherwise, they will not work.

d) **Water plants**

You can select some water plants of suitable size to plant in the aquarium. The roots of the plant selected should be washed thoroughly to remove mud particles. Hydrilla and Valisnaria are commonly used plants.

e) **Fishes and other water animals**

Now your aquarium is ready. And you should select suitable sized fishes for the aquarium. Other animals such as snails should be reared in the aquarium.

f) **Other Equipment**

Equipment such as net to catch fishes, equipment to remove polluted water and to provide clean water to the acquiring should be provided.

These are the important components of an aquarium. Now let us see the guidelines for maintaining the aquarium.

3.4.3 Guidelines to maintain Aquarium

The aquarium should be placed at some height and a position, where enough sunlight and wind can be obtained. The feeding for the fishes should be done regularly. And you should exchange the water materials in the aquarium periodically. You should assign the maintenance of the aquarium as an activity of the science club.

Check your progress - 3

What are the materials required for constructing and aquarium ?

- Note :*
- a) Space is given below to write your answer;*
 - b) Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

3.5 TERRARIUM

Terrarium may be a new term for you. Now let's see the meaning of terrarium, its components and maintenance in detail as follows.

First of all, we shall discuss the meaning of terrarium. Terrarium is sealed transparent containers used for growing plants. That is, selected plants are growing in sealed, transparent settings. For this purpose you can use any type of glass jars. But very small containers should be avoided.

In addition to the educational purposes, terrarium has decorative purposes also. We can keep them 'in doors' in this regard. Terrarium will help you for the instruction of soil texture, spacing of plants while planting, influence of humidity, and growth of plants in controlled condition.

Now we shall discuss on setting a terrarium.

3.5.1. Setting a Terrarium

First of all we shall discuss the materials required for setting a terrarium. The materials are clean glass jar, gravel/charcoal pieces, soil mixture, sand, moss, plants for planting and tool for planting watering and pruning. Soil mixture should contain 2 parts of fibrous foam soil, 2 parts sand and 1 part leaf particles. (leaf mold)

All these materials should be collected first and then you should set your terrarium. Take the glass jar and clean it well. Gravel or charcoal pieces should be spread at the bottom of the jar for about an inch thickness. Then you should take the soil mixture, and make it moist before you put it in the jar. For this purpose you should add water in the middle of the soil mixture until it became crumbly. Then put the mixture in jar. Now your terrarium is ready for planting. So we shall see the details of planting and maintenance of plants in a terrarium.

3.5.2 Planting and Maintenance

Before planting, you should select the plants suitable for planting. Usually plants such as lichens, selaginella, fern and flowering plants such as Begonia and jasmine are long lasting in terrarium. Then you should decide the arrangement of plants in the terrarium

Once you selected the plant for growing in terrarium, you should transfer them with soil around its roots and fix them in the terrarium with adequate spacing. Soil should press firm around the sides of the root after fixing them in the terrarium. After fixing all the selected plants in the terrarium you should cover the jar with plastic or glass cover to maintain humidity inside the terrarium. The amount of humidity is very important as far as the maintenance of terrarium is concerned. Excess humidity should be reduced by opening the cover for the given time. Appearance of small drops of water on the sides of the jar indicated excess humidity in terrarium. If humidity is less you should increase it to be desired level by watering. You should remove dead and decayed vegetation as soon as possible from the terrarium. pruning should be done to provide enough space for plant growth. If plants are grown weak, fertilizers should be added to the soil by diluting them to one fourth of its concentration. Terrarium should not be placed in full light but only in partial light. If you are successful to maintain all these conditions your terrarium remain intact.

Check your progress -4

Bring out the procedures to be followed in setting and maintaining a terrarium ?

- Note :*
- a) Space is given below to write your answer;*
 - b) Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

3.6 GREEN HOUSE

You may have heard about green house. Now let us see the meaning of a green house. Green house is a controlled environment which various plants can be grown. The control is mainly in terms of sunlight and humidity. Since, you have control over the environment you can grow aside variety of plants throughout the year. ie regardless of seasonal changes. You know that the growth of plants is season specific. So if we can provide such an environment without seasonal changes, we can cultivate plants regardless of seasons. That is the advantage of green house.

Now, we shall see the components of a green house.

3.6.1. Components of a Green House

Components of green house means the materials required for constructing a green house and its various inclusions. First of all we shall see the building materials required for constructing a green house

Building materials required

All of us know about various materials used to construct buildings. Similarly, materials such as wood, metal pipes, brick or stones are necessary for constructing the basement and the frame of the green house also. Polyethylene sheets are used to cover the frame of the green house. A blanket also is required to cover the polyethene covering at times to prevent heat loss from green house, when there is extreme cold outside the green house.

Inclusions in a green house

Inclusions ion a green house means, various plants to grown in the green house. Plants such as ornamental plants, medicinal plants, edible plants, small barbs, etc.can be grown effectively in a green house. You know that in order to grow plants, planting pots, are necessary. There should be frames or arrangements necessary to place the pots, instruments for planting and watering are also necessary. These are the various materials and inclusions in a green house. Now let's see how to build a green house.

3.6.2 How to build a Green House

You are familiar with construction of buildings. Now we shall discuss about building a green house. We can build a green house either attached with the main building or independent of the building. First of all we shall see the green house attached with the main building or house. A pictorial view of attached type green house is given in figure.7.

- 1. Basement
- 2. Plastic sheet
- 3. Space between plastic and glass
- 4. Glass plate
- 5. Blanket
- 6. Main building
- 7. ventilation

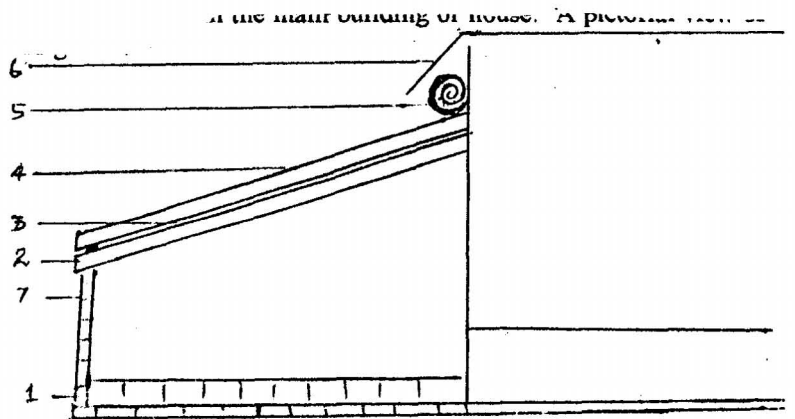


Figure 7 Attached type of green house.

The type of green house must be facing south, that is the slope of the roof is towards south. This will help to get maximum sunlight into the green house. The roof should be made either with plastic sheets only or with plastic sheet and glass plate together. You should provide 2.5 to 5 cm air space between them. If you use a double layer of polyethylene sheet, then it should be replaced by a new sheet in every two years.

You should make ventilation facilities, while building the green house, this will help to avoid excess heating. Supplemental lighting facilities also is essential. You should use fluorescent lamps for this purpose. Now we shall discuss green house constructed independent of any building.

A pictorial view of green house which is not attached to any building is given in figure 8

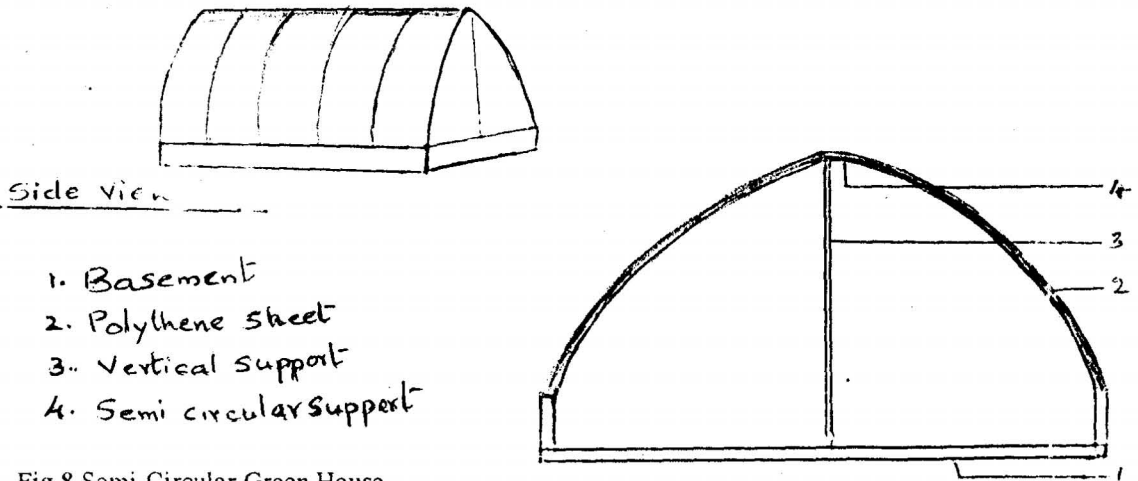


Fig.8 Semi-Circular Green House

An un attached green house is more easy to build and cheaper than attached type green house. In this type semi-circular frame is the main component of the green house. This frame could be made of wood or metal pipes. Polyethylene sheet should be provide horizontal support, if necessary. Ventilation and lighting facilities should be the same as that of the attached type green house. These are the essential aspects in building a green house. And now we shall discuss about the instructional uses of green house.

3.6.3 Instructional uses of Green House

Before we discuss about the instructional uses of green house being a teacher you should write some of the instructional uses of green house.

Learning Activity

Write some of the instructional uses of green house.

Note : a) Space is given below to write your answer;

.....

.....

.....

.....

.....

.....
.....
You may have listed the following instructional uses for a green house.

- i) It helps in studying growth of plants, flowering and seed formation.
- ii) It helps to study the influence of climate on plant growth.
- iii) It also helps to compare different types of plants and their rate of growth.

Along with these some other uses are also there. Let us see the other used also.

- iv) Building and maintenance of green house can be done as a student activity. Thus it will help to develop a positive attitude towards science.
- v) You can direct your students to compare the rate of growth of plants inside and outside the green house.
- vi) Different types of pollination, need of pollinating agents, artificial pollination, etc. can be easily learned with the help of a green house.
- vii) More over, green house will be a place for students' group work and can foster scientific attitude and inquiry skills in them.

These are the various instructional uses of a green house.

Check your progress 5

What are the components of green house ? How do you build up a green house.

- Note :*
- a) Space is given below to write your answer;*
 - b) Compare your answer with the one given at the end of this unit.*

.....
.....
.....
.....
.....
.....
.....
.....
.....

3.7 LET US SUM UP

In this unit we have discussed various types of accessory learning aids. The meaning of accessory learning aids and different aids such as a science museum, aquarium, terrarium and green house we discussed in detail. Accessory learning aids means those aids which are essential for instruction and which are seen in close association with classroom setting.

Science museum contains different kinds of specimens, both animals and plants. Different

Science museum contains different kinds of specimens, both animals and plants. Different techniques for narcotising and preserving specimens are discussed. Procedure for herbarium preparation is discussed.

The discussion on aquarium involves

Scope of aquarium in science teaching

- i) Construction of an aquarium, and
- ii) guidelines to maintain an aquarium.

The discussion on terrarium involves.

- i) Setting a terrarium and
- ii) Planting and maintenance of a terrarium.

The discussion on green house involves:

- i) Components of a green house.
- ii) details of building a green house, and
- iii) instructional uses of green house.

Check your progress - Possible Answers

1. *Narcotisation means killing an animal in an unconscious stage, by applying chemicals such as menthol, magnesium sulphate etc. suitable sized glass jars and suitable preservatives are necessary for preserving specimens. Formaldehyde, Ethyl alcohol; and Bovin's are fluid suitable preservations.*
2. *Preparation of herbarium involves press drying and preservation of such specimens. Press drying means drying the selected plant parts by putting them in bet been papers and pressing. Then it should be pasted on A4 sized paper with the description of the specimen.*
3. *The glass jar (usually with rectangular shape), clean sand stones, and aerators are the materials required for the construction of an aquarium. Some other materials such as fishing nets and equipment for exchanging water also are the materials necessary for an aquarium.*
4. *A clean glass jar is the major component of a terrarium upto an inch from bottom. Charcoal pieces should be out in the jar. The glass jar should be then filled with moist soil plants such as selaginella, inches etc. Should be painted top of the jar should be adequate spacing between each of them. The top of the jar should be properly covered and it can be used as terrarium.*
5. *Various materials such as stone, bricks, wood and metal pipes are necessary for the basement of the green house. Polyethylene sheet should be used as the top covering. A blanket also is useful at times to prevent heat loss. Green house can be constructed, in attachment with the main building or detached from the building in a semicircular form.*

UNIT - 4 COMMUNITY RESOURCES

Contents

- 4.0 Objectives
- 4.1 Introduction
- 4.2 Community Resources
 - 4.2.1 Major Community resources
 - 4.2.2 How to utilize community resources
- 4.3 Scope of Community Resources in Teaching Science
- 4.4 A model schedule to utilize community resources
- 4.5 Let us sum up.

4.0 OBJECTIVES

Utilizing community resources in biology teaching is a usual practice to increase the interest of pupils while you are going through this unit you can answer questions such as what is the meaning of community resources ? And how could we utilize these resources ? At the end of this unit you will be able to

- * interpret the meaning of community resources
- * identify the major community resources
- * identify the ways to utilize these resources.

4.1 INTRODUCTION

The community is a great human laboratory and a very efficient instructional medium. Due to high educational value, people and activities in a community can be used as educational resources. Planned contacts with adults of the community would provide new horizons of knowledge for students. Learning about the community as an active member of the community is very important for each individual. Learning different social roles and significance of each role in social productivity could be attained through such as participatory study only.

In this unit, we will see the major community resources, how to identify and utilize community resources, and the scope of community resources in education.

4.2 COMMUNITY RESOURCES

A community is the gathering of a variety of things, persons, and innumerable interactions and incidents. A community has immense value in terms of resources. We all know the various resources of a community. Here we will see community resources, which are useful for instruction. For example a pond has importance in teaching ecosystem, and hence it is considered as a community resource. Like wise a health visitor could be able to give lecture about health and hygiene to pupils. So such persons are also considered as community resources. So anything in a community which is useful and utilizable for instruction is referred to as a community resource. In few occasions, community resources are used for entertainment purpose also.

Learning Activity - 1

Try to name the community resources in your village.

Note : a) *Space is given below to write your answer;*

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

4.2.1 Major Community Resources

The community resources can be mainly of two types, namely, material resources and human resources. The material resources include institutions such as zoo, museum, planetarium, libraries, theatre, cultural centres, factories, ponds, lakes, rivers, water fall, etc. also came under this category. The human component involves various agencies and personnel. The agencies as you know are health services, post and telegraph services, teacher's organizations, science organizations, transport services etc. The resource personnel can be a leader, social worker a teacher or any one who is an expert in this field. Say for example a motor mechanic could be able to explain the various aspects of working and failure of the motor. So for a teacher everything in the community has its own utilization value from the point of view of education.

Check your progress -1

Bring out the meaning of the community resources. What are the major community resources.

Note : a) *Space is given below to write your answer;*
b) *Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

4.2.2 How to utilize community Resources :

Use of community resources in science teaching is mainly three fold. Firstly by bringing the resources in to the class room, secondly by requesting persons to come to school and give lectures and thirdly by making arrangements to visits to such places of resources. In any of these cases you should be

thoroughly prepared to utilize the resource purposefully. Let us try to examine, how we can utilize such resources effectively.

Survey of resources

A survey to identify the resources in a community, can be conducted with the help of your students. You could realize the various types of resources through that survey. Suppose you conduct a survey to realize the resources in your community. You will get a list of resources in your community.

Analysis of resource list

After you get the list, you should analyze the list to identify the useful ones. Useful ones in the sense that they are useful for teaching biology. The survey had provided the whole list of resources in your community, so you should analyze the list to identify the usable resources. This analysis should be based on the content area to be instructed in different standards. You have to ask questions such as : Is this resource useful for teaching ? If so Why ? And what are its uses ? In order to analyze each resource. You will thus get a list of useful resources from the whole list of resources. Now we shall identify which all resources are accessible to us.

Identification of accessible resources

You cannot use all the resources from the list of useful resources, due to practical difficulties.. Say for example it is better not to visit a factory producing pesticides and fumigants, a risky place (a water fall), etc. A person though highly qualified, but is not able to talk at the level of secondary school pupils will not be an accessible resource. So, you should identify the accessible resources on the basis of utilisability of each useful resource. Then you should prepare a list of useful and utilizable resources.

Learning Activity - 2

How do you classify useful and utilizable community resource.

Note : a) Space is given below to write your answer;

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Now we shall pas on to classification of resources. So compare your answer with the following discussion.

Classification of resources

So you will get a final list by avoiding those resources which are not readily utilizable. Then you should prepare an alphabetical list of resources in general. Detailed list should be formed for each category of resources. Say for example, separate lists should be formed for various agencies such as government agencies, private agencies and voluntary agencies. The list should be include transport service such as airports, railway station, bus depots and ports, business organizations, and special organizations such as planetarium, aquarium, ponds and lakes.

Each list should be in separate sheets, and arranged in such a way, to facilitate updating of information.

Similarly a classified list of individuals in the community, who have expertise in their own field, and who are willing to come to schools to share their knowledge, also should be prepared.

If any unusual resources are present in the community, they also should be categorized into a special list. Say for example a blood bank, a semen bank etc. come under this category.

Data required for utilization of resources

While you prepare the list of resources you should enclose the following necessary data pertaining to the resource. First of all you should know name of the resource, then you should know location of the resource. For utilizing a resource you should know the person to whom can contact to get the facility, what procedures are these for the utilization of resource, will it serve the purpose and is there any restrictions for its utilization.

You should also prepare a map of the place to show the locations of various resources in your community. Formats to obtaining permission also should be developed by the teachers to get permission from the concerned authority. In addition to all these, you should develop a detailed plan for linking your lesson with the resource which you plan to utilize for instruction. Before we pass on to the scope and uses of community resources, you have to answer the following question to check your progress.

Check your progress - 2

How do you utilize various resources at your locality ?

- Note :**
- a) Space is given below to write your answer;
 - b) Compare your answer with the one given at the end of this unit.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

4.3 SCOPE OF COMMUNITY RESOURCES IN TEACHING SCIENCE

The common practice in our country has made teaching of science a talk show. We cannot blame the science teachers in this respect. Because, you know that the facilities available in your school are very limited. And we are not in a position to purchase each and every equipment. Here comes the scope of community resources. There are innumerable facilities for teaching science in our community. The community resources would be helpful in providing direct experience in many instances. Say for example, pasteurization techniques can be understood easily by a visit to the nearby dairy farm.

Community resources are helpful in adopting a variety of approaches in teaching. Let us consider an example. You have prepared to teach ecosystem. So you give directions to the students, to observe a particular pond in the locality and make lists of plants and animals there. Here you can adopt a survey only. You can give directions for group investigation, on the following tasks. Identification of the types

of greenplants (in different groups such as floating, submerged etc.), and different levels of consumers at different trophic levels.

You know that learning is facilitated by first hand experiences in concrete manner than in abstract form. For example, you want to teach about amoeba. At first you may talk about the size of an amoeba using a diagram. Instead of the chart if you use a slide, it will be more effective to develop the concept of the size of an amoeba.

Observation and problem solving ability can be developed using community resources. This is also helpful in providing first hand information in natural set-ups. This is within the community system.

So, it is your task to deal effectively with the available resources, for instruction as well as to enable the student to see the real world in which they will enter.

Check your progress - 3

"Utilization of community resources are essential for good teaching" substantiates the statement the scope of resources in teaching.

- Note :**
- a) Space is given below to write your answer;
 - b) Compare your answer with the one given at the end of this unit.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

4. MODEL SCHEDULE TO UTILIZE COMMUNITY RESOURCES

The outline given below might help you to develop your own schedules for utilizing the resources effectively.

- a) **Area Map :** An area map of your locality should be developed to understand the location of various resources. A format of an area map is given in figure 9.

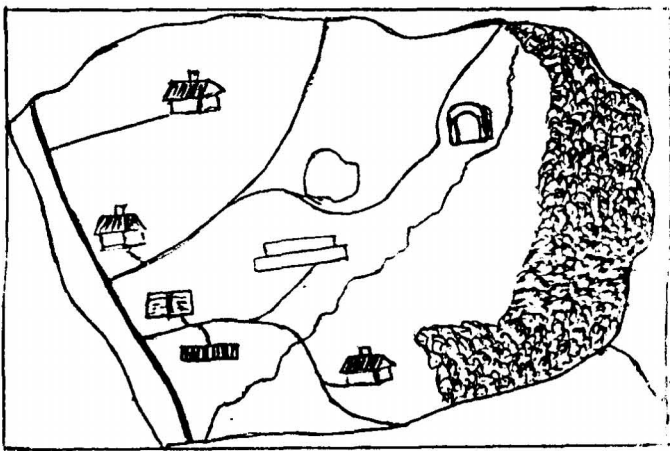


Figure 9 Format of an Area Map.

b) Alphabetical list of Resources

All the resources will be arranged in alphabetical order under separate sub headings.

- i) Animal farm
 - Dairy farm
 - Poultry farm.
 - Any other

- ii) Eco system
 - Forest land
 - Pond
 - River

- iii) Factory
 - Rubber Factory
 - Soap factory
 - Tile factory
 - Any other

- iv) Higher education institutions
 - Arts & Science College
 - Higher Secondary School
 - Industrial Training Centre.
 - Any other

- v) Library
 - Public library
 - Youth club library
 - Any other

- vi) Offices
 - Panchyath Office
 - Police Station
 - Post office
 - Village Officer
 - Any other

c) Alphabetical list of personnel

	-	Name & Address	Phone No. if any
Doctor	-	"	"
Engineer	-	"	"
Factory Manager	-	"	"
Farmer	-	"	"
Librarian	-	"	"
Panchayat Officer	-	"	"
Police Officer	-	"	"
Post Master	-	"	"

Veternary Officer	-	"	"
Village Officer	-	"	"
Zoo Keeper	-	"	"

(You should develop your own list)

d) Special list of unusual resources

- Acrodrome
- Planetariums
- Research laboratories
- Ship yard
- TV station

e) Permission procedure

You should write it on the letter pad of your institution.

To

.....

Sub : Educational visit to your institution,
request regarding -

I request you to give permission for a group of students (.....nos) and teachers (----nos) to visit your institution on a convenient day in the month of Please inform us about the date and time allotted to us.

Thanking you,

Yours faithfully,

Head of the institution

(Some additions could be made according to the change in resource).

f) Transportation facility

The road way is marked in the area map. So the actual distance required to reach the place is determined and necessary arrangements should be done with contact carriages. You should also plan when to start and when to return.

g) *Instruction to students

The instruction should be appropriate to the place we propose to visit. But, 'Behave decently', 'Don't touch anything', 'uncertainly', 'Always keep quiet' etc. should be used to attain maximum utility of the resources also should be given.

h) Uses of the resources

You should develop a detailed plan about the uses of the resource. Say for example, you plan to visit a pond along with the students. So you should plan well in advance as to how should I teach

ecosystem by utilizing this. It is better to give necessary directions for the students about the purpose of our journey.

Check your progress - 4.

What are the major components of a schedule meant for utilizing community resources.

- Note :**
- a) Space is given below to write your answer;*
 - b) Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

4.5 LET US SUM UP

In this unit we have analyzed various aspects of community resources, in terms of its influence on teaching. The following are the main points emerged from the analysis.

- i) Community resource is anything, that could be useful and utilizable for instruction.
- ii) Community resources can be of two types namely material resources and human resources.
- iii) In order to utilize the resources, you should survey the resources at your locality, identify them, classify them, and collect the data about its name, location and educational importance.
- iv) Community resources have wide scope in education by providing real life situations to your students.
- v) A schedule for utilizing community resources should include an areas map, alphabetical list of resources, permission procedure, transportation facility, instructions to students and uses of the resources.

Check your progress - Possible answers.

- 1. Community resource means anything in a community that is useful and utilizable for instruction. The resources are of two types namely material resources and human resources. Material resources involve various institutions and resources such as pond, lake, river, etc. Human resources involve expert personnel in different areas of knowledge.*
- 2. In order to utilize resources in a community a survey of resources should be conducted. The identified resources should be then arranged alphabetically. A final list of useful and utilizable resource should be developed from the alphabetical list. An area map also should be prepared. The list and area map will be helpful in utilizing community resources.*

3. *Community resources facilitate interest in learning. These resources are helpful to provide direct experiences. Innumerable resources provide ample scope for science teaching through practical experiences. Learning with the aid of community resources help to develop observation and problem solving abilities in pupils.*
4. *The schedule for utilizing community resources should include various components such as area map, alphabetical list of resources, alphabetical list of personnel, special list of unusual resources, permission procedure, transportation facility, instruction to the students and uses of the resource.*

UNIT 5 EXTENDED CURRICULAR ACTIVITIES

Contents

- 5.0 Objectives
- 5.1 Introduction
- 5.2 Extended curricular Activities
 - 5.2.1 Extended curricular activities - Meaning
 - 5.2.2 Important extended curricular activities
- 5.3 Science Club
 - 5.3.1 Aims of Science Club
 - 5.3.2 Organizing a science club
 - 5.3.3 Activities of Science Club
- 5.4 Science Exhibition
 - 5.4.1 Organization of science exhibition.
 - 5.4.2 Planning for science exhibition
 - 5.4.3 Guidelines to conduct exhibition.
- 5.5 Science Quiz
 - 5.5.1 Aims of science quiz
 - 5.5.2 Organizing Science quiz.
- 5.6 Field Trips
 - 5.6.1 Organizing Field Trip
- 5.7 Science Projects
 - 5.7.1 Components of a Science Project
 - 5.7.2 Components of project report.
- 5.8 Let us sum up.
- 5.0 **OBJECTIVES**

Apart from curricular activities, several extended curricular activities are also practised in our schools. All these activities are meant for the overall development of the child. In this unit we will see some of the important extended curricular activities such as science fair, science quiz, science projects and field trip. At the end of this unit you will be able to:

- * interpret meaning of extended curricular activities.
- * identify the major extended curricular activities which could be used in our schools
- * develop an awareness of organizing science club
- * develop an awareness of organizing science fair
- * develop an awareness of organizing field trips.

5.1 INTRODUCTION

Activities outside the curriculum and the activities in accordance with curriculum are very important as far as science teaching is concerned. There of course are varieties of such activities. The organization and execution of such activities demand expert planning from your part. In this unit we will discuss some of such very essential extended curricular activities, in terms of its aims and organization. Hope this will help you in practical situations.

5.2 EXTENDED CURRICULAR ACTIVITIES

In Education we have activities of three types namely curricular activities, co-curricular activities and extra curricular activities. Here we shall discuss about co-curricular activities, which are named as extended curricular activities. Now let us see the meaning of extended curricular activities.

5.2.1 Extended curricular Activities - meaning

Extended curricular activities are the extensions of the curricular activities. In other words, we have numerous curricular activities and long with them there can be other activities which should supplement the curricular activities. These activities are termed as extended curricular activities because they supplement the curricular activities. More over these activities are meant mainly for students having more interest in science. Say for example conduct of science projects is an example for an extended curricular activities. Usually science projects are assign to students who have more abilities, and interest in science. So such extended curricular activities are helpful to cater to the needs of average and above average children to explore the scientific knowledge, to test the relevance of existing knowledge, and to apply the knowledge into new situations. Now let us see what are the important extended curricular activities with respect to science curriculum.

Learning Activity

According to you what are the important extended curricular activities ?

Note : a) Space is given below to write your answer;

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

5.2.2. Important extended curricular activities

Now let us examine the important extended curricular activities in science. The major activities are science club, science exhibition, science quiz, field trip and science projects.

Science club, helps us to develop scientific awareness in students and should help us to extend many classroom activities to the real situation.

Science exhibitions will help us to foster the creative abilities of students and to promote organizational skill in students. Most of the exhibits can be the extensions of school syllabi.

The rapidly developing nature of science, its recent developments, and newer explorations can be exposed through science quiz. This will help to gather more advanced and recent knowledge about that we already know.

Field trips serve as a curricular activity, some times and it has profound influence in the learning of biology usually we confine biology learning to non-living class rooms. So field trips are actual extensions of class room experience to give direct experience related to biology.

You might have been troubled by your gifted students at least once in every class, as they may be getting bored over the meaningless repetitions. In such cases projects will help you greatly. They can be used to satisfy the needs of rapid learners to test and verify their existing knowledge and to explore new knowledge.

So, all the activities mentioned earlier have direct bearing on classroom instruction. Each of such activities has profound influence in science teaching. Now we shall discuss each of them in detail in terms of their aims, and organization.

Check your progress 1

What is the meaning of extended curricular activities ?

What are the important extended curricular activities ?

- Note :*
- a) Space is given below to write your answer;*
 - b) Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

5.3 SCIENCE CLUB

Science clubs have become an inseparable part of our school system. You all might have some experience with regards to science club. The science club has to lead many scientific activities in the school. Let us see the aims and objectives of the science club.

5.3.1. Aims of Science Club

Science club is a mediator between classroom teaching and laboratory work. You know that, science club should be helpful to create interest, in science, to learn process of science, to understand scientific principles, etc. On the basis of the importance of science club the following aims are determined.

5.3.3. Activities of Science Club

We have organized a science club to keep students active in learning science. So naturally you should plan and execute those activities in which students have interest. There may not be a ready made set of activities and you needn't impose your ideas on students. Your role is just to happen the idea put forth by the students and to give necessary guidelines for them. The following suggested as a model for activities of a science club.

- a) Organizing lectures, donates and symposia topics of scientific interest.
- b) Collecting articles that have scientific interest and exhibit it in the science news board.
- c) A survey of the community to realize various community resources.
- d) Preparing charts, models and conducting experiments related to class room learning.
- e) Conducting project work on various topics related to science.
- f) Organizing science fair and science exhibitions.

You could select and conduct various other activities as per the interest of your students and the facilities available.

Check your Progress 2.

- i) *How do you organize a science club in your institution*
- ii) *What will be the activities carried out by the science club ?*

*Note : a) Space in given below to write your answer;
 b) Compare your answer with the one given at the end of this unit.*

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

5.4 SCIENCE EXHIBITION

Exhibition is the process of exhibiting various science items including projects. The science exhibitions has many advantages with respect to science education. It is highly effective in developing various skills such as skill in problem solving, skill in organizing and skill in analyzing relationships. Exhibitions also should facilitate science learning and develop scientific interest and appreciation. You might have experience in conducting exhibitions successfully. You could point out some other merits of the science exhibition. And now we shall discuss about the organization of science exhibition.

5.4.1 Organization of Science Exhibition

The organization of an exhibition, as you know is a strenuous activity. You should consider various factors, while organizing an exhibition. Usually in our schools, the conduct of exhibition is the responsibility of the science club. Planning is first and most important component of an organization. Let us try to identify the various aspects of planning.

5.4.2 Planning for science exhibition

The planning should involve the following components]

a) Area requirement

You have to plan the total area required to conduct the exhibition. If it is conducted for more than one day the room or, hall selected should have locking facilities.

b) Beginning time and duration

You should plan the actual beginning time and duration of the exhibition. It would be helpful to you to make necessary arrangements.

c) Committee

You should form different committees of students to facilitate the conduct of exhibition. Committees such as organizing committee, planning committee, finance committee, publicity committee, refreshment committee, award committee, and safety committee should be formed.

d) Judgements and awards

You should plan for the judgement to best items exhibited in and prizes should be given for them. This should be done with the help of award committee. You should take precautions to maximize objectivity in judgement.

e) Budget

You know that financial resource ce is very essential to conduct the exhibition. You should request the headmaster for financial assistance. You should help finance committee to develop the budget.

f) Publicity

Publicity committee is responsible for giving wide publicity to the exhibition. You should give necessary guidelines for the students in this regard.

g) Guidance

A group of teachers should be selected to give necessary guidelines to the students in the various committees. You should be vigilant to give directions, wherever required.

Check your progress -3

What are the components of the planning of science exhibition.

Note : a) Space is given below to write your answer;
b) Compare your answer with the one given at the end of this unit.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

5.4.3 Guidelines to conduct exhibition.

Now you know the various aspects of science exhibition. Next, we will see certain guidelines with the hope that it will help you to conduct the exhibition successfully.

Science exhibition is a co-operative activity of all the teachers and students. Other teachers may say that it is the duty of science teachers. But you should seek the co-operation of every teacher to conduct the exhibition. So you have to bear in mind the following guidelines.

i) Co-ordination of staff and students

To make the fair an event you should co-ordinate all the teachers and the members of students selected to the various committees.

ii) List of items

You should make a list of all the items, to be exhibited. Separate list in different subjects is preferable.

iii) Guidelines to teachers

You should give necessary guidelines to the other teachers regarding their duty. For this purpose, you should divide the duties to all the teachers and depute them to various committee.

iv) Guidelines to students

You should prepare the students who are going to exhibit items in the fair. Necessary directions should be given to arrange the items and how to explain about the exhibited item.

v) Safety precautions

You know that dangerous chemicals, equipment and electricity are essential in the fair. So you should make precautions to handle them vigilantly to avoid any accidents. And you should also provide a first aid kit in the exhibition hall.

vi) Evaluation

After the completion of the fair, a general body is to be organized to evaluate the various aspects of the fair with reference to its success and failures.

Check your progress - 4

What are the guidelines to be followed while conducting a science exhibitions . Explain briefly.

- Note :**
- a) *Space is given below to write your answer;*
 - b) *Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

5.5 SCIENCE QUIZ

As science teachers, you must have some experience in organizing quiz programme in science. Because, we have to select one or two students, to participate in sub district level quiz competition, all of us are familiar with this. Even then most of us are un aware of the important aspects of this activity. Now let us see the aims of science quiz.

5.5.1 Aims of science Quiz .

Quiz is an important extended curricular activity. The major aims of science quiz are as follows.

- i) **To explore new information :** while participating in quiz programmes, students will get a chance to acquire advanced and recent information. Usually the questions of the quiz programme comprise of advanced and recent information. This will help students to acquire such valuable information and help to develop scientific awareness.
- ii) **To develop interest in scientific activities:** Along with the quiz programme many other activities such as science club, science fair, field trip and science projects are the activities of science. Participation in quiz programmes will help students to promote interest in other scientific activities also, through which they can gain advanced knowledge.
- iii) **To develop communication skills:** Development of communication skills is very important, as we have to communicate effectively with other members of the society. Through programmes like quiz we could develop communication skills.

These are the major aims of science quiz.

Learning Activity - 3

How do you organise science quiz?

- Note :**
- a) *Space is given below to write your answer;*

.....

5.5.2 Organizing Science Quiz

Though it seems simple organization of a quiz programme involves several components or steps. Let's see them one by one

i) Announcement

The first step of quiz programme, with respect to venue, date and time, theme/topic and whether it is oral/written. Announcement should be well in advance so that your students get enough time for preparation. You should give at least one week's time for preparation. If the programme to be conducted is in written form, you should give necessary directions to your students to bring writing materials.

ii) Preparation

At this stage you should collect any number of questions suitable for quiz programme. You should then select suitable questions of appropriate number. You have to collect the list of participants, then and make necessary seating arrangement for them. A quiz master, preferably a science teacher, should be supportive, communicative and energetic person. If you conduct oral form of quiz, select one teacher as marker, who is responsible for marking scores on the score board. These much things should be done at the preparation stage.

iii) Conduct of quiz programme

After completing the preparation arrangements, you should conduct the programme. Enough seating and lighting facilities should be given for each participant, quiz master and listeners. The score board should be placed in such a way that it is visible for all at the venue. The questions should be placed in such a way that it is visible for all at the venue. The questions should be asked loudly and should be asked loudly and should be explained if necessary. At the end of the programme, tabulations is to be done and results declared.

These are the procedures to be followed while organizing science quiz programme.

Check your progress - 5.

What are the steps involved in organizing science quiz programme

- Note : a) Space is given below to write your answer; b) Compare your answer with the one given at the end of this unit.

.....

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

5.6 FIELD TRIPS

Field trips may be considered as an active special kind of laboratory situation. In some field trips demand students to be actively engaged in collecting, observing, evaluating and manipulating. In this case it is like a laboratory situation. In other trips it provides opportunity to observe and gain specific information. Field trips can play very vital role in teaching biology. This will help the students to learn natural phenomena, to understand basic principles of ecology and their applications for better living and conservation, and to develop skills such as collecting, identifying and studying specimens. Usually a field trip should be organized in connection with the units on our environment'.

Now let us see how to organize a field trip.

Learning Activity - 4

What will be the essential steps in organizing a field trip

Note : a) Space is given below to write your answer;

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

5.6.1 Organizing field trip

In any organization, planning is the primary activity. Similarly, in organizing a field trip also planning is the beginning stage. The planning should have the following activities. We will see them one by one.

Selection of the place

The selection of the place is done by the teacher. While the time of selection, distance from school to the place, time required for journey, travelling facilities, time required to visit the place fully and the richness of the place also should be taken into consideration.

.....
.....
.....

5.7 SCIENCE PROJECTS

Project is a very effective method for learning science and scientific method. In our schools, we hardly use project for instructional purposes. projects designed, if any, may be used for science exhibition.

A project is defined as a planned undertaking specified for a purpose, and usually involves a task or problem in need of constructive thought and action.

Though project method is used for group investigation, it could be effectively utilized for the individual needs of children, especially of the gifted and highly interested students. You should help your students to conduct project work on the problems which they proposed as doubts. Project work is prolonged activity, which takes many hours for its completion. But, while the students start working on a project, they will get attached to it and will be able to learn process of science more easily.

Learning Activity - 5

What will be the components of a science project

Note : a) Space is given below to write your answer;

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

5.7.1 Components of a science Project

Now, let us discuss the important components of a science project. Project work means some sort of research work. So it must be scientific and systematic. There are a number of components in a project.

- a) **Background research** - Of course you have a number of problems to be selected for the project work. Before finalizing the topic, you should conduct a back ground research to find out its nature, characteristics, difficulties and methods to be adopted.

- b) **Selection of the topic** -Consider that you should select, the topic as " Sun light affects photosynthesis". Then you have to ask your self. Whether it is difficult ? Whether all the resources are available? Are there all necessary guidance facilities? Is it valuable ? And, Is it workable ? Your answers to these questions help you to select and finalize the topic. In short, you should determine the difficulty level, necessary resources, facilities of guidance, validity and workability of the topic. If your topic does not give satisfactory answers to such questions, it is better to avoid the topic.

- c) **Helping agencies** - Once you fix the topic, then you should make a list of agencies to whom you should approach for necessary help during your work on the project. The helping agencies include librarian, science teachers, and resource persons in the concerned topics.
- d) **Hypothesis** - You should formulate a tentative answer to the problem (Hypothesis), say for example, the hypothesis for the topic sunlight affects photosynthesis can be stated as 'photosynthesis takes place in the presence of sunlight only'. The hypothesis should be formulated to give a direction to your work.
- e) **Try out the work** - This is the actual stage of working on the project. All the activities mentioned above the preparatory components for the project. And now you could attach on your project on the basis of the hypothesis and available resources. The topic which we stated as an example should have certain experimental settings to verify our hypothesis.
- f) **Project Report**- You know that reporting is very essential to keep a record of any object of happening. The report should be systematically presented in simple clear language. It includes the following parts.

5.7.2 Components of a project report

- i) **Title** - The title should be precise and attractive. It also should explore the idea contained in it. Say for example sunlight is essential for photosynthesis.
- ii) **Abstract** - By abstract, we mean the essence of the project is expressed in few sentences. It should include almost all the main ideas of the project in about fifty to seventy five words.
- iii) **Introduction** - This section involves a brief description of the topic, related information, purpose of work, scope and method of investigation, and the hypothesis of the study.
- iv) **Materials and methods** - In this connection, we have to write the materials used and the method used for investigation. In the given example the materials and facilities required are a potted plant, black paper, dark room, iodine solution, warm water and clips. The method used may be experimental method with control.
- v) **Observation** - You should note down your observation from the experiments. All the details of such observation should be given as appendix. In the given example main observations are iodine gives blue colour to starch, starch is not produced in the area covered black paper etc.
- vi) **Conclusions** - The major conclusions obtained through the study will be given in this section. Evidences for each conclusion should be given in accordance with each.
- vii) **Application and suggestions** - Certain projects have applications and practical suggestions. This should be given clearly. So as to utilize the work fully.
- viii) **Appendix** - Detailed information about the observations, graphs, tables, photographs, etc. Should be given in the appendix.
- ix) **Bibliography** - This is the last section of our project report, which provides a list of books utilized for collecting informations with regard to the work.

these are the various components of a science project.

Check your progress 7

What are the components of a science project? Make a list of components in reporting a project work.

- Note :**
- a) Space is given below to write your answer;
 - b) Compare your answer with the one given at the end of this unit.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

5.8 LET US SUM UP

In this unit, we have seen that extended curricular activities are very essential as far as science teaching is concerned. The major ideas of the unit can be summarized as follows.

- i) Extended curricular activities are extensions of class room activities.
- ii) The important extended curricular activities are science club, science exhibition, science quiz, field trips and science projects.
- iii) Science club helps to foster scientific awareness, scientific interest, and ability for scientific investigation.
- iv) Science exhibition helps to promote organization abilities, communication skills and creativity.
- v) Science quiz explores new horizons of knowledge.
- vi) Field trip provides ample opportunities of real life experience.
- vii) Science projects help to satisfy the needs of average and above average students.

Check Your progress - Possible answers.

1. *Extended curricular activities are those activities which supplement the curricular activities, and are aimed for students having high interest in science. The major extended curricular activities are science club, science fair, science quiz, field trip and science projects.*
2. a) *A science club is formed under the leadership of a science teacher. Interested students are taken as the members of the club. An executive council should be the body which takes various decisions about the activities performed by the club.*

b) *The activities should generally come under four categories such as lectures and reading, preparation of learning materials, working on science projects and preparation for science exhibition*

3. *The components of planning a science exhibition are area requirement, beginning time and duration, committees judgement and awards, publicity and guidance.*

4. *The guideline for science exhibition involve*

- i) *co-operation of teachers and students.*
- ii) *list of items to be exhibited*
- iii) *guidance of teachers*
- iv) *guidance to students*
- v) *safety precautions, and*
- vi) *evaluation.*

5. *There are different steps in organizing a science quiz. The steps are, given as follows:*

i) *Announcement about the programme, venue, date and time, theme and mode of quiz (oral/written)*

ii) *Preparation of questions, seating arrangements for participants, appointment of quiz master and markers.*

iii) *Conducting the quiz programme is the final step.*

6. *Field trip is a trip to nature from the tiny class room situation. The change in learning situation itself promotes learning. During a trip students could be engaged in observation, collection, organization, identification, and evaluation of different phenomena and different objects directly.*

7. *A science project has six components. They are,*

- i) *background research,*
- ii) *selection of topic,*
- iii) *helping agencies,*
- iv) *hypothesis,*
- v) *layout of the work, and*
- vi) *project report.*

The project report should include title, abstract, introduction, materials and methods, observation, conclusions, application and suggestions, appendix and bibliography.

UNIT - 6 RESOURCE UNITS

Contents

- 6.0 Objectives
- 6.1 Introduction
- 6.2 Components of Resource unit
- 6.3 Steps in Developing a resource unit.
 - 6.3.1. Collection of data
 - 6.3.2. Preparation of Materials
 - 6.3.3. Organization of materials
- 6.4 Illustrative model of a resource unit
- 6.5 Let us sum up.

6.0 OBJECTIVES

Resources for teaching is unlimited. You have to depend on many resources while you are teaching. In this unit we will see the important aspects of resource unit such as its components, and the steps in preparing a resource unit. At the end of this unit you will be able to :

- * identify the components of resource units.
- * state steps in developing a resource unit.
- * develop a positive attitude towards developing resource units
- * identify the uses of resource units in biology teaching.
- * develop resource units for secondary level biology

6.1 INTRODUCTION

We have already discussed unit planning and lesson planning in (Block 2 Unit 1 & 2). We will now discuss on how various resources of teaching should be put together to form a resource unit. A resource unit should act as the back bone of the teaching unit. Teacher should develop the resource unit for each teaching unit. A resource required for the instruction of that unit. A resource unit will help you for the effective instruction of that unit. In this unit we will discuss the components of a resource unit, steps in developing a resource unit and a model resource unit.

6.2 COMPONENTS OF RESOURCE UNIT

Before we go into the details of the components of resource units, we shall see the meaning of resource units. Resource units means the all inclusive materials needed for the instruction of a unit, or in short it is the best source of information for unit planning. When we get a unit of subject material, at first we should prepare the resource unit. Perhaps we may not be able to utilize all that is listed in the resource unit at the time of teaching. So from the resource unit, then we make the unit plan based on the available and utilizable resources. The details of unit planning is already discussed in Block 2, Unit 1.

Now naturally a question arises that how does a resource unit became all inclusive ? We shall get the answer by analyzing the components of resource units. Now let us see the various components of a resource unit.

1. List of Possible instructional Objectives

The first component of resource unit is a complete list of instructional objectives for the unit to be taught. A complete list of instructional objectives should be prepared in advance and included in the resource unit. Block 6, Unit 1, will give the detailed idea about instructional objectives.

2. Subject matter outline

Next component in resource unit is the subject matter to be included in the unit. The subject matter should be selected from authentic sources and should be arranged from ancient to recent information. You should arrange the subject matter outline in separate sections. For example, the subject matter outline for a section of the unit 'Our environment' can be written as follows:

Unit : Our environment

1. Concept of ecosystem

- 1.1.1 Biotic factors
- 1.1.2 Abiotic factors

1. Type of eco system

1. Pond as an eco system

- 1.3.1 Energy source in a pond
- 1.3.2 Biotic Components in a pond
- 1.3.3 Abiotic components in a pond.

This will be continued till the completion of the unit.

3. Instructional Experience

This is the third component of the resource unit. This includes suggested instructional experience of various types. These instructional experiences or activities are design in such a way to realize the pupils with different learning abilities are common in our class rooms. So the instructional experience should be of different types to cater to the needs of slow learners, fast learners, average learners and disabled children.

4. Learning aids

We have discussed the instructional experience as a component of resource unit. Along with the learning aids also required for effective instruction. A variety of learning aids should be included in the resource unit for the benefit of learners. These aids can be auditory or visual or video-visual in nature. But maximum possible learning aids should be included in the resource unit.

5. Bibliography

A Bibliography involves various sources of the content of the unit. Appendix and important terminology in the subject - outline.

6. Sample tests

This is the final component of a resource unit. This involves, as you know, sample tests based on the subject matter outline of the unit, in order to test whether the objectives of the unit are realized.

These are the components of a resource unit. The material in the resource unit should be in such a depth, that a teacher could build their own teaching unit from this material. It should also be helpful to meet the needs of students with different learning abilities.

Check your progress 1

Briefly explain the components of a resource unit.

- Note :*
- a) Space is given below to write your answer;*
 - b) Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

6.3 STEPS IN DEVELOPING A RESOURCE UNIT

We have already discussed the components of resource units. Now let's see the steps in developing a resource unit. The important steps are collection of data, preparation of materials and organisation of materials. We shall discuss each one in detail.

6.3.1 Collection of data

The first step in developing resource unit is collection of data. At this step you have together information relevant to develop a resource unit. While collecting the relevant data you should take the following points into consideration.

1. What should be collected :

First of all you should determined, what all data should be collected. Data related to subject matter, instructional experiences and instructional aids can be collected. Here, you should collect these data relevant to the unit under question.

2. Sources of information

Once you have determined what all things are to be collected, then you should identify the sources from which the data can be collected. The primary source is authentic books, journals and encyclopedia. In addition to the primary sources, you should collect data from secondary sources also. The secondary sources include discussion with experts in the fields of research. Say for example, you are going to collect data about nervous system. You should get primary information from books and other publications, and if you need any additional information or classification of any point you should approach a neurologist.

Learning Activity -1

How do you collect relevant data about a topic of your choice.

Note : a) Space is given below to write your answer;

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

How to collect relevant data . Data collection card can be used in this regard The card need not be a card, a piece of paper with a size 8" x 6" will serve the purpose of card. The source of data should be recorded in top of the card and below that you should make a note on any single item and put it as the heading of the card. The summary of that item should be written on the space provided. Let us see a data collecting card (see fig. 10)

<p>ITEM : Eye Disease</p> <p>Source : Sense organs - written by Huson (1986), P 117-120, Mc Graw Hill Co. LONDON</p> <p>.....</p>

Fig . 10 - Format of a data collection card

6.3.2 Preparation of materials

We have discussed various aspects of data collection. In addition to collection of data you should prepare or develop certain components of the resource unit. This includes the following items such as instructional objectives, instructional experiences, learning aids and testing tools.

1. Instructional objectives

To achieve mastery in any given content we have to frame certain objectives. Say for example for the lesson 'Pollution' we have to frame the objectives such as

1. Ordering of materials

Ordering of materials means arrangement of materials in sequential order. We have discussed the components of a resource unit. These components are arranged in different groups such as experiences for average learners, learning experiences for below average learners, and learning experiences for above average learners. This will help you to select the appropriate experience as per the needs of the students.

2. Sectioning and Numbering

Sectioning, as you know is dividing the material into suitable sections. Usually, a section consists of details of a single aspect. Say, for example instructional experience for average learners should be given in one section and that for above average learners should be given in another section.

You should also give necessary numbers to components, section and sub-sections if any, as you see in this instructional material. It will help you to locate an item easily.

Check your progress - 2

Explain briefly the steps in developing a resource unit.

- Note :*
- a) Space is given below to write your answer;*
 - b) Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

6.4 ILLUSTRATIVE MODEL OF A RESOURCE UNIT

Now, Let us see an illustrative model of a resource unit. We shall discuss the unit Evolution.

EVOLUTION

Instructional Objectives

The instructional objectives of this unit are as follows. The pupils should be able to

1. Identify scientific terms, scientific facts and concepts relating to evolution.
2. Interpret the facts and concepts relating to evolution.
3. Analyze the facts, concepts, principles and theories relating to evolution.

4. Define the important aspects of evolution
 5. Compare the various aspects of evolution.
 6. Explain scientific basis for evolution.
 7. Generalize concepts, principles and theories of evolution.
 8. Develop skill in observing various aspects of evolution.
 9. Collect and organize data relating to evolution.
 10. Develop interest in the process of evolution.
 11. Develop a scientific attitude towards natural phenomena.
 12. Develop appreciation of scientific investigation and inventions
- (These are the major instructional objectives of this unit.)

Subject - matter outline

- 1.1 Definition of organic evolution
 - 1.1.1 Structural difference of organisms through time
 - 1.1.2 Time duration as determinant of evolution
- 1.2 Origin of life
- 1.3 Theories on origin of life
 - 1.3.1 Re-incarnation theory
 - 1.3.1.1 Proves in support and against the theory
 - 1.3.3 Theory of chemical evolution
 - 1.3.3.1 Proves in support and against the theory.
- 1.4 Condition of the earth at the time of origin of life.
- 1.5 From where did life begin ?
- 1.6 Chemical reaction and evolution
- 1.7 Important elements related to life.
- 1.8 Nucleoproteins - first form of life.
 - 1.8.1 Peculiarities of nucleoproteins.
- 1.9 Unicellular forms of life.
 - 1.9.1 Early unicellular forms.

- 2.0 Multicellular forms of life.
 - 2.0.1 Early multi cellular forms
- 3.0 Evidences of organic evolution.
 - 3.1 Palaeontological evidences.
 - 3.1.1 Definition of palaeontology
 - 3.1.2 How to determine the age of a fossil
 - 3.1.3 Difference between fossils of different time.
 - 3.1.4 Findings of fossil study
 - 3.2 Comparison of animal body structure.
 - 3.2.1 Similarities in bodily features
 - 3.2.2 Findings in support of evolution.
 - 3.3 Taxonomical evidences of evolution
 - 3.3.1 How does taxonomy became evidence for evolution.
 - 3.4 Embryological evidences.
 - 3.4.1 Features of embryo at different stages of development.
 - 3.4.2 Recapitulation of characters
 - 3.5 Physiological evidences
 - 3.5.1 Physiology behind various life processes.
 - 3.6 Biochemical evidences.
 - 3.6.1 Biochemical similarities of different group of organisms.
- 4.0 Human evolution
 - 4.1 Ancestors of modern man.
 - 4.1.1 Features of various ancestors of human beings
 - 4.2 Advantages of human beings
 - 4.3 Dis advantages of human body
 - 4.4 Conclusion.

The variety of instructional experiences possible to teach this unit is as follows.

Questioning is the most easy and important instructional experience. Questions can be framed according to the class room situation and progress of the lesson. While teaching evolution different types of questions can be asked. These should include questions to test the previous knowledge, introductory questions, developmental questions and review questions. Questions to test previous knowledge should give a clear idea about pupils's present knowledge level. Introductory questions help to introduce the new topic in relation with the previous knowledge. Developing questions are those which are asked during

the progress of the lesson. Review questions should be asked at the end of the lesson. Such questions are helpful to know how far the pupils have learned.

Discussion is another instructional experience to a great extent. Important aspects of evolution can be recognized through discussion.

Instructional experiences with the help of specimens, models and diagrams are effective methods.

Observation of natural phenomena such as seed germination, growth of plants and animals, differences between parents and offspring and similarities of parents and offspring is another useful instructional method.

Short films and film strips relating to organic evolution can be effectively utilized for instruction

Experimentation is another valid method for instruction. Say for example, students should be encouraged to conduct experiments to disprove self-generation theory of evolution

Field trip is a method, which has profound use in the instruction of this unit. Trips to museum, zoo, places of evolutionary importance, tissue culture farms, agriculture farms and animal farms will be helpful to understand varieties and other important processes of evolution.

4. Learning Aids

Various learning aids, that are useful for the instruction of the given unit are as follows.

- i. Pictures and diagrams of ancient earth, plants and animals, to show the life at ancient time.
- ii. Models and charts of unicellular and multicellular living beings to develop the concept of complexities and bio-diversity through time.
- iii. Photographs, diagrams and descriptions on fossils to express the nature of palaeontology and its significance in evolution.
- iv. Specimens and diagrams of developmental stages of different animals to exhibit recapitulation of ancient characteristics during the development of embryos and to show the embryological evidences of evolution.
- v. Pictorial view of taxonomy to understand the taxonomical evidences of evolution.
- vi. Diagrams of forelimb bones of different animals to show the structural similarities as an evidence of evolution.
- vii. Photographs, or diagrams of different human ancestors to develop the concept of human evolution
- viii. Film strips and films on fossils and collection of fossils, to understand the available evidences of evolution.

5. Bibliography.

In this section the various sources from where the subject matter outline and other content of the unit are obtained are to be given. These should include the author, title of the article, name of book or journal, page numbers, publishing company and year of publication.

Say for example if the material is taken from a book, it should be given as follows :

Sharma, S.D. (1990). Methods of science teaching (1st edn) New delhi : Sterling, 120-125

If the material is from the journal, it should be given as follows:

Suresh. D. (1994), Human Evolution. In journal of Biology Vol. 7. (P 110-115)

You should also give appendices if present in bibliography. If any terminology required special reference, it will also be given in the bibliography.

6. Sample Test.

Sample test items may be written down if necessary or the teacher may develop and use test of one's choice. Test should include different types of test items such as objectives type, short answer type and essay type items. The details of different type of test items and their development is given in block 6 Unit 2. You should utilize those principles to develop, test of your choice. One sample item for each type of question is given here as follows.

Objective type

1. The study of fossil is termed as

Short answer type.

2. What is meant by recapitulation of ancestral characteristics ?

Essay type

3. Human body has many limitations, even though human being have become the most powerful species. How ? Explain.

This is an illustration for a resource unit. You should develop and use resource units of your own choice for each unit in biology you have to teach.

6.5 LET US SUM UP

We have discussed various aspects of a resource unit in this unit. The major points of our discussion can be summarized as follows.

A) The components of a resource unit are

- i) list of possible instructional objectives
- ii) Subject matter outline
- iii) instructional experiences
- iv) learning aids
- v) bibliography, and
- vi) sample test.

B. The major steps in developing a resource unit are.

- i) Collection of data
- ii) Preparation of materials, and
- iii) Organisation of materials

C) Collection of data involves, the ways to collect data, sources of data, and what all things should be collected.

D) Preparation of materials involve developing instructional objectives, instructional experiences,

- D) Preparation of materials involve developing instructional objectives, instructional experience instructional aids and testing tools.
- E) Organisation of materials involves ordering of materials, sectioning and numbering

Check your progress - Possible answers

1. *A resource unit should have six components. The first one is instructional objectives. Which explains the objectives to be achieved by learning the unit. Subject matter outline is the second component, which expresses clear picture of the component area to be learned. Third component is instructional experiences, which deal with the suitable experiences for the fourth component which identify all the necessary learning aid for sources of content, appendices and importan. which are directs how to test learning of the given unit.*
2. *There are mainly three steps in developing a resource unit. Collection of data is the first step. This include what should be collected, sources of data and how to collect relevant data. Second step is preparation of instructional objectives, instructional experiences, learning aids, an testing tools, the third step is organisation of materials, which includes ordering of materials, structuring and numbering of sections and sub section.*

ASSIGNMENT QUESTION

- A) *Briefly comment on the various media and materials for teaching biology.*
- B) *Develop a resource unit for the unit Health science.*

Note : Space is not given for writing the answer. So, you should write your answer in separate sheets.

SOURCES

Brow, J.W., Lewis, R.B. & Harclerod, F.F. (1973) *AV Instruction : Technology, Media & Methods*. New York : Mc Graw Hill.

Cable, R. (1970) *Audio-Visual Handbook*. London : University of London.

Falk, D. (1971) *Biology Teaching Methods*. New York : John Wiley & Sons Inc.

Kaufmann, P. B. Mellichemp, T.L. Lacy, J.G. Larcox, J.D.(1983) *Practical Botany*. Reston PUB.

Morholt, E. Branswein, P.F., Joseph A. (1958). *A source book for Biological Sciences*. New York : Harcourt Brace & World Inc.

Pierce W.D. Lorber, M.A., (1971) *Objectives and Methods for Secondary Teaching*. New Jersey : Prentice Hall Inc.

Vaidya, N. (1971) *Impact science Teaching*. New Delhi : Oxford & IBH

Washton, N.S. (1967). *Teaching Science Creativity*. London. W.B. Saunders & Co.

BLOCK 6 STRATEGIES OF EVALUATION IN BIOLOGY

Unit- 1 meaning of Evaluation

Unit - 2 Test Construction

Unit - 3 Self reporting techniques

Unit - 4 Observational techniques

Unit - 5 Miscellaneous Techniques.

Unit - 6 Case Study

Unit -7 Scoring and Grading

Unit - 8 Diagnostic Testing and remedial Teaching.

Unit -9 Self Evaluation.

BLOCK 6 STRATEGIES OF EVALUATION IN BIOLOGY

BLOCK INTRODUCTION

Though all the earlier blocks we were dealing with all essential details which are contributing finally to effective classroom instruction. When we prepare for instruction we start with long term and short term objectives. Therefore, after a specific length of instruction, knowing whether the objectives are realised or not also becomes essential. This step in education is known as evaluation. This Block deals with the details of educational evaluation.

The block has nine units. They are

1. Meaning of evaluation
2. Test Construction
3. Self reporting techniques
4. Observational techniques
5. Miscellaneous techniques.
6. Case study
7. Scoring and grading.
8. Diagnostic testing and remedial teaching.
9. Self evaluation.

The purpose of the block is to give you basic orientation to evaluation, choosing appropriate techniques of evaluation and applying the knowledge in your class room evaluation.

Unit. 1 discusses the concept, need and rationale for evaluation, how to evaluate, types of tests, minimum levels of learning and internal assessment.

Unit 2 discusses the details of test construction such as phase of testing, types of test items planning for testing and preparing test question paper.

Unit 3, 4, 5 and 6 discuss the various techniques of evaluation other than testing. self reporting techniques, observational techniques, miscellaneous techniques and case study are covered in these units. The concept and details of development of each techniques are discussed in detail.

Unit.7 discuss the details of scoring and grading. Procedure for scoring and grading are described. The bases of grading and formulae for calculating grades are also given.

Unit 8 discuss the details of diagnostic testing and remedial teaching. The concept, planning and development of diagnostic test and preparation of diagnostic chart are described. The meaning and organising details of remedial teaching also are discussed.

Unit 9 discusses the concept, purpose and methods of self evaluation. Techniques of self assessment also are described.

UNIT I MEANING OF EVALUATION

Contents

- 1.0 Objectives
- 1.1 Introduction
- 1.2 The concept of evaluation
- 1.3 Why evaluation
- 1.4 What is to be evaluated
 - 1.4.1 Instructional objectives
 - 1.4.2 Taxonomy of objectives
- 1.5 How to evaluate
- 1.6 Types of tests
 - 1.6.1 Purpose - specific - tests
 - 1.6.2 Mode - specific tests
 - 1.6.3 Process - specific tests
- 1.7 Minimum levels of learning.
- 1.8 Internal assessment
 - 1.8.1 Models of internal assessment.
- 1.9 Let us sum up.
- 1.0 **OBJECTIVES**

Evaluation is the integral part of teaching at any stage. In this unit you will see the details of the concept of evaluation, the rationale for evaluation, minimum levels of learning and internal assessment. At the end of this unit you will be able to:

- * interpret the concept of evaluation
- * identify the need of evaluation.
- * distinguish among different educational objectives.
- * identify the techniques and tools of evaluation.
- * distinguish between different types of tests.
- * interpret the meaning of minimum levels of learning.
- * develop a positive attitude towards internal assessment.

1.1 INTRODUCTION

Evaluation is the part and parcel of any system of education. We are using a variety of techniques for evaluating our pupils. The techniques of evaluation are very important and should adopt sensible and suitable methods for different purposes. So you should be well in touch with the basic aspects of evaluation. You have to answer three questions so as to help you to understand the concept of evaluation.

Now it is clear that evaluation is essential, so naturally the question arises that what is to be evaluated? Let us try to answer this question.

We have seen that, desirable behavioural changes are the target of education. These desirable behaviour changes are other wise termed as educational objectives or instructional objectives. This term may be a familiar one to you. So evaluation aims of determining, how well educational objectives have been attained. Now it is essential to know the important instructional objectives. So, let us have a discussion on major instructional objectives.

1.4.1 Instructional Objectives

Since education aims at developing desirable changes in behaviour, each instructional objective stands for developing of a particular behaviour. Each instructional objectives should be stated in behavioral terms so as to facilitate measurement of the observable behaviour. You know that, planning and designing of instruction is based on objectives. Suitable learning experiences should be used, to develop the behaviour upto the dissired level. Then you should measure only the observable behaviour. So we have to state the objectives in observable form. Say for example you can not observe directly whether a student knows all the components of the ecosystem. Here the listing will help you to know whether the students know a partifular thing or not.

Now we will see the important instructional objectives. You know that there are three domains of instructional objectives such as cognitive domain, affective domain and psychomotor domain.

Cognitive domain involves, knowledge, intellectual ability and intellectual skills. Affective domaine involves attitude, appreciation, social and emotional adjustment, will character etc. And the psychomotor domain involves muscular skills and co-ordination. So you can understand that, there are a variety of objectives and specifications under each domain and a variety of evaluation techniques are essential to measure the attainment of all objectives. The details of objectives under each domain is given in subsection 1.4.2.

Check your progress 2.

Bring out the importance of instructional objectives in evaluation.

- Note :*
- a) Space is given below to write your answer;
 - b) Compare your answer with the one given at the end of this unit.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

1.4.2. Taxonomy of Objectives

1.4.2. Taxonomy of Objectives

Taxonomy means systematic classification. Here we will see the classification of objectives under cognitive affective and psychomotor domains. Cognitive domain is usually given more emphasis as far as the classroom instruction is concerned.

The detailed classification of cognitive domain is given in table 1.

Table 1. Classification of Cognitive Domain.

Category	Objectives	Action verbs
A Knowledge	<ol style="list-style-type: none"> 1. Knowledge of specifics 2. Knowledge of terminology 3. Knowledge of specific facts 4. Knowledge of conventions 5. Knowledge of Trends and sequences 6. knowledge of classification & Categories 7. Knowledge of criteria 8. Knowledge of methodology 9. Knowledge of Universlas & abstractions 10. Knowledge of principles & generalisation 11. Knowledge of theories and Structures. 	<p>Recall</p> <p>Recognise State, list.</p> <p>Name give,</p> <p>describe</p>
B. Comprehension (Understanding)	<ol style="list-style-type: none"> 1. Translation 2. Interpretation 3. Extrapolation 	<p>Translate, Illustrate, detect, identify, classify, interpret, compare, select, descriminate explain, calculate, re arrange, manipulate.</p>
C. Application	<ol style="list-style-type: none"> 1. Reasoning 2. Definition 3. Suggestion 	<p>Make (hypothesis, establish relation, give reasons, reason out, draw inference predict, define.</p>
D. Analysis	<ol style="list-style-type: none"> 1. Analysis of elements 2. Analysis of relationships 3. Analysis of organisational principles 	<p>Analyses, suggests, findout relation, identify the assumptions, state the theory of principle, predict the effect, specify the limitations.</p>
E. Synthesis	<ol style="list-style-type: none"> 1. Production of unique communication 2. Production of a plan or proposed set of operations. 3. Derivation of a set of abstractions 	<p>Communicate, Organise, derive, produce, formulate a hypothesis, make a generalisation propose an experiment interpret the data.</p>

F Evaluation	<ol style="list-style-type: none"> 1. Judgement based on internal evidence 2. Judgement based on external evidence 	<p>Judge, evaluate defend your position, justify, discuss, critically, find the fallacy in..</p>
--------------	--	--

In table 1 the detailed classification of cognitive domain as its categories, objectives and action verbs for each specification are given. The objective under cognitive domain are classified into six categories such as knowledge, comprehension (understanding) application, analysis, synthesis, and evaluation. Each of these objectives should be stated in observable, measurable and attainable forms. Such specific objectives are otherwise termed as specification. Specific objective have two parts such as an action verb and a content part. Action verb is a specific verb used to represent an action in relation to pupils learning behaviour. Such as pupil recalls, explains applies, etc. The content part of the specification will have to change with different content and the action verbs can remain the same.

Statement of objectives in observable and measurable form alone gives direction in evaluation. An example for correct statement of an objective in behavioural terms is given below.

Statement of objectives

General Statement

- a) Knows a synonym for animal (Such as living being, creature)

Statement in behavioural term

- b) Writes (or states or selects) a synonym for the term animal.

You should formulate objectives in behavioural terms using each action verb (Given in table. 1) and the related content part.

Now we will see the classification of affective domain in table.2

Table.2 Classification of affective Domain.

Category	Objectives	Action Verbs
A. Receiving (attending)	<ol style="list-style-type: none"> 1. Awareness 2. Willingness to receive 3. Controlled or selected attention 	<p>becomes aware becomes willing.</p> <p>directs, holds.</p>
B. Responding	<ol style="list-style-type: none"> 1. Acquiescence in responding 2. Willingness to respond 3. satisfaction in response 	<p>responses, satisfies.</p>
C. Valuing	<ol style="list-style-type: none"> 1. Acceptance of a value 2. Preference of a value 3. Commitment 	<p>accepts prefers appreciates</p>
D. Organisation	<ol style="list-style-type: none"> 1. Conceptualisation of a value 2. Organisation of a value system 	<p>Conceptualises.</p> <p>Generalise.</p>
E. Characterisation by a value or value complex	<ol style="list-style-type: none"> 1. Generalised set 2. Characterisation 	<p>Characterises.</p>

Now we shall try to answer the questions. "how to evaluate" ?

1.5 HOW TO EVALUATE

Now, we shall discuss various procedures of evaluation which help to measure attainment of educational objectives and personality changes of your students. The following are various evaluation techniques and tools to measure behavioral changes in students

The important techniques of evaluation can be classified as follows.

- i) Achievement testing (See U.2)
- ii) Self - Reporting techniques (See U.3)
- iii) Observational techniques (See U.4)
- iv) Miscellaneous techniques (See U.5)
- v) Case study technique (See U.6)
- vi) Diagnostic testing (See U.7)

There are specific tools for evaluation under each technique. The tools under each technique are given below and their detailed discussion is given in the units noted within brackets.

- | | | | |
|------|--------------------------|---|--|
| i) | Achievement testing | - | Achievement test |
| ii) | Self-reporting technique | - | Inventory, Questionnaire, Opinionnaire and check list |
| iii) | Observational technique | - | Observational check list, Rating scale, situational test and anecdotal records |
| iv) | Miscellaneous techniques | - | Analysis of records & documents Interview sociometry Guess who technique and social distance scale |
| v) | Case study technique | - | All tools |
| vi) | Diagnostic testing | - | Diagnostic test. |

Tests can be classified on the basis of content, format, mode of construction and mode of administration.

Among the test listed above the tests measuring achievement are in the familiar tests. Achievement test is most important as far as class room teaching is concerned, because you have to use achievements tests frequently. Other techniques such as sociometric techniques, observation, interview, anecdotal records, etc are also useful in evaluating pupil behaviour

Techniques of sociological nature will help you to determine the socio-emotional development, acceptance, leadership qualities, adjustment problems, etc. of your students. You shall get the detailed discussion of such techniques in Units. 3,4,5, & 6 of this 'Block'.

First of all we shall discuss different types of tests.

Check your progress 4.

Which are the important techniques and tools of evaluation.

- Notes :
- a) Space is given for your answer
 - b) Compare your answer with the one given at the end of this unit.

1.6 TYPES OF TESTS

You know that tests are tools, specified for measuring something through the process of testing and this measurement helps us in evaluation. Different types of tests serve for checking the realisation of various purposes of education. These tests may be catagories into three such as.

- a) Purpose - Specific types
- b) Mode - Specific tests and
- c) Process - Specific tests.

Though we have categorised the tests into three, there can be inter relations between them and we could not separate them into water tight compartments. Now let us discuss each of these categories in detail.

1.6.1 Purpose - Specific Tests.

This category involves, those tests which are designed to achieve specific purposes. The major coming under this category are ,

- * diagnostic tests,
- * aptitude tests,
- * achievement tests, and
- * proficiency tests.

Let us see the features of each one briefly.

Diagnostic tests. You know the diagnostic tests help us to identify the points where the learners need remedial teaching. These will help us to know actually what students know, and what they do not know. In order to serve this purpose diagnostic tests should be prepared by covering all details of the given content. (We will have a detailed discussion on diagnostic tests in Unit 8 of this block).

Aptitude test : These types of tests help to identify special abilities in particular areas. These abilities should be the indicative of future performance. Aptitude for different profession, musical aptitude, aptitude for teaching, etc. can be measured separately. These tests are generally used to select people for courses requiring speical abilities. (The modern concept of aptitude is discussed in Block 4, Unit 6.)

Achievement test: You may be familiar with the purpose of achievement tests. They are used to measure the extend to which the the instructional objectives have been realised. These tests are usually designed on the basis of the prescribed syllabus for each subject and standard.

Proficiency test Proficiency tests usually used to assess the general ability of a person at a given time. practical test for proficiency in type writing is an example for proficiency test.

1.6.2. Mode - specific tests

In mode - specific category of tests we can include five pairs of tests types. Tests in each pair are different from the another on the basis of the nature of the test. The main categories are as follows.

*	Formal assessment	VS	informal assessment
*	Formative assessment	VS	summative assessment
*	Course work	VS	examination
*	Process	VS	product assessment
*	Internal assessment	VS	External assessment.

Formal assessment VS informal assessment

Formal assessment is used for selection on the basis of any special achievements for scholarships or awards. This should follow a standardised pattern. The assessment result should be open to public. Merit scholarship is an example for formal assessment.

Informal assessment may be conducted informally to understand the present nature of a given issue. A series of questions to know the pollutants in a locality is an example for informal assessment.

Formative assessment VS Summative assessment

Formative assessment is assessing the progress in attainment at regular intervals. Formative assessment helps to identify learner weakness and help learning more easily. Unit tests are example for formative assessment.

Summative assessment or terminal assessment is done at the end of a course, which aims at certifying or grading the attainment. Example S.S.L.C Examination.

Course work VS Examination ;

Both of these serve the purpose summative evaluation. Course work may be taken as an index for learner assessment in some cases. Practice teaching during B.Ed training is an example for course work and its evaluation is the assessment on the basis of the course work.

Examination is a very familiar form of assessment. You are conducting examinations, after completing each unit. Example unit tests.

Process VS product assesment These types of evaluation is done in experimental and research work. You can assess the performance at different stages leading to the completion of the work or course. This is process assessment. And you can make assessment on the basis of the final result then it is product assessment.

Internal assesment Vs External assesment

Internal assessment is evaluating internally by the person responsible for teaching. Both academic and non-academic achievements are considered for internal assessment. In external assessment the evaluator is an outsider that is from other institution or other state. You may remember the external commission evaluating your teaching performance externally during your B.Ed training.

1.6.3. - Specific tests

Process - specific Tests

Process - specific tests can be categorised on the basis of its construction. The major types of tests coming under this category are.

to learn the basic aspects for essential aspects of the subject. Say for example, in order to learn a new language, first of all learning the alphabets of that language is essential.

Likewise, study of mathematics require the knowledge of basic mathematical operations such as, addition, deletion, multiplication and division.

The basic aspects or essential aspects of every subject act as the foundation for learning the subject in depth. If one does not learn the basic aspects of a subject, he will not be able to study the subject in depth.

The learning of these basic aspects or essential aspects of a subject is referred to as minimum level of learning of that subject. The minimum level of learning required to study a subject will have to change according to the change in the depth of learning. So the minimum level of learning science at secondary level is entirely different from that of the primary level. The essentials of science at the secondary stage, act the minimum level of learning of science at the higher secondary level.

As teachers you must know the minimum level of learning biology at secondary level. They are, the knowledge of living beings, characteristics of living being, important life processes, and economic aspects of living beings, you should test the students' to know whether they have attained the minimum level of learning. If your students do not learn these aspects, you should help them to learn the essential basic aspects.

Check your progress 6

What is the significance of minimum levels of learning in the teaching of biology.

- Notes :**
- a) ***Space is given for your answer***
 - b) ***Compare your answer with the one given at the end of this units.***

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

1.8 INTERNAL ASSESSEMENT

Internal assessment is a specific form of evaluation. We need to make two types of measurement namely quantitative and qualitative measurement. Quantitative measurement ois usually done by examinations. But qualitative measurement can be obtained by internal assessment. Internal assessment means assement of learners continuously by the teacher himself. Both academic and non-academic achievement should be considered for internal assessment. Thus internal assessment helps us to give a comprehensive picture of the students' achievement. Internal assessment also helps us to evaluate the attainment of the long range objectives. Now, let us see the different modes of internal assessment.

1.8.1 Modes of Internal Assessment

We can identify different modes of internal assessment. The first mode of internal assessment is through tests.

Various techniques such as achievement testing, self-reporting techniques observational techniques, miscellaneous techniques, case study and diagnostic testing are being used for evaluation.

Minimum levels of learning means the basic and essential aspects of every subject which could be learnt in lower classes and is necessary for further learning.

Written tests laboratory work, assignments, participation in curricular and co-curricular activities should be considered for internal assessment.

CHECK YOUR PROGRESS - POSSIBLE ANSWERS

1. *Evaluation is a process of value judgement based on certain measurement of students achievement or activities.*

Evaluation has a directive role in making desirable behavioural changes. Evaluation helps us to determine which all objectives are realised, how far they are attained and the nature and extent of behavioural changes.

2. *Each instructional objective stands for a particular behaviour. So attainment of an objective means acquiring that behavioural change. Through evaluation we could judge the observable and measurable form. So instructional objectives are very essential as far as evaluation is concerned.*

3a) *Observable, measurable and attainable form of behaviour is termed as a specific objective or specification.*

Action verb is usually used to describe an action in relation to acquiring a behaviour.

b) *Formulation of objectives in behavioural terms requires appropriate action verb and relevant part. Action verb should come first followed by the content part.*

4 *The important techniques of evaluation are as follows :-*

- | | |
|-------------------------------|--------------------------------|
| i) Achievement testing | (ii) Self-reporting techniques |
| iii) Observational techniques | (iv) Miscellaneous techniques |
| v) Case study technique | (vi) Diagnostic testing |

The tools for evaluation under each techniques are the following :-

- | | | |
|--------------------------------|---|--|
| i) Achievement testing | - | Achievement test |
| ii) Self-reporting techniques- | | Inventory, Questionnaire, Opinionnaire and check list. |
| iii) Observational techniques- | | Observational checklist, Rating scale situational test and anecdotal records. |
| iv) Miscellaneous technique | - | Analysis of records and documents, interview, sociometry, Guess who technique and social distance scale. |
| v) Case study technique | - | All tools. |
| vi) Diagnostic testing | - | Diagnostic test. |

5. *Purpose - specific tests such as diagnostic tests, aptitude tests, achievement tests, and proficiency tests.. Mode-specific test such as formal assessment informal assessment, formative assessment, summative assessment, course work, examination, and internal assessment.*

Process specific tests such as teacher-made tests, standardised tests, norm-referenced test and criterion referenced test.

6. *Minimum level of learning means the learning of basic or essential aspects of a subject, which is necessary for further learning of the subject. As in the case of other subjects, learning of biology at secondary level also requires certain minimum levels of learning. Knowledge of such minimum levels helps the learners to attain mastery learning.*

7. *Internal assessment means assessment of learners continuously by the teacher himself.*

Various means to do internal assessment are oral or written tests, laboratory work, assignment, participation in sports and games, and participation in co-curricular activities.

UNIT 2 TEST CONSTRUCTION

Contents

- 2.0 Objectives
- 2.1 Introduction
- 2.2 Phases of testing
 - 2.2.1 Planning for testing.
 - 2.2.2 Design of the test
 - 2.2.3 Developing a test.
 - 2.2.4 Administaring the test.
 - 2.2.5 Communication of test result.
- 2.3 Types of test items
 - 2.3.1 Selection - type item formats
 - 2.3.1.1 Multiple choice items
 - 2.3.1.2 True or false items
 - 2.3.1.3 Matching -type items.
 - 2.3.2 Supply - type item formats
 - 2.3.2.1 Completion type items
 - 2.3.2.2 Short answer type items
 - 2.3.2.3 Essay - type items.
- 2.4 Planning for testing
 - 2.4.1 Specify course content and objectives
 - 2.4.2 Selection of appropriate item format.
- 2.5 Preparing test question paper
 - 2.5.1 Instructional objectives
 - 2.5.2 Blue print
 - 2.5.3 Formulation of questions.
 - 2.5.4 Scoring key.
- 2.6 Let us sum up.
- 2.0 OBJECTIVES

Testing is a familiar term for you. In daily teaching, you have to use **different types** of tests to evaluate pupils' achievement. This unit is meant for providing details of **classroom testing**, types of test items, and preparing test question paper. At the end of this unit you will be able to

- * identify the phases of testing.
- * develop different types of test items.
- * develop an awareness about planning for testing.
- * develop test question paper for an achievement test.
- * develop a positive attitude towards classroom testing.

2.1 INTRODUCTION

In our life, we have to face a number of tests of different types. Testing is usually done for assessing particular changes in behavior. If you want to administer a test, the testing techniques should be familiar to you. A poorly constructed test does not serve the purpose of the test.

In this unit you can see various aspects of testing such as phases of testing, types of test items, preparing test items, and preparing test question paper. First of all we shall discuss phases of testing in detail.

2.2 PHASES OF TESTING

You know that educational evaluation is closely related to teaching. You should use a variety of testing techniques to evaluate student's performance of student. Usually, you should develop various tests to assess the performance of test development. There are different phases in development of tests. Before we discuss these phases in detail you may do the following learning activity.

Learning Activity 1

You are familiar with test construction, in your opinion, what are the steps in test construction.

Notes : a) Space is given for your answer

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

You may have suggested the following steps for test construction.

Deciding topic, writing test items, fix number of test item, and scoring key for tests. We have to discuss each of these steps and some other steps as phase of testing. Mainly there are five phases for classroom testing. They are planning, design, development, administer the test, and communication of result. Let's discuss each one in detail.

2.2.1 Planning for Testing

This is the first phase of classroom testing. You know that planning is the first phase of every activity. Proper planning is essential for the success of every programme. Suppose you are going to conduct a unit test on control coordination.

How will you plan for the test ?

Learning Activity - 2

What are the essential points of planning for a unit test in the unit 'Control and Coordination'?

Notes : a) *Space is given for your answer*

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

You may have opined that the date, duration, and time of the test should be planned in advance. Exactly, you must do these. But along with these aspects, you should consider the following components as the main concern at planning phase. The main components are instructional goals and objectives, expected level of learning outcomes, and provision of remedial work. Let's see each of these components in detail.

Instructional goals will be a familiar aspect for all of you instruction usually aims to attain specific goals or objectives. You should have written instructional objectives for each lesson that you have to teach. So, you should first of all identify the instructional objectives of the unit.

You will have some expectations about your student's performance. You have expected a particular level of achievement from each individual and the group as whole. Say for example, you are teaching at 10th Standard. So naturally, you may expected that the front benchers will be high achievers than back benchers. This kind of assumption about achievement is referred to as expected level of learning outcomes.

Another thing we should consider while planning is the provision remedial work. Though remedial work comes after interpretation of test result, you should ready for it early enough. The details of remedial work is given in unit 8. We have more discussion about planning section 2.4.

Now, we shall pass on to the second phase of testing, that is design of test.

2.2.2 Design of the test.

The design means, structural specification of the test. Structural specification includes type of test, type of test items, objectives of the unit, difficulty level of test items, scoring key and marking scheme. All these aspects together be termed as blueprint of the test. We shall discuss blue print in detail in sub sec. 2.5.2, now we have not gone into the details of the blue print. What you should do at this phase is to make the blue print of the test. In doing so, you should select different types of test items namely multiple choice type, short answer type and essay type. You should fix the number of items in each type of items. And these items should be based on objectives of the unit. You should then make the blue print in tabular form, as given at towards the end of the unit under 2.5.2.

Now we shall pass on to the third phase of testing, that is developing, a test.

2.2.3 Developing a test.

Now you are ready to develop a test of your choice as you have prepared the blueprint. The

2.3 TYPES OF TEST ITEMS

We have discussed different types of tests in section 1.6 of Unit 1. We shall now discuss about different types of test items. So, naturally the question arises that what is an item? An item means a question. In response to an item the testee has to express what is supposed to have acquired during instruction. Usually a question or an item is based on a specification of an educational objective, which demands a response from the learner. Such responses are subject to evaluation. Usually items are arranged in item formats. An item format means the format or the style of a question; say for example a multiple choice item, completion type item etc. We will discuss some item formats below. Item - formats are classified mainly into two categories namely selection type and supply-type item formats.

3.1 Selection-Type Item formats

In selection type item format, answers are provided along with the items. The answers are given in a cluster of similar type of incorrect answers. Learners have to choose the correct answer from the group of answer. Since there will be only one correct answer for these items, the scoring can be done objectively. Therefore, they are known as objectives type also. Three types of item can be included in this item and matching-type items. Let us discuss each of these in detail.

2.3.1.1. Multiple Choice items:

Multiple choice items are essential part of any achievement test. So you may be familiar with this type of items. In this type the learner has to choose the correct answer from the given options, normally four in number. These types of items should be either in the form of an incomplete statement or as an interrogative question. Let us see the following example.

Item No. 1

Animals live in water are called

- A. Fishes
- B. Water beings
- C. Aquatic animals
- D. Terrestrial animals.

Box for correct answer

Item No. 2

Which one is a renewable natural resource ?

- A. Iron
- B. Rubber
- C. Petroleum
- D. Aluminium

Box for correct answer

Item 1 is an example for an incomplete statement form and item 2 is an example for interrogative question form.

2.3.1.2 True or false items:

In this type learner should select the correct answer from the two given alternatives. True or False items are usually represented as statements. Learner can make his/her response by putting a tick mark at the relevant place. Let us see an example.

Item 3

State whether the following statements are true or False. Mark your answer by putting a tick mark in the appropriate box.

1.	a)	Number of carnivorous animals in a locality have no relationship with the number of herbivorous animals in the locality.	True	False
			<input type="checkbox"/>	<input type="checkbox"/>
	b)	Wood is a renewable natural resource.	<input type="checkbox"/>	<input type="checkbox"/>

The third type of item that belongs to selection type is the matching type.

2.3.1.3. Matching Type items

Matching type items can be used, when the content has a number of related concepts, say for example scientists and their inventions books and authors, animals and their habitats, and so on let us see an example for matching- item.

Item No: 4

Match the words in column A with the words in column B. Put appropriate number in the box provided.

A		B
1. Grass Hopper	<input type="checkbox"/>	a. Environmental destruction
2. Petroleum	<input type="checkbox"/>	b. Pollution
3. Aswan dam	<input type="checkbox"/>	c. Primary consumer
4. Acid rain	<input type="checkbox"/>	d. Non-renewable resource
		e. Nanga river

Now we shall see the supply type item format.

2.3.2 Supply type item formats

Supply type item requires supply of responses in relation to the questions. In certain items types only one word is required as answer, but in some other item types very long response are necessary. In this category of item format also there are three types of items. They are completion type items, short answer type items and essay type items. Let us discuss these items in detail.

2.3.2.1. Completion type item

In completion type items, the learner should supply one word or two words to make the statement complete and meaningful. The format of this type comprises of incomplete statement. You should take care to make it clear. What is actually needed to complete the statement. See the following example.

Animals living on-----

Here the learner can not give correct answer, because the statement is a bit confusing. So you should restate the item as follows so as to direct the learner to know what actually we expect from him

Each animal is living on its particular-----

You should always take care while preparing such items. These completion - type items also are objectively - scorable.

Now we shall see the short answer type items.

2.3.2.2 Short-Answer type items

Short answer type items are also the essential component of an achievement test. So you may be familiar with this type of items. Short answer type items are useful to measure abilities such as analysis synthesis and evaluation. Learner should be thorough with the use of language and diagrams in order to answer such questions. Here also you should state the question clearly so that the scope should be clear. See the following example.

Write short notes on pollution.

This type of question statement is defective so let's try to modify the item as follows.

Write in about fifty words the lethal effects pollution on environment.

If the question is not clearly stated, the learner may not answer correctly or up to the required depth of the content.

2.3.2.3. Essay type items

Essay type item also may be familiar type for you. Essay type items helps us to measure.

- a) Learner's ability to use language.
- b) Learner's ability in organization and presentation of data precisely and accurately.
- c) It also helps to measure abilities such as application, analyses, synthesis and evaluation. You should take care to state the question clearly and to give necessary directions such as length of the answer. See the following example.

Write an essay in not more than 200 words about air pollution its causes, lethal effects and preventive measures.

There are different item formats which could be utilized for test construction. Now we shall pass in to planning for testing.

Check Your progress. 2

Which are the major type of test items

- Notes :
- a) *Space is given for your answer*
 - b) *Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

.....
.....
.....
.....
.....

2.4 PLANNING FOR TESTING

We have seen that thorough planning is essential for testing. So let us discuss the aspects included in planning. In the first step you should specify course content and objectives.

2.4.1. Specify Course content and objective

Once you plan to evaluate your students, then you should specify the actual content area on which the test should be developed. Now, naturally a question will arise as to what is to be evaluated. Now you have to evaluate the achievement of pupils. We have defined achievement in terms of attaining instructional objectives. So, you should evaluate whether those objectives have been realized or not. Say for example you decide to conduct the test on the unit 'Our environment'. You should test the realization of objectives such as draw inferences, establish relationships, interpret cause-effect relationship, sketch labelled diagrams and so on. In order to test the realization of these objectives you have to select appropriate item formats.

2.4.2 Selection of appropriate item format

Several item formats are available to use in variety of situations. The selection of item formats depends on

- i) the content area.
- ii) Purpose of the test, and
- iii) duration of the test.

You have to select necessary number and types of item formats as per your need. You should involve necessary number of objective type, short answer type and essay type of items.

Check your progress 3.

Bring out the essential aspects of planning for testing.

- Notes :
- a) Space is given for your answer
 - b) Compare your answer with the one given at the end of this unit.
-
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

2.5 PREPARING TEST QUESTION PAPER

We have already discussed different types of item formats and planning for testing. Now, let us see the aspects in construction of test question paper.

2.5.1. Instructional Objectives

You have to list out the instructional objectives, as the first step in the construction of a question paper. This listing will help you to determine the required number of items under the format along with the objectives and specifications. They are given as follows. K-Knowledge, U-Understanding, A - Application, S- Skill, K Recalls, K (Recognize), U (discriminates, compares, classifies, detect, site illustrations, varifies, generalizes, etc.), A (Analyses, Formulate Hypothesis, Judges, give reasons, etc.), S (Measures, reads, records, sketches, draws etc.). Once you had enlisted the objectives, then you should develop a blue print.

2.5.2 Blue print

Blue print is a three dimensional chart showing the type of items, objectives and number of items in each category. You may have developed blue print at the time of your B.Ed course. Now let us see the major steps in designing a blue print. These steps involve assigning weightage to content, objectives, difficulty level, and type of items, scheme of options and scheme of sections. Now let us see the details of each step for developing a blue print for a unit test on the unit cell.

1. Weightage to content.

In this step the content areas are to be tested and weightage for each content should be marked. See table 4.

Table 4 Weightage to content

Sl.No.	Content	Marks out of 25	%
1.	Cell Theory	8	32
2.	Electron microscope	2	8
3.	Cell orgavells	6	24
4.	Animal tissue	3	12
5.	Plant tissuc	4	16
6.	Connective tissue	2	8
	Total	25	100

2. Weightage to objectives

The second step is fixing of weightage to objectives ie. by allotting marks to each objective as per its importance.

See table 5. Weightage to objectives

Sl.No.	Objectives	Marks out of 25	%
1.	Knowledge	7	28
2.	Understanding	10	40
3.	Application	5	20
4.	Skill	3	12
	Total	25	100

3. Weightage to difficulty levels

In this step proportionate weightage should be given according to the difficulty level of questions. See table to 6.

Table 6. Weightage to difficulty levels

Sl.No.	Difficulty level	Marks out of 25	%
1.	Essay questions	7	28
2.	Average difficult questions	14	56
3.	Difficult questions	4	16
	total	25	100

4. Weightage to type of questions

In this step proportionate weightage should be assigned to type of questions as shown in table 7

Table 7, weightage to type of questions

Sl.No.	Type of questions	Marks out of 25	%
1.	Objective type	10	40
2.	Short answer type	12	48
3.	Essay type	3	12
	total	25	100

5. Scheme of options

At this step the details of options if any should be given. In the present test no option is given.

6. Scheme of sections

Questions should be arranged into sections such as part A, B & C at this step.

All these step should be included in the design of blue print as shown in figure 11.

Blue print for the unit test.

Unit - cell

Standard VIII

OBJECTIVES Type of Questions Content	KNOWLEDGE			UNDERSTANDING			APPLICATION			SKILL			TOTAL
	O	S	E	O	S	E	O	S	E	O	S	E	
1.Cell theory	(1) 2	(2) 1		(1) 1			(1) 1	(2) 1					(8) 6
2. Electron microspore								(2) 1					(2) 1
3. Cell Organelles	(1) 1			(1) 2								(3) 1	(6) 4
4. Animal tissue	(1) 1			(2) 1									(3) 2
5. Plant tissue	(1) 1			(1) 1	(2) 1								(4) 3
6. Connective Tissue					(2) 1								(2) 1
Sub total	(1) 5	(2) 1		(1) 4	(2) 3		(1) 1	(2) 2				(3) 1	(25) 17
Total	6(7)			7(10)			3(5)			1(3)			17(25)

Figure 11. A model blue Print.

Note : Figures inside the brackets denote score for each item figures outside the brackets denote the No. of items. O-Objective type S-Short answer type E-Essay type of questions. You have to consider the content, objectives, type of questions and difficult of level of questions, while preparing blue print.

2.5.3 Formation of questions

Questions of your choice can be prepared on the basis of the blue print. The questions should be arranged in different sections. You have to formulate the items as we have discussed in section 2.3.

Let us see one item each from different type of formats.

Sec A

Eg.1 Cell is discovered by.....

(A Rudolf Vircho, B Robert Hook, C Shlieden D. Theodar Shawn)

1Mark

2.6 LET US SUM UP

In this unit we have discussed phases of testing, types of test items, planning for testing and preparing a test question paper. The phases of testing involves the following phases.

- i) Planning for testing
- ii) Design of the test
- iii) Developing a test
- iv) Administering the test.
- v) Communication of the test result.

The major types of test items are :

- i) Selection type - multiple choice, true or false and matching - type.
- ii) Supply type - completion type, Short essay, & essay.

Planning for testing involves what is to be listed. Specify course content and objectives, and selection of appropriate item formats.

Preparation of test question paper involves fixing of instructional objectives, blue print, formulation of questions and scoring key.

Check your Progress - Possible answers

1. *Phases of testing involves planning for testing, designing the test, developing the test, administrating the test, and communication of the test result. In planning phase instructional objectives, expected learning outcomes and provision for remedial work should be planned.*
2. *The items come under two categories such as selection type item formats and supply type item formats. Selection type involves multiple choice items, true or false items and matching type items supply type involves completion type items, short answer type items and essay type items.*
3. *Major aspects of planning are specification of course content the objective and selection of appropriate item format selection of item format will depend on the content area, purpose of the test and duration of the test.*
4. *Listing of instructional objectives is the first step in the preparation of a test. The development of blue print comes next to this. in order to develop the blue print weightage should be assigned to content. Objectives, difficulty level and type of questions (items). Formulation of question in simple, clear language is another aspects of a test question paper. Preparation of scoring key for the evaluation of the correct answer is the final aspect in the development of a test question paper.*

UNIT.3 SELF REPORTING TECHNIQUES

Contents

- 3.0 Objectives
- 3.1 Introduction
- 3.2 Self-reporting technique-Concept
- 3.3 Inventories
 - 3.3.1 Meaning of inventory
 - 3.3.2 Developing an inventory
- 3.4 Questionnaire
 - 3.4.1 forms of a questionnaire
 - 3.4.2 Developing a questionnaire
- 3.5 Opinionnaire
 - 3.5.1 Opinionnaire - Meaning
 - 3.5.2 Developing an Opinionnaire
- 3.6 Check list
 - 3.6.1 Checklist - Meaning
 - 3.6.2 developing a checklist
- 3.7 Let us sum up.

3.0 OBJECTIVES

Apart from the usual achievement tests, other testing techniques are also use to evaluate many other aspects, of pupils. In this unit we will see the major self reporting techniques meant for assessing various behaviors of children. This includes inventories Questionnaire, Opinionnaire and check lists. At the end of this unit you will be able to:

- * interpret the meaning of self reporting techniques.
- * identify the types of inventories.
- * develop and uses an inventory.
- * develop and use a questionnaire.
- * develop and use checklist.

3.1 INTRODUCTION

Test of the usual type may not serve all purposes of the evaluator. So, you have to know some other evaluating techniques apart from the regular classroom tests. The usual test will give us the information of achievement only. As a teacher, you should know the needs and opinions of your students. Usually students are hesitant to express their feelings directly to their teacher. This unit, you will get the details of self-reporting techniques such as inventory, questionnaire, Opinionnaire and checklist.

3.2 SELF REPORTING TECHNIQUES - CONCEPT

It is as the name indicating a technique used for evaluation in which the students themselves are reporting their own details. The self-expression of the learners, would be utilized through these techniques. This would help us to understand the personnel opinions of learners in many respects.

The major type of self-reporting techniques are inventories, Questionnaires, opinionnaires and check lists.

We shall have a discussion on each of these tools.

3.3 INVENTORIES

The meaning of inventories and its developments are discussed as follows.

3.3.1. Meaning of Inventory:

Inventories lead us to self revealing of students with regard to their various aspects. An inventory attempts to measure a typical behaviour. Say for example musical interest inventory attempts to measure the learners interest in music. Inventories can be developed and used on any particular topic generally interest inventories are used widely to understand the preferences of learned in a particular area.

When we want to collect the respondent's family data, personal data, educational plans, we could inventories. Learner's interest, attitude and personality are also measured using inventories. Now let us see how to develop an inventory.

3.3.2 Developing an inventory

The following points should be born in mind, while developing an inventory

- * Define the general and specific objectives.
- * Construction of appropriate questions or statements.
- * Arrangement of questions in appropriate order
- * Designs appropriate format.
- * Administration of inventory.

Let us see each one in detail.

General and specific objectives

The definition of objectives helps us to formulate appropriate questions, on the basis of the objectives. See the following examples.

Eg: To collect the background data of an individual, which may have bearing on a classroom behavior.

This is an example for a general objective. On the basis of this objective we have to develop a set of specifics objectives and items to gather relevant data about the background of the individual. Say for example collect data about physical facilities at home is a specific objective.

Construction of appropriate questions/Statements : You know what are the essential features of a question. You should state the question/statement clearly. It should be simple terms in an understandable manner. Case should be taken not to involve so many questions. See the following example.

Eg: Do you like reading fictions ? Yes/No.

If, yes do you prefer reading English fictions ? Yes/No/Undecided.

3.4 QUESTIONNAIRE

Questionnaire are used to collect factual informations. They are other wise termed as inquiry forms, as they attempt to inquire about various aspects at the given time. Questionnaire should provide us the data of the existing status of the conditions we are searching for. Now let us see the components of the questionnaire.

3.4.1 Form of a questionnaire :-

A questionnaire may have two forms namely the closed form and an open form.

Closed form :-

Questionnaire that demand restricted response is classed as closed form. Say for example one item requiring the responses either YES or NO is a closed form.

Eg :	a.	Do you like playing	Yes/No.
	b.	If yes, do you get enough facility for playing	Yes/No.
	c.	Do you get coaching from any body ?	Yes/No.

This is an example for closed form question of a questionnaire.

Open form : The open form is just contrary to the closed form. In this type the respondents are free to express their responses. There is no restriction such as Yes/No. see the example.

- Eg:
1. Why are you interested in games
 2. Give your suggestions on students participation in the conduct of school sports meet.

3.4.2 Developing a Questionnaire

Now, let us discuss how to develop a questionnaire. We can identify the following steps in developing a questionnaire.

- * Collection of background knowledge.
- * Define the purpose.
- * Designing of questionnaire
- * Finalization of questionnaire.

Let us discuss each point in detail.

Collection of back ground knowledge :- You have to collect the back ground knowledge about the area in which you are going to develop the questionnaire. You will get necessary information through reading books, relevant to the area and also studying other questionnaires. So you will get an overall view of questionnaire its organization, presentation content. You can also consult experts in the relevant fields to gather information regarding the questionnaire.

Defining purpose :- Purpose definition is the next step in developing questionnaires. We can develop questionnaire for different purposes. Say for example, we could develop a questionnaire to know the causes of educational backgrounds of SC and ST students. We also can develop a questionnaire for different sections of people namely to teachers, parents and social workers, whatever level we choose, the purpose should be specified first.

Designing of questionnaires :- Questionnaire should be designed either in closed form or open -form or in union of closed by form and open form. A questionnaire comprises of both closed form and open form in preference. The questions should be arranged in section wise. Related questions should be given in the same section. The items should be simple, clear and precise. Now let us see the finalization of questionnaire.

must identify the purpose of the opinionnaire developing of as opinionnaire is collection of statements.

Collection of statements :- A number of statements should be collected at this stage. These should be obtained by background reading of relevent books and articles and discussion with experts. Each statement should be written on item and as in the case of questionnaire items. This would be written on item card as in the case of questionnaire items. This would help to correct the statements if required.

Trial test :- After arranging the statements, it should be administered to a limited number of students, this test will help to eliminate confusing and incorrect statements. We also should be able to understand the time required to complete the tool.

Finalization of opinionnaire :- After the trial test, we could eliminate unnecessary items. The number of responses should be fixed to either 3 to 5. The responses should be like this agree /undecided /disagree (3 point) or strongly agree/agree/undecided/disagree/strongly disagree (5 points)

The scale value for the points are as follows.

	favouring scale value	Opposing Scale value
a Strongly agree	5	1
b. agree	4	2
c. undecided	3	3
d. disagree	2	4
e. strongly disagree	1	5

We can analyses the scale value of each statement and understand the opinion of the pupil.

Check your progress 3

Bring out the meaning of an opinionnaire. What are the essential aspects in developing an opinionnaire.

- Notes :**
- a) Space is given for your answer**
 - b) Compare your answer with the one given at the end of this unit.**

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

3.6 CHECK LIST

Now we shall discuss the meaning of a checklist and how to develop a check list.

3.6.1 Check list-Meaning :

A check list means a list of behaviours or activities to which the respondent should mark his

response by putting a tick mark against those which are there in his you may have seen check lists in connection with many application forms. See the illustration. At the end of an application form a check list is given (check whether the following items were enclosed).

1. Proof of age
2. Copies of educational qualifications.
3. Passport size photograph .
4. Income certificate.

Here the check list help you to check whether all the items are to be enclosed with the application. But in check list for self reporting data collection purpose, one has to report one self against the behaviours or activities which are listed in the check list. Now let us see how to develop a check list.

3.6.2 Developing a checklist :-

In the development of a checklist also we have to collect necessary statements at first as per our purpose. The statements should be arranged in logical order. You should administer it to a small group to identify the short coming and confusing items. Then you should finalize the checklist. Use, short, simple and clear statement.

see the following illustration

Checklist to know health practices.

Directions : Listed below are a series of characteristics related to health practises. Check those are applicable to you. (tick) mark in the relevant boxes.

- | | | |
|----|--|--------------------------|
| 1. | Take a bath twice daily | <input type="checkbox"/> |
| 2. | Brushes teeth after eating | <input type="checkbox"/> |
| 3. | Take preventive measures to certain contagious disease | <input type="checkbox"/> |
| 4. | Use hot water for drinking | <input type="checkbox"/> |

Likewise you should prepare such a list regarding any aspects of your students behaviours. Say for example checklists can be made on a study habits, learning, activities in which they have more interest, classroom discipline and so on.

Check your progress 4

What is the meaning of a check list ?

- Notes :**
- (i) Space is given for your answer
 - (ii) Compare your answer with the one given at the end of this unit.

.....

.....

.....

.....

3.7 LET US SUM UP

In this unit we have discussed various self-reporting techniques such as inventories, questionnaire, opinionnaire and check list.

- * Inventory aims to measure preferences or the extend of any behaviour of an individual.
- * Questionnaire should give us data of the existing status of the condition we are searching for. It may have two forms closed form and open form.
- * Opinionnaire is an information form, which is used to measure belief of an individual.
- * Self - reporting checklist is used to collect necessary details of one's behaviour, by making a tick () mark to the appropriate degree.

Check your progress - Possible Answers

1. *Inventory is a tool to measure a typical behavior of an individual. It is an effective way of self reporting. The following aspects are essential for the development of an inventory. They are defining general and specific objectives, construction of appropriate questions/statements in appropriate order., design of appropriate format and administration of the inventory.*
2. *A questionnaire has a closed form and an open form. Closed form demands restricted responses such as Yes/No. Open form demands free response. The following are the steps in developing a questionnaire, They are collection of background information, define the purpose, designing the questionnaire, and finalizations of a questionnaire.*
3. *Opinionnaire is an information form, which uses to measure belief of a individual. The essential aspects in developing an opinionnaire are collection of statements, trial test and finalizations of opinionnaire.*
4. *A self-reporting check list means a device through which one should report one self against the behavious or activities which are listed in the device.*

Check list should be developed using the following procedure. Collection of necessary statements first, then arrange them to in logical order. Trial test should be done and finalize the checklist for mass administration.

UNIT 4 OBSERVATIONAL TECHNIQUES

Contents

- 4.0 Objectives
- 4.1 Introduction
- 4.2 Observational check list.
 - 4.2.1 Developing an observational check list.
- 4.3 Rating scales
 - 4.3.1 Type of rating scale
- 4.4 Anecdotal records
 - 4.4.1 Features of anecdotal records
 - 4.4.2 Effective use of anecdotal records
- 4.5 Situational tests
 - 4.5.1 meaning of situational test.
 - 4.5.2 How to conduct situational tests.
- 4.6 Let us sum up.

4.0 OBJECTIVES

In addition to the self - reporting techniques, observational techniques such as lists, rating sales, anecdotal records and situational tests are also used for evaluating pupils. In this unit you will see the important aspects of aforesaid observational techniques. At the end of this unit you will be able to.

- * develop an awareness about the use of observational techniques.
- * develop and use checklists for observation
- * develop and use of the rating scales.
- * Identify the importance of anecdotal records.
- * practice situational tests.
- * develop a positive attitude towards observational technique.

4.1 INTRODUCTION

Observation is a natural and common method to get the sociological aspects of an incident or situation. There are specified observational techniques to make your observation and precise and correct what you should do is to become familiar with those observational techniques, which help you to assess your pupils. In this unit you will get the details of such observational techniques.

4.2 OBSERVATIONAL CHECK LIST

In unit 3 we discussed about self reporting type of check list. But now we will discuss about observational check lists. Observational check lists consists of students (name/numbers), their activities and behaviors which the observer should record when an incident occurs. But in self-reporting check list one should report about one self. This check list helps us to understand the important characteristics of learners. But we could not rate the quality and frequency of occurrence of behavior. The observational

check list helps to identify the specified behavior of learners. Now let us see, how to develop an observational checklist.

4.2.1 Observational checklist

We can identify the following steps in developing a check list

- * Identification of purpose
- * Collection of statement
- * Arrangement of Statement
- * Trail testing.
- * Finalization of the check lists.

Identification of Purpose :- First of all you should identify the purpose of the checklist, ie what characteristics should be observed and recorded. For instance in order to study the habits of pupils you should collect statements related to study habits and arrange them properly.

Collection of statements :- Once, we defined the purpose of the checklist necessary statements regarding the topic should be collected. These could be collected from the related literature and discussion with experts. You can brake up the proposed behavior so small that it also enable you to develop statements.

Arrangement of statements :- Once, we defined the purpose of the check list, necessary statement regarding the topic should be collected. These could be collected from the related literature and discussion with experts. You can brake up the proposed and discussion with experts. You can brake up the proposed behavior so small that it also enable you to develop statement. The statements should be arranged in logical order. The related statements should be arranged is association with one another. The section-wise grouping will help you to record observation easily.

Trail testing : A pilot administration of the check list to a limited member of students can be done. This will help us to check the appropriateness of the statement and also their ordering.

Finalization of check list :- After the pilot testing you should make necessary changes in the checklist. Ordering should be finalized and proper directions can be given as an introduction.

Let us see an illustration of observational check list in figure 13.

Directions : Listed below is a series of characteristic related to class room discipline. Check those characteristics which are applicable to students.

Characteristics to be observed	Roll Nos of the pupils												
	1	2	3	4	5	6	7	8	9	10	11	12	etc.
1. Active participation in group work													
2. Noisy but generative													
3. Encourage others													
4. Help others													
5. Silent, and calm													
6. Passive. and uninterested.													

Fig. 13 Format of an observational checklist.

The observer must be through with the process of observation i.e. How to observe, what to observe and how to record the observation.

Check your progress I

What is an observational check list? What are its essential steps?

- Notes :** **a) Space is given for your answer**
 b) Compare your answer with the one given at the end of this unit.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

4.3 RATING SCALES

Rating scales have many similar characteristics with checklists. But rating scale have some advantages than check lists. Through checklists we could identify whether a characteristic is present or not. But rating scales help us to find out the quality of the behavior also. The rate (one who record the observations a rating scale) should have a crucial role in rating scales. There are different types of rating scales. Let us see what are they

4.3.1 Types of rating scales

The major type of rating scales are :-

- * Numerical rating scale
- * Graphic rating scale
- * Descriptive graphic rating scale

Let us see each one in brief.

a) Numerical rating scale :- This is the simplest type of rating scale. In this type, the given characteristics are numbered from 1 to 5. Each number represents the degree of the given characteristics. Usually necessary directions to the rater are given at the beginning along with the key for each digit. See the following example

Direction	Put a mark to the appropriate number showing the extent to which the pupil exhibits his skill in drawing.					
Key	1. Unsatisfactory 2. Below average 3. average 4. Above average 5 outstanding					
Skill	(i) Drawing is neat	1	2	3	4	5
	(ii) Proportion is adequate	1	2	3	4	5
	(iii) Picture is of adequate size	1	2	3	4	5

Like wise various aspects of a given characteristic could be listed and the pupils's acquisition of the skill can be judged well. Any other observable behavioural also can be judged by this.

b) Graphic rating scale: In this type of rating scales the ratings are made in a graphic form. Here you should assign some value to a specific characteristic. A number of characteristics should be used in serial order. This enables you to construct a behavioral profile of your student.

Direction : Scale values are arranged from 1 to 5 you can use points between the scale values. Put 'X' at the appropriate place.

1. How much attentive was he in the class ?

5	4	3	2	1
Very attentive	Attentive	Average Attentive	Inattentive	very inattentive

2. Dis his answers show good organization ?

1	2	3	4	5
Very poor	poor	Average	good	very good

3. How was the explanations given ?

1	2	3	4	5
Too little	A little	Average	moderate	adequate

You may make the list of a number of characteristic like this example.

C. Descriptive graphic rating scale : is detailed version of graphic rating scale will help to clarify and define behaviors in details

This will help us to increase objectivity of rating. See the following example.

Directions scales values are arranged from 1 to 5
Put a 'X' at the appropriate places.

1. While answering questions, how was his performance ?

Well organized beautifully spelt and all inclusive	Fluently spelt with adequate aspects	Not at all organized worsely spelt. didn't involves all aspects
--	--	---

You can get a complete and detailed descriptions of the various characteristics of your students through this type of rating scale.

Check your progress 2.

**What are the different types of rating scales ?
Briefly describe each.**

- Notes :
- a) Space is given for your answer
 - b) Compare your answer with the one given at the end of this unit.

.....
.....

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

4.4 ANECDOTAL RECORDS

This is another type of device which helps us to record the behavior of our students. The behavior should be on specific incidents and situations but in informal settings. Say for example a student in the library, laboratory, playground, group work could be assessed informally in such situations using this tool. Let us see the important features of anecdotal records.

4.4.1 Features of Anecdotal records

Let us see an example to see the features of an anecdotal record.

July 10, 1995
9.30 a.m.

1. Dasheen is seen at the science corner, reading articles on nature, though the regular school work has not begun.

July 25'95
11.30 am Biology (period)

2. Dasheen is found to be the only boy responding to the teachers questions of certain recent aspects on destruction of nature.

July, 28'95
12.15 p.m.
Language period

3. Dasheen was caught reading a book on 'nature during the language period and was send out from the class room.

Interpretation : Dasheen is very interested in natural science

Recommendation : Dsheen should be encouraged to do certain projects related to nature and also to give more attention to other subjects.

We shall try to anlyse the hidden features of anecdotal record from its example.

- a) It gives the description of an event with regard to its data and time, what had happened and the situation in which it happened.
- b) The records are of a series of incidents round about a particular aspects.
- c) Each anecdotal records should contain a record of a single studnet.

- d) The incident recorded should have significance in the growth and development of the pupil.
- e) Interpretation and recommendation should be given separately at the end of the description.

From this we could see that anecdotal records will give us a picture of the specific behavior's of a single student.

4.4.2 Effective use of Anecdotal Records

While using the anecdotal records you should take care of the following points. They are .

- (i) Observe only one or two behaviors at a time.
- (ii) Observation should be selective.
- (iii) A guideline for observation should be prepared in advance.
- (iv) Try to collect complete details of the incident.
- (v) Record should be collected by all the teachers.
- (vi) Enough practice and training should be given to the teachers in observation and writing the anecdotal records.

Check your progress 3

Bring out the essential features of anecdotal records.

- Notes : a) *Space is given for your answer*
 b) *Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

4.5 SITUATIONAL TEST

Situational test is a form of observational technique which may help you to assess your students at specific situations. Now we shall discuss the meaning and details of conducting of a situational test.

4.5.1 Meaning of situational test.

You are familiar with situations, and you may create many artificial situations, while you are teaching. Say for example in order to introduce respiration, an incident of death due to fall in water can be a suitable situation.

Learning Activity 1

Write a situation to bring out the meaning of situation.

Notes : a) *Space is given for your answer*

.....
.....
.....
.....
.....
.....
.....
.....
.....

You may have answer that a situation can be special set up including some of the necessary elements for the learning of a given idea. Along with this a situation of your pupils towards the ideas. Say for example, you are going to teach breathing in eighth standard, you may narrate about a boy who does not know swimming. You would then ask a question, what will happen if the boy falls in water? and what is the reason for that? Here you should explore the concept, air is necessary for breathing. Thus you can introduce a respiration very well. Such situations are very essential for meaningful learning. Here we shall see a different use of situation, that is its use in testing.

You should create a situation to measure the response of your students in that situation. Here the students are unaware that they are going to be tested, and only the teacher knows the purpose of that situation. So situational test is the creation of an artificial situation, in order to test certain specific behaviors in specific situations. You can test the extent of honesty co operation., leadership quiddities, etc of your children through this method.

5.2 How to conduct situational tests

Development of a suitable situation is the first step in conducting situational tests. It is your duty select of develop such suitable situations. After selecting the situation, you should expose your children that situation without their knowledge. You should then observe the behavior of your children in the situation. It is better to observe them secretly. Say for example, you are creating a situation to test the honesty of selected pupils in your class. You may create the following situation to test this. You put your purse with full of money (you alone know the actual amount) in a corner of your class, when all the pupils are out of the class for interval. It will appear as it was accidently fallen down. You can assign certain indoor duties to all of the pupils, except for those who are selected to be exposed to the situation. You could allow the pupils (those who have no duties) to go into the classroom. Here you may get three types of response from your pupils. They may be, as follows.

- The pupils suddenly bring your purse to you or to any responsible person.
- i) The pupils took your purse for them.
- ii) The pupils took some money from the purse and put it at the same place.

From these responses you can understand the extend of honesty of your pupils. Like wise you can create situations to test the leadership qualities, co-operation etc. of your pupils. You can also create situations to test creativity, and memory power of your pupils.

Check your progress 4

What are the essential aspects in conducting a situational test.

- Notes : a) *Space is given for your answer*
- b) *Compare your answer with the one given at the end of this unit.*

.....
.....

4.6 LET US SUM UP

In this unit we have discussed various observational techniques such as, observational checklist, rating scale, anecdotal records, and situational tests.

- * Observational checklist is different from that of self-reporting checklist in the sense that an outside observer marks the characteristics of pupils in the checklist, instead of reporting by self.
- * Rating scales help to identify the characteristics present in an individual along with its quantity. There are numerical, graphic and descriptive graphic rating scale.
- * Anecdotal records are used to collect specific behavioral of students on informal settings.
- * Situational test proceeds through development of an artificial situation, students's exposure to such situations and observation without the knowledge of students. This test uses to study specific behavioral at specific situations.

Check your Progress - Possible answers

1. *Observational checklist is a device to measure activities or of learners by an outside observer. The essential step in developing an observational checklist are identification of purpose, collection of statements, arrangements of statements, trial testing and finalization of the checklist.*
2. *There are three types of rating scale, such as numerical rating scale, graphic rating scale and descriptive graphic rating scale. In numerical scales numerals are used to represent the extent of behavior. In graphic rating scales values of specific characteristics are arranged in the scale. In graphic descriptive rating scales values of specific characteristics rating scales each point is described in detail.*
3. *The essential features of anecdotal are the follows :-*
 - i) *It gives description of an even with regard to date, time and situation.*
 - ii) *The record would be about a single aspect.*
 - iii) *Record of a single student is given.*
 - iv) *The recorded information should be of significance in the growth and development of the people.*
4. *The essential aspects of situational tests are as follows.*
 - i) *Development of a suitable situation.*
 - ii) *Expose children to such a situation without their knowledge*
 - iii) *secret observation of pupil's activities.*

UNIT 5 MISCELLANEOUS TECHNIQUES

Contents

- 5.0 Objectives
- 5.1 Introduction
- 5.2 Analysis of Records and Documents
 - 5.2.1 Types of records and documents
 - 5.2.2 Cumulative record.
- 5.3 Interview
 - 5.3.1 Types of interview
 - 5.3.2 Developing an interview schedule
 - 5.3.3 Illustrative interview schedule
 - 5.3.4 Conduct of interview
- 5.4 Sociometry
 - 5.4.1 Conducting sociometry
 - 5.4.2 Sociogram
- 5.5 Other techniques
 - 5.5.1 Guess who technique
 - 5.5.2 Social distance scale

5.6 Let us sum up

5.0 OBJECTIVES

In this unit we will see the important miscellaneous techniques which are useful for evaluation. These include analysis of records and documents, interview, sociometry and other techniques. At the end of this unit you will be able to :

- * identify the major records and documents, which are useful for evaluation
- * develop an awareness about the relevance of utilizing records and documents for evaluation
- * discriminate between structured interview and unstructured interview
- * apply interview technique for evaluation
- * discriminative between guess who techniques and social distance scale
- * develop a positive attitude towards using miscellaneous techniques.

5.1 INTRODUCTION

We have already discussed a wide variety of evaluation techniques, which help you to assess your pupils in different ways. We have to consider these miscellaneous techniques and tools which will help to assess various aspects of our pupils also. In this unit we will discuss miscellaneous techniques such as analysis of records and documents, interview, sociometry, guess who technique and social distance scale.

5.2 ANALYSIS OF RECORDS AND DOCUMENTS

All of us are familiar with various types of records and documents in our educational institutions. Many of those are very much valuable as far as education of the students are concerned. Now let us make a records and documents used to keep the details of pupils in our school.

Learning Activity - 1

According to you what are the major records and documents which includes the details of pupils ?

Notes : a) Space is given for your answer

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

5.2.1 Types of records and Documents

You may have listed the items such as admission register, attendance register, health report, sports and games register, Art festival register, and awards and scholarship register.

Apart from these, the cumulative records is another very important record containing information of pupil.

All other documents except cumulative record are familiar to us because we are responsible for maintaining all those documents. So you can directly gather information from those records as and when necessary. Now we shall have a discussion on cumulative record what is it?

5.2.2 Cumulative record

A cumulative record is a valuable record of information about students. You know the term cumulative stands for adding information for up-dating. We could record various types of information in this form. They are,

- 1) Academic achievement
- 2) class attendance
- 3) assignment responses
- 4) intelligence
- 5) Health report
- 6) Hobbies
- 7) likes and dislikes
- 8) Extra curricular activities
- 9) performance for activities.

Information about these aspects will help use to understand a child completely. We can verify

this past habit on achievement of any of the mentioned aspects and compare it with his recent performance in that aspect. A model format for cumulative record performance in that aspect. A model format for cumulative record is given figure 13 you shall try your own format also.

Name of Student	Academic Achievement			Attendance			Assignment Responses			Intelligence	Health Report		Hobbies	Likes	Dis Likes	Extra curricular Activities				Vocational Preference		
	I	II	III	I	II	III	I	II	III		Disability	Any Other				Sports	Literary	Science	Voluntary			

Fig. 14 Format of a cumulative record

This is a closed-form question. So, closed form question requires restricted responses. Such questions will give only superficial information. Open form questions will provide in depth information.

Un structured interview

Unstructured or informal type interview is advantageous than the unstructured type as it gives adequate information in depth.

Now, we shall see how to develop an interview schedule.

5.3.2 Developing an interview schedule

Interview schedule is the written format of items to be asked to the interviewees.

Learning Activity - 2

In your opinion, what points are to be considered while developing an interview schedule ?

Notes : a) Space is given for your answer

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

You may have written that the following points are to be considered while developing a schedule. They are: fixing the topic framing questions and determining the number and type of questions.

First of all we should identify the purpose of the interview. Thus you should fix the format of the schedule. Here format means the number of open-form and closed-form of questions and some introductory questions. The introductory questions will help to establish a rapport between interviewer and interviewee. Then you should frame questions in order to satisfy the purpose of the interview. While framing the questions, you should bear in mind the following aspects:

- i) The questions should be simple, clear and straight forward.
- ii) Questions should not contain long and confusing statements.
- iii) one question should contain only one aspect.
- iv) Questions should be stated clearly.

After framing questions, you should arrange them in logical order. An illustration for an interview schedule is given as follows:

5.3.3 Illustrative interview Schedule

An interview schedule to know the attraction of pupils towards TV programmes.

1. What is your name ?
2. In which class are you studying ?
3. How many members are there in your house ?
4. Do you have a TV set at your house ?
5. Do you see all the Malayalam Programmes ?
6. Do you see programmes in other languages ?
7.
 - (a) What type of programme do you prefer most ?
 - (b) Why ?
8.
 - a) Which channel programme do you prefer most ?
 - b) Why ?
9. How much time do you spend to watch TV every day ?
10.
 - (a) Do you think that watching TV programmes is very essential ?
 - (b) Why ?
11.
 - (a) Do you feel any harm due to watching TV programmes ?
 - (b) Why ?
12. How much time do you spend for studying at home ?
13.
 - (a) Do TV programmes negatively affect your studying ?
 - (b) Why ?
14.
 - (a) Do you think that watching TV will facilitate your studying.
 - (b) How ? Why ?
15. Do you have any special suggestions regarding TV programmes ?

Now we shall see how to conduct an interview ?

5.3.4 Conduct of Interview

Conduct of interview is a skillful activity. You should follow certain guidelines to conduct interview. These guidelines are given below.

- i) Create a friendly environment for the conduct of interview.
- ii) Consider student's responses patiently
- iii) Do not show an authoritarian attitude.
- iv) Give enough respect to the interviewee.
- v) Do not compel interviewee to give answers as you wish.
- vi) Arguments with interviewee should be avoided.
- vii) Give positive comments and congratulate interview for their good responses.

These are the points to be borne in mind while conducting an interview. These points will help you to conduct the interview successfully.

Check your progress.2

Discuss how you will develop an interview schedule.

- Notes :**
- a) *Space is given for your answer*
 - b) *Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

5.4 SOCIOMETRY

Sociometric techniques are used to describe the social relationships of an individual in a group and among the members of the group. So sociometry is a technique to describe acceptance or rejection of individuals among a group. You are familiar with occasions when we ask for student's acceptance to elect a leader or representative of a class. Sociometric technique will help you to identify level of acceptance of each student in your class. Now let us see how to conduct sociometry.

5.4.1 Conducting sociometry.

Sociometry involves a systematic procedure. Now, we will see the details of the procedure. The first step is to identify the acceptance of students in the classroom.

Identification of acceptance level of students :

In order to identify the acceptance level of students, you should collect options of every student about all other students. You should collect options of every student about all other students. For instance, when a class leader is needed for class you have to use special type of choice forms. Special types of forms would be designed for collecting the options of the students. A choice form should include provision for making three choices namely, first choice, second choice, and third choice. You should direct your students to mark their choice according to the preference to his or her classmates. The choice form would be a piece of paper bearing space to write preference, as shown in figure - 15.

I would like to work with/Play with.....
I choice.....
II choice.....
III choice.....

Fig.15 A model choice form

You should give necessary instructions to students about how to mark their preferences on the choice forms, well before giving the choice forms.

The second step sociometry is scoring of choice forms.

Scoring of choice forms

You should follow a definite scoring procedure to keep maximum objectivity. Now, you have all forms duly filled in by your students. So let us see how to find out the most preferred and the least preferred students in your class.

The simplest scoring procedure is to count the number of times an individual student is chosen regardless of the order of choice. But this will not give much objectivity. So let us try another procedure for scoring.

You should give convenient points to each choice. Such as, three points to first choice, two points to second choice and one point to third choice. The student who gets maximum score will be the most preferred one in the most preferred individual in a group is termed as the 'star' and the least preferred one in the group is termed as 'neglectee'. An individual who does not choose any body is termed as an 'isolate'. Now we shall see the final step of sociometry, namely the graphical representation of sociometric data.

Graphical presentation of sociometric data

Now we have the score of sociometry with the help of which, we could construct a very special type of graph namely, the 'sociogram'. This graph will help you to identify the various choice preferences of your students and the stars, 'neglects', 'isolates'. We shall see the details of preparing a sociogram as follows.

5.4.2 Sociogram

We have already seen that sociogram is the graphical or symbolic representation of sociometric data. So, first of all we shall see the various symbols that can be used in sociogram.

Symbols in a sociogram.

The important symbols used for constructing sociogram are provided in figures 16 to 23.

1. Symbols for boys and girls.



Figure 16. Symbol for boys and girls

2. The symbol can be use to represent a particular individual by writing his/her name within the symbol



Fig. 17. Symbol for a particular individual

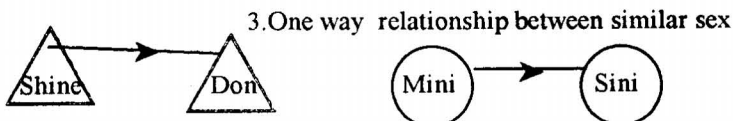


Fig. 18 One way relationship between boys and girls



Fig. 19. Mutual relationship between boys and girls

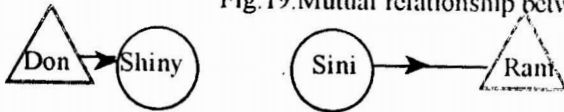


Fig. 20. One way choice between sexes

6. Mutual relation between sexes

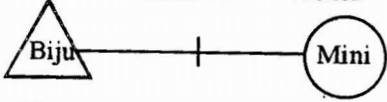


Fig. 21. Mutual relations between sexes.

7. Small sub-groups with mutual and one way choice within sex among boys and girls.



Fig. 22 Choice within sub-groups

8. Sub group with mutual and one way choices between sexes.

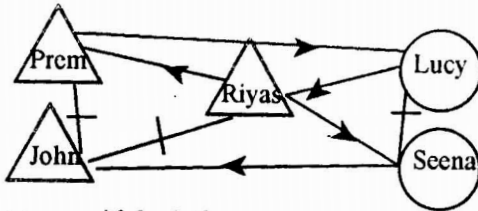


Fig. 23. Choices in sub-groups with both the sexes

These are the various symbols that can be used to construct a sociogram. Now, we shall see how to construct a sociogram.

Constructing a sociogram

Sociogram is in circular form. There can be three circles. Drawn one outside another. The innermost circle involves the 'stars' the more away from the inner circle the less preferred are the students. The isolated and the neglected are seen outside the outer circle. A model sociogram is given in figure 24

5.5 OTHER TECHNIQUES

We have discussed sociometry and now we are going to discuss two other tools of sociological nature. They are,

- (i) Guess who technique, and
- ii) Social distance scale.

First of all we shall discuss the details of guess who technique.

5.5.1 Guess who technique

Guess who technique is a simple sociological measurement. In this technique pupils are asked to write the name of individual pupils on the basis of the given explanations. Say for example, the statement 'a vehicle used to go under sea water is termed as a 'sub marine'. is an explanation for 'sub marine'. Likewise one should write the name of the pupil from a set of peculiarities. Let see an example.

- 1. This boy is the best singer in the class. He is also very good in running and playing foot ball
- 2. This girl always quarrels with boys.
- 3. This boy joins with anybody in group activities and helps any one who needs help.

Likewise, you should write statements suitable for each pupil in your class. Many statements should be prepared for each pupil.

Learning Activity. 2.

Write statements suitable for any of your pupils.

Notes : a) Space is given for your answer

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Now we shall discuss the scoring process in a guess who technique. The scoring procedure is simple. You should give one plus point (+1) for each good quality marked against a pupil and a negative point (-1) should be given to each bad quality. Then you should add all the plus scores and all the minus scores. The negative scores are then subtracted from the poscores are then subtracted from the positive scores obtained. The pupils getting highest score have maximum good qualities and those who get lowest score have minimum good qualities.

5.5.2. Social Distance Scale

Social distance is as name indicates, a device to measure social distance. Here, scale distance means, the extend or degree to which an individual or a group of individual is accepted or rejected by another individual or a group. So this technique will help us to realize the relationship between individuals

and between groups in a class. Since this device measure the degree of relation, it helps to understand acceptance on rejection among students in a class. The relation ship between students can be three types. Such as, complete acceptance relationship should be intimate and informal. In partial acceptance relationship should be formal and in rejection there will not be any relationships. The difference between these hree types of relationships can be more clear through the following statements.

- i) I would like to have this one as my best friend (Complete acceptance)
- ii) Is would not mind sitting near this fellow (partial acceptance)
- iii) I wish this boy were not in my class (rejection)

Such statement should be developed and used to measure social distance between your students. You should ask your students to write the name of students as each one considers others, against each statement. You should understand the relationship by consolidating and analysis of responses of all students in the class.

Check your progress 4.

What is the guess who technique ? And how does it differ from social distance scale ?

- Notes :
- a) Space is given for your answer
 - b) Compare your answer with the one given at the end of this unit.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

5.6 LET US SUM UP

In this unit we have discussed miscellaneous techniques for evolution such as, Analysis of records and documents, interview, Sociometry and other techniques.

- * Analysis of records and documents provides information about attendances, academic achievement, progress in achievement in co curricular activities, health hobbies.
- * Interview provides valuable information in depth, interview can be of two types namely structures and unstructured with respect to the topic and interviewee.
- * Sociometry is a technique to study social relationship, acceptance or rejection among individuals. Sociogram is the graphical representation of sociometric data.
- * Other techniques such as guess who technique helps to identify individuals possessing maximum good qualities. Social distance scale helps to measure the degree os acceptance or rejection.

Check Your Progress - Possible Answers.

1. *The important inclusions in a cumulative record are academic achievement, class attendance, assignment responses, intelligence health report, hobbies likes and dislikes, extra curricular activities, and vocational preference.*
2. *In order to develop an interview schedule, the following points should be taken into consideration. The purpose of interview should be taken into consideration. The purpose of interview should be fixed at first. The format of the schedule should be selected. The questions should be short, simple, clear and stright forward. Each questions should contain a single aspect only.*
3. *Sociometry should include the following aspects.*
 - i) *Identification of acceptance levels of pupil.*
 - ii) *Options of each students about other students are collected.*
 - iii) *preparation of choice forms*
 - iv) *Scoring of choice forms*
 - v) *Identification of stars, isolates and neglectees.*
 - vi) *Preparation of sociogram.*
4. *Guess who techniques is a simple sociological measurement is which the students are asked to name a student on the basis of certain peculiarities. From the total score it is easy to identify those who possess maximum good qualities in the class.*

But social distance scale is a measure to identify the degree of acceptance or rejection of each student in a class. Suitable statements representing complete acceptance, and rejection should be developed to the given statements.

UNIT 6 CASE STUDY

Contents

- 6.0 Objectives
- 6.1 Introduction
- 6.2 Case Study - the concept
 - 6.2.1 Identification of a case
- 6.3 Steps in a case study
- 6.4 Essential aspects of a case study
- 6.5 Case Study - An illustration
- 6.6 Let us sum up.
- 6.0 **OBJECTIVES**

'Case Study' is entirely a new form of evaluation, which is not usually practiced in our schools. In this unit we will see the important aspects of a 'case study'. This includes the steps involved in case study and how to conduct a case study. At the end of this unit you will be able to :

- * interpret the meaning of case study
- * identify the steps involved in case study
- * develop a positive attitude towards conducting case study
- * conduct case study for evaluation

6.1 INTRODUCTION

The 'case' we shall discuss in this unit is entirely different from the 'case' we used in our spoken language. The 'case' of course is linked with a person, a group or an institution. Case study may be an unfamiliar part of educational evaluation. In this unit we shall discuss the meaning of case study, steps involved in case study, how to conduct a case study and the uses of case study. All these aspects are discussed in detail in this unit.

6.2 CASE STUDY - THE CONCEPT

We have already discussed different types of evaluation techniques. Case study is another technique for evaluation. Now, let us see what is a case and then the details of case study.

A 'case' may be an individual or a group of individuals, or an institution, as the subject for the study. Case study is the intensive analysis of a case. Case is the center of the case study. As we are more concerned about teaching, we can use a single individual or a group of individuals as a case.

6.2.1 IDENTIFICATION OF A CASE

In order to identify an individual as a case, you should observe him thoroughly, whether he is displaying any symptoms requiring special attention. If he is showing any symptoms requiring special attention, then we could consider him as a case. These symptoms involve serious problems such as isolation, under achievement, mal adjustments, inactivity, hyper activity etc.

6.3 STEPS IN CASE STUDY

Now we shall discuss the various steps in case study. We have already discussed how to locate case in your class room. Suppose, you identified a case, what will be your next step ?

Learning Activity I

According to you, what steps should involves in a case study

Notes : a) *Space is given for your answer*

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

You may suggest collection of information, analysis of information and suggestions on the ba of the available information are the steps in a cases study, after identification of the case. So naturally the first step in a case study is locating the case.

1. Locating a case :

Locating a case is otherwise termed as identifying a case. We have already seen the necessa. sues for identification of a case in sub sec. 6.2.1.

Once you know the symptoms of those who need special attention, then identification process very easy. What you should do is to observe your pupils closely. Naturally the following questions w arise, what should be observed ? When to observe ? and how to observe ?

Observing a child is an easy job. But the thing important is that your observation must systematic. You should first of all decide what to be observed. You should observe special or exception activities and serious problems. In order to know these you have to observe various activities of studen both inside and outside the class room and their achievement in curricular an co curricular activities.

You should keep a record of all pupils. This should involve their grades in examinations, c curricular activities, their special interest or lack of interest. Cumulative record (5.2.2 of this Block) w help you to locate the probable 'case'

2. Collection of information :

Collection of relevant information or data is very crucial as far as case study is concerned. order to get relevant information you should consider the following points :

order to get relevant information you should consider the following points :

1. Survey of available sources of information and
2. Seeking additional information if necessary.

Survey of the sources of information will help you to collect relevant data easily. The major sources of information about a case are observation, informal testing, student's personal folder and records kept by the teacher.

Additional information about pupil's family history, physical and intellectual abilities, emotional patterns, needs interests and adjustment problems, can be obtained by interviewing family members and class mates

So, Observation and interview will help you to collect relevant data of a case. If necessary, appropriate tests/self - report also are to be conducted.

3. Formulation of Hypothesis :

You will get a clear picture of student's problem by analyzing the collected information. On the basis of this, you should formulate a hypothesis about the problem. Hypothesis is a tentative solution of an identified problem, which can be tested and verified. We shall see an example to make it clear about formulation of hypothesis.

Rajesh is seen in attentive and restless in class room and he is not able to concentrate in learning activities. From the collected information it is clear the Rajesh has certain problems at his home, treatment on teachers also cause adjustment problems. So broken home environment and unsuitable attitude of teachers cause defective learning.

Like wise you should make hypothesis of your student's problems on the basis of the identified symptoms.

Learning Activity -2

State a hypothesis for a case felt in your teaching life.

Notes : a) Space is given for your answer

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

4. Design and Tryout of Remedial programme.

Once you hypothesise the problem of your students, you should design and try out necessary remedial programmes to solve the problems.

Remedial programme for each individual pupil should be different from one another, as each one has different problems and different programme for different cases.

6.4 ESSENTIAL ASPECTS OF A CASE STUDY

We have already discussed the steps in a case study. Now, we shall discuss how to conduct a case study. Certain essential aspects in conducting a case study follow.

1. Long term study :

The first thing to remember is that case study will take many months to get satisfactory progress. So it is a long term work and you should be well prepared for such a study.

2. Identifying cases.

We have thoroughly discussed how to identify a case and various problems leading to a case. On the basis of that guidelines, you should identify the cases in your class room and categorize them as per the nature of problem they facing.

3. Develop a healthy attitude:

A healthy attitude would be developed for group activities among the members in the class room. You should also establish a rapport with the identified cases. You would not directly tell them that they have some problems. On the contrary, you should encourage them to take part in the remedial programme.

4. Develop suitable remedial programme :

You should develop remedial programme suitable for the need and age level of your pupils. Remedial programmes will be simple and directed towards overcoming the problems.

5. Seek the help of other pupils :

You know that peer teaching is very effective. In case study also you should seek the help of peers of the case in order to assist him to work out remedial programmes.

These are the important aspects that should be considered while conducting case study

Check your progress - 3

What are the important aspects in conducting case study

- Notes :
- a) Space is given for your answer
 - b) Compare your answer with the one given at the end of this unit.

6.5 CASE STUDY - AN ILLUSTRATION

here we will see the details of the case study, conducted to solve the problems of a secondary school pupil. The example is presented through the same steps we discussed earlier in sub sec. 6.3

1. Locating the case:

Shiju is an eighth standard pupil in the very first class itself the teacher noted that he was inattentive in the class. After few more classes the teacher made a close observation of shiju. The teacher found out that shiju is silent, disinterested, inattentive and is isolated from other pupils. Now a case is located, so the teacher decided to collect details about shiju.

2. Collection of Information.

The teacher observed the 'case' more thoroughly. Along with observation the teacher conducted an interview with the pupil, his mother other pupils in the class, and had a discussion with other teachers

All the teachers opined that Shiju was inactive and disinterested. He does not even respond while they ask questions. His classmates brought out the fact Shiju had no friends in the class and in any other classes. They also said that Shiju was unwilling to speak freely with them. He always showed shyness when others tried to keep his company. Shiju's mother said he is the youngest of her children and did not know how to talk with other and behave properly. The teacher reminded the mother that Shiju is a fourteen year old, and he is able to take decisions by himself. The mother was surprised to hear it and said Shiju is the baby in their home and he is unable to do anything as the teacher said

Shiju, in response to the informal interview said that, though he is grown up in age and size his parents and siblings consider him as a small child. They are always behind him with so many don't's. So he gradually developed into an isolate, mainly because of shyness and confusion about others' responses towards his behavior.

3. Formulation of Hypothesis

A through analysis of the information obtained from these source bring out the clear picture of shiju's problems, which can be hypothesized as follows:

Lack of adequate social interaction leads to isolation and there by causes problems in learning

4. Design and Try out of Remedial Programme :-

the teacher organized the following remedial programmes such as counselling session with the pupil and his parents and practical activities to overcome problems of the pupil.

Counselling session with the pupil was directed towards developing his self confidence. Teacher gave necessary direction for Shiju's parents to treat his as a young man and provide opportunity to his self development. To making his participate in decision making discussions at home, entrust his the responsibility of certain home affairs, and to stop scolding his as a small child were suggested by the teacher.

Teacher advised other pupils in the class to mingle with Shiju, so that he could overcome his shyness.

Teachers also planned certain group activities to facilitate learning. Activities such as certain

the leader of the group, once he become an active member of a group.

5. Evaluation of outcome.

After few weeks the teacher evaluated the outcome of the remedial programmes that he adopted in his class. There was marked change in the behaviour of Shiju and his class room achievements. This shows that the remedial programmes helped his to overcome his problems. Evaluation was done by observation and achievement test.

The remedial programmes were organized for some more time to overcome the problems of Shiju completely.

6.6 LET US SUM UP

In this unit we have discussed the details of case study. Case study is in depth study of an individual or a group of individuals or an institution, which is termed as a 'case'. A case can be identified on the basis of symptoms such as isolation/under achievement, maladjustment, inactivity, hyper activity etc.

The steps in case study are :-

- i) identification of a case
- ii) Collection of information
- iii) formulation of hypothesis
- iv) design and tryout of remedial programme and
- v) evaluation of outcome.

The essential aspects of a case study are as follows ;

- i) It is a long term study
- ii) Identification of case is important
- iii) Develop healthy attitude for group work among pupils
- iv) Development of suitable remedial programmes
- v) Seek help of other pupils.

CHECK YOUR PROGRESS - POSSIBLE ANSWERS;

1. *A case is an individual or a group of individuals or an institution, which is displaying any symptoms requiring special attention. The cues which help to identify case are isolation, underachievement maladjustment, inactivity and hyperactivity.*
2. *There are five steps in a case study. First step is locating or identification of a case, in which a case is located on the basis of symptoms. Collection of information is the second step. The major sources of information are observation, informal testing and questioning, students personal folder and records kept by the teacher. Formulation of hypothesis is the third step in which hypothesis should be stated clearly. Design and tryout of remedial programme is the fourth step in which suitable remedial programmes are designed and tryout according to the symptoms shown by the case. Evaluation of outcome is the final step, in which the teacher should evaluate the progress after trying out of remedial programme.*
3. *The essential aspects in conducting a case study are as follows:*
 - i) *Case study is a long term study.*
 - ii) *Identifications cases are important*
 - iii) *Healthy attitude for group work should be developed.*
 - iv) *Remedial programmes should be appropriate*
 - v) *Seek co-operation of other pupils.*

UNIT 7 SCORING AND GRADING

Contents

- 7.0 Objectives
- 7.1 Introduction
- 7.2 Scoring
 - 7.2.1 Scoring - concept
 - 7.2.2 Steps in scoring
- 7.3 Grading
 - 7.3.1 meaning of grading
 - 7.3.2 Bases of grading
 - 7.3.3 Procedure of grading
- 7.4 Let us sum up
- 7.0 **OBJECTIVES**

In this unit we will see the details of another familiar process namely scoring and grading. This includes the procedure in scoring and grading and their importance. At the end of this unit you will be able to

- * Interpret the meaning of scoring.
- * identify the steps in scoring.
- * State the concept of grading.
- * identify the different procedures in grading.
- * discriminate the different bases of grading.
- * develop a positive attitude towards grading.

7.1 INTRODUCTION

We have already discussed different techniques and tools of evaluation. Now we shall discuss the procedure for scoring and the importance of grading.

The process of scoring involves definite steps. Grading may be a new practice for you. In this unit you will get the details of the concept of scoring and grading.

7.2 SCORING

The concept of scoring, and the procedure in scoring are discussed detail below.

7.2.1 Scoring concept.

Scoring is a very familiar process for all of us. Scoring is the integral part of teaching, as it is a part of evaluation. Scoring means, making the score of each question to item in an evaluation tool. You are familiar with scoring of achievement tests. The score in a test means, the total score obtained for a particular student in that test. So score is the technical term for marks, and scoring is assigning marks to the responses of individual students for each questions or item. In scoring you should evaluate the correctness of responses of students according to questions, given to them

Learning Activity 1.

According to you what will the steps in scoring.

Notes : a) *Space is given for your answer*

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

7.2.2 Steps in scoring

Scoring procedure begins at the time of question paper setting of an achievement test. The same is the case of scoring of other types of evaluation tools also. But, as far as our daily use is concerned, we should concentrate the scoring of an achievement test. The first step of scoring is planning.

Planning for scoring

You know that planning is essential for the success of any activity, so, through planning is essential for accurate scoring also. Planning should begin at the time of selection of, objective and specification and the question. Development of scoring key and marking scheme are the results of such planning. So the development of scoring key and marking scheme is the second step in scoring.

Development of scoring key and marking scheme

Scoring key can be the key meant for scoring the objectives type (Selection Type) questions. Such scoring key involves, question numbers, alphabets representing correct answers, and marks for each answer. A scoring key can be arranged as follows.

TABLE 8 Scoring Key for Objective type items in an achievement test.

QUESTION NUMBERS	1	2	3	4	5	6	7	8	9	10
ANSWERS	B	C	D	B	A	D	A	B	C	C
MARKS	1	1	1	1	1	1	1	1	1	1

The scoring key given in table 8 is helpful to score objective type questions only. So, it is essential for us to know, the scoring scheme for free response or open-ended questions, in which each student can make response according to his own level of learning. In the case of free-response questions, you should get essential value points for each question. These value points will help you to evaluate, essay type and short-answer type answers. So, a detailed scheme of scoring is essential to evaluate free

response items such as short-essay type and essay type items. Along with the value points given, weightage for each point also should be determined in advance. Such a marking scheme should involve question number, value points, mark division for each value point and total mark for answer. The arrangement for marking scheme is given in the following example and in table 4.

The marking scheme for the following questions are given in table 4.

- Q.11 Define cell theory
- Q.12. W.B.C.'S have the capacity to destroy germs. Give reason.
- Q.13. Draw a diagram of an animal cell and label for the following parts.

- a) Cytoplasm b) Nucleus c) Mitochondria d) Nuclcolus.

Table 9 Marking Scheme For Part - B

Q. Nos.	Value points	Mark	Total Mark
Q.No. 11	i) Plants and animals are made up of cell	1	2
	ii) Cells are emerged from pre-existing ones only	1	
Q.No.12	i) Lysosomes are seen in W.B.C.S.	1	2
	ii) Lysoemes have lytic enzymes, which destroy germs	1	
Q.No.13	i) Neatness	1	4
	ii) Proportion	1	
	iii) labelling of parts	1/2 each	

The evaluation of an achievement test must thus involves scoring key for section A (objectives type items) and marking scheme for section b (Short-essay and essay type questions). The scores obtained in selection A and B together make the total score of one individual.

Check your progress 1.

Bring out the essential elements of scoring.

- Notes :**
- a) *Space is given for your answer*
 - b) *Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

7.3 GRADING

Usually after scoring you should communicate the score of each student in the class room. As

per the present system, those who get thirty five percent of marks will pass in the examination. So two students getting thirty five out of hundred and sixty out of hundred respectively have passed in the examination. We make only quantitative difference among the two. If we want to express the difference qualitatively we should change the mode of communication. Here comes the importance of grading. Now we shall discuss the meaning, bases and procedure of grading.

7.3.1. meaning of Grading

Usually, we use progress reports to communicate student's progress. But progress report does not serve the actual function of communicating results. Through the progress report, you do not convey details of the performance of a student, such as how good or bad student performs. Here comes the importance of grading.

Grading means describing a student's performance qualitatively, using symbols. Here qualities involve the levels of performance of individuals in an achievement list. Say for example, grading will help us to describe 'how good' or 'how bad' one performs in an achievement test. The symbols used can be some of the first letters in English, such as A, B, C, D & E. Grading will help us to make a precise judgment of one's performance also. In grading we use narrow range scale as against the wide-range scale we used in an achievement test. That is, an achievement test, may be designed with a maximum marks of fifty or hundred. On the contrary a grading scale will be very narrow, with five or seven grade points; use symbols such as A, B, C, D & E in a five point scale the grade point and performance level in each as follows.

Grade Point	Letter Grade	Level of Performance
5	A	Excellent
4	B	Very Good
3	C	Good
2	D	Satisfactory
1	E	Un satisfactory

You can further lengthen the scale to a seven point scale or a nine point scale, by using additional symbols such as o. A+, B+, and C+ for long answers.

In order to attain each grade point one must have attained certain standards of performance.

And now we shall pass on to the bases of grading.

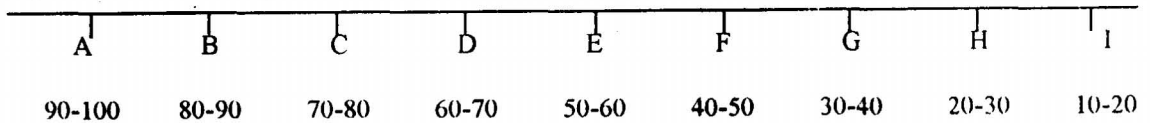
7.3.2 Bases of Grading

There are different bases of grading, now we shall have a discussion on that. The bases of grading mean the standards used for describing a grade, that is the level of performance such as good or average or poor. Such description of the performance is based on some standards. You should either take the performance of the whole class as a standard or consider an ideal level of performance. So there are two bases of grading, such as.

- i) Relative grading standards(Consider the performance of whole group as the standard), and
- ii) Absolute grading standard (An ideal level of performance as the standard). Let us discuss these two standards in some more detail.

Relative grading standard : In relative grading standard, grading is done according to the rank of a learner in relation to the other learners of the same class. But, you only rank your students and not grade them. In relative grade you should specify a group learners with a selected level of percentage of performance as a grade. Scales with five points or seven points or nine points can be used in this type.

Say for instance a nine point can be as follows.



You can shorten the scale by reducing the number of grades

Absolute grading standards : In absolute grading standards, each grade can be attained by achieving a set of scores. So, in order to attain a grade one should achieve the prescribed set of scores. In another form a given quantum of content or level of mastery of given skills is to be achieved to attain a concerned grade.

Say for example a student should be awarded 'A' grade, if he/she is able to answer correctly all the essential aspects of Nervous co-ordination in an achievement test.

Check your progress 2

Bring out the meaning of Grading. Explain briefly different bases of grading.

- Notes :**
- a) Space is given for your answer
 - b) Compare your answer with the one given at the end of this unit.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

now we shall discuss the procedure of grading.

7.3.3 Procedure of Grading

At the time of grading, you should first of all look for the different item types, such as objective type, and free response type. Because scales of different ranges will be suitable for different item types.

In evaluating an objective type item, the answer can be either right or wrong. So a two point scale is essential for evaluating an objective type item. The two point scale can be 0-1. When '1' stands for correct response and '0' stands for wrong response.

But evaluation of short answer type question requires a scale with more than two points. A three point scale may be serve the purpose of evaluating a short answer type item. So the scale can be 0-3, where '3' stands for a good answer, '2' stands for a moderately good answer and '0' for a wrong answer.

In evaluating an essay type answer, you should consider a fairly long scale, usually a seven point scale will serve this purpose. So the scale can be 0-6, each grade point can be as follows.

'6'	-	Outstanding
'5'	-	Very Good.
'4'	-	Good
'3'	-	Average
'2'	-	Fair
'1'	-	Poor
'0'	-	Failure.

In grading an essay type item, you should consider adequacy, appropriacy and relevance of the contest, clarity of form, imagination and resourcefulness of the presentation.

Here you should note on thing that, scales with different grade points are used to grade different item-types of the same test. Our aim is to grade the student on the basis of the achievement test. So, you should combine grades of different item-types to get the comprehensive grade of the achievement test. In order to get an accurate grade, you should standardize the grade points into a common scale. You should select a scale as the standard, and scores on other scales should be converted to that scale.

Say for example, suppose seven-point scale is taken as the standard scale, you should convert scores to other scales to a seven point scale. Usually, the scale used to grade essay type question can be taken as the standard scale.

The scores on a 2 point scale used to grade objective items can be converted into a 7 point scale by applying the following formula.

$$\frac{\text{Sum of scores on objective items} \times 6}{\text{Number of objective items} \times 1}$$

Where, 6 is the maximum grade on a 7 point scale and 1 is the maximum on a 2 point scale. Suppose, these are fourteen objectives types items in a test and one get the score 14, so grade point for objective items can be,

$$\frac{14 \times 6}{14 \times 1} = 6$$

The grade point = 6

The scores on a 3-point scale used to grade short answer type questions can be converted into a 7 point scale by applying the formula :

$$\frac{\text{Sum of scores on short answer items} \times 6}{\text{The number of short answer items} \times 2}$$

Where 6 is the maximum grade point on a 7-point scale, and 2 is the maximum grade point on a 3-point scale.

Suppose there are ten short answer type items in a test, the maximum score can be 20.

$$\text{The grade point for short answer type items} = \frac{20 \times 6}{10 \times 2} = 6$$

After converting different grades into a standard grades into a standard scale, you should

calculate the overall grade for a test by working out the average of the sum of the grades of different types of questions belonging to different sections using the following formula.

$$\frac{\text{Sum of the points on different sections}}{\text{The number of sections}}$$

We will see an example to calculate grade of a test.

The verbal descriptions and letter grades in a 7-point scale can be given in a tabular form as follows.

Usually a question paper includes three sections of objective type, short answer type and essay type questions. Suppose the grade points on each of these sections are 4.5, 4.8 and 5.0. the overall grade for a test.

$$= \frac{4.5 + 4.8 + 5.0}{3} = 4.76$$

Now you can find out the corresponding letter grade from table.

Table Grade points and letter grades

Grade Range	Grade Point	Letter Grade	Verbal description
5.5. and above	6	O	Outstanding
From 4.5 to 5.49	5	A	Excellent
From 3.5 to 4.49	4	B	Very good.
From 2.5 to 3.49	3	C	Good
From 1.5 to 2.49	2	D	Satisfactory
From 0.5 to 1.49	1	E	Pass
Less than 0.5	0	F	Failure.

A student getting overall grade 5 performs excellently and on who got grade 1 has just passed in the test. Similarly the grade point 4.76 stands for excellent performance.

While you get the grades of your students in all subjects, you should calculate the overall grade of a single student for the termed examination. The average grades can be obtained by using the following formula.

$$\frac{\text{Sum of the grade points on different subjects}}{\text{Number of Subjects}}$$

Suppose a student got grade points in different subjects as follows :

Malayalam 4.12,, English 2.48, Hindi 3.41, Social studies 3.5, Science 4.09, and Maths 4.00. The overall grade for term -end examination should be calculated as follows :

$$= \frac{4.12 + 2.48 + 3.41 + 3.5 + 4.09 + 4.00}{6} = \frac{21.60}{6} = 3.6$$

The letter grade for 3.6 is B, i.e very good. using similar procedure you should calculate the final grade of the student also. The following formula helps us to work out the annual grade of course grade.

question. Scoring key is the list of correct answers of objective type items. And marking scheme include the value points descriptive type items.

2. **Grading means describing student's performance qualitatively using symbols.**

These are the two bases of grading such as relative grading standard and absolute grading standard. In relative grading standard the performance of the whole group is taken as the standard. In absolute grading standard ideal level of performance is taken as a standard.

3. **In grading, first of all analyses the different item types on the basis of which suitable scales are selected. Scales with different grade points would be standardized to a standard scale, usually a seven point scale. Grade for each subject can be calculated like this. And from these grades, overall grade for the examination can be worked out.**

UNIT - 8 **DIAGNOSTIC TESTING AND REMEDIAL TEACHING**

Contents

- 8.0 Objectives
- 8.1 Introduction
- 8.2 Diagnostic testing
 - 8.2.1 Diagnostic testing - meaning
 - 8.2.2 Planning and developing a diagnostic test
 - 8.2.3 Preparation of diagnostic chart and diagnosing the weaknesses
- 8.3 Remedial teaching.
 - 8.3.1 Remedial teaching - Meaning
 - 8.3.2 Organizing remedial teaching.
- 8.4 Let us sum up.

8.0 **OBJECTIVES**

Usually, we are teaching in heterogeneous classes. So the level of achievement of many pupils may not be satisfactory. As a teacher you must do certain remedial work to improve the level of achievement. It is an essential practice in relation to any programme of instruction. This requires diagnosis of the difficulties of the pupils learning at first. A special test known as diagnostic test is used for this purpose. In this unit we will see the details of diagnostic testing and remedial teaching. At the end of this unit you will be able to :

- * interpret the meaning of diagnostic testing.
- * identify the important aspects of diagnostic testing.
- * plan and develop diagnostic test.
- * construct diagnostic chart
- * interpret meaning of remedial teaching.
- * identify the important aspects of remedial teaching.
- * apply remedial measures in class room teaching.

8.1 **INTRODUCTION**

Diagnostic testing and remedial teaching are the essential part of evaluation. Diagnosis is a familiar term for us, in relation with diseases. But the term diagnosis that we are going to discuss has a different meaning. Along with diagnostic testing we shall discuss the important aspects of remedial teaching and the procedure in remedial teaching. First of all we shall see the details of diagnostic testing.

8.2 **DIAGNOSTIC TESTING**

Diagnostic testing is an old concept included in evaluation. But it is a neglected part of evaluation. Actually diagnostic testing is a very essential part of evaluation which helps the learner to learn more easily and the teacher to teach more effectively. So, we shall discuss the meaning, purposes, planning, developing and administrating of diagnostic testing in detail as follows:

.....
.....
.....
.....
.....

8.2.3 Preparation of Diagnostic Chart And Diagnosing Weaknesses.

Diagnostic chart is a specially designed chart used for analyzing the responses of each student against each question. Such an analysis is used to diagnose the weakness or difficulties in learning the given content. Now, we shall discuss the different elements of a diagnostic chart.

Elements of diagnostic chart : The major elements of diagnostic chart are as follows :

- * Name of pupils (Total number of pupils attended the test)
- * Type of question (Objective type, short answer type and essay).
- * Responses of each student to each question.
- * Total number of correct answers, wrong answers, partially correct answers, and omitted questions.
- * Total marks and remarks (Whether passed or failed) obtained for each student.
- * A consolidated table including the total number of students responded correctly, wrongly, partially correctly and omitted each question.

In a diagnostic chart there should be separate row for each student and separate column for each question. This is because, you have to note down the details of responses of each student to each item in the appropriate column. Then only you can diagnose.

- (i) The students who are able to respond correctly for most of the questions.
- (ii) Students who are unable to respond well.
- (iii) The question/questions which are answered by most of the students.
- (iv) The question/questions which are difficult to be answered, un answered and wrongly answered.
- (v) The areas posing difficulty to all the pupils and
- (vi) Students having weakness at special areas.

Now let us see the format of diagnostic chart in fig.25 and format to write student's response in

Figure 26:

8.3 REMEDIAL TEACHING

Remedial teaching is a concept that stands in close relation with diagnostic testing. That is remedial teaching comes just after diagnostic testing. Along with Mastery learning we have seen the concept of remedial teaching. (Block 4, U.6) now we shall see the meaning and conducting of remedial teaching.

8.3.1 Remedial Teaching - Meaning

The term remedial teaching may be familiar to you. We have seen that remedial teaching follows diagnostic testing. Now, let's discuss the meaning of remedial teaching.

Remedial teaching is the special programme used to remove the weakness in learning and thereby achievement.

Usually we are teaching our students and evaluating them periodically. But after valuing the answer papers and communicating the scores of each student, you may naturally pass on to the next topic or unit. Some time, you may discuss the question paper in the class room and proceed to the next unit. So naturally those ideas which are not learned properly, will remain as such and it creates a gap in learning. Definitely this will affect further learning. Here comes the importance of remedial teaching.

Remedial teaching helps you to organize suitable programs to bridge the gap in learning by making necessary changes in teaching or learning programme. It also helps to remove unnecessary or unwanted habits and attitude needed for optimum learning. So naturally a question will arise, that, how do you know the desirable habits, skills and attitude needed for optimum learning? Thorough analysis of habits skills and attitude required for learning at such a level help you to understand the competence required for optimum performance. Now we shall see the details in developing and organizing remedial teaching.

8.3.2 Organizing Remedial Teaching

We have discussed how to diagnose the weaknesses and difficulties in learning and teaching. Now, we can see the details of organizing remedial teaching. At first we will see the detailed steps of organizing remedial teaching.

Planning :

You know that the planning is the first step of any organized form of activity. So, before you begin with remedial teaching session, you have to plan thoroughly the various aspects of remedial teaching.

At first, you have to identify the areas in which your pupils felt difficulty. This will help you to make use of suitable remedial measures.

Secondly you have to determine the nature and type of difficulties that require special assistance from your side. Generally, incomplete learning, miss representation of concepts, concepts not properly developed, etc. might be some of the difficulties that may have occurred in learning and teaching in your class room.

Thirdly you have to identify the number of students who committed errors in answering each question. You should also analyses the type of errors each one made while answering. So, you should get an overall view of the errors as well as the errors made by each student.

Then you should determine the nature and type of remedial programs which require to remove weakness or difficulties in teaching and learning occurred previously.

Finally, you should evaluate the effectiveness of the remedial measures adopted to remove the weakness and difficulties in teaching and learning. This should be done with the help of periodical questioning/testing.

Design of remedial teaching.:

Once you have identified the weakness and difficulties in teaching and learning, you should develop suitable remedial measures.

You should utilize special programs in this regard. These programs can be of the following nature.

- * alternative instructional methods and learning activities.
- * Use more accessory learning materials to get clarity for each concept.
- * Give enough time for mastery over the given content. (because you know that aptitude in the function of time).
- * Employ review at the points wherever necessary. This will help the learners to know his progress and help the teachers to know the level of learning.

So, in essence, you should utilize a new method/methods for instructing the given content. You know that the instructional procedure depends on the nature of the content.

A variety of accessory learning materials can be used to facilitate learning. You can also ask your students to prepare certain accessory learning materials. This will help their interest in learning. All these aspects connected with accessory learning aids are discussed earlier in connection with other relevant content ^{areas} ~~areas~~. (Block 5 u3). So it is unnecessary to discuss all these aspects in detail once again.

Now let us conclude this discussion about remedial teaching

Check your progress - 3

Explain briefly the procedure of remedial teaching.

- Notes :
- a) Space is given for your answer
 - b) Compare your answer with the one given at the end of this unit.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

8.4 LET US SUM UP

In this unit we have discussed the details of diagnostic testing and remedial teaching. Diagnostic testing means testing to know the difficulties and weakness in learning a given content.

Diagnostic testing involves fixing of instructional objectives, design of blue print, write of questions, testing and development of diagnostic chart.

Diagnostic chart involves name of pupils, type of questions, responses of each student, Total number of the types of responses, and total marks obtained for each student.

Remedial teaching means special teaching programme used to remove weakness and difficulties in learning there by achievement.

While organizing remedial teaching alternative teaching methods and additional learning aids should be used. Enough time should be given to get mastery. Periodic assessment should be conducted to ensure progress.

CHECK YOUR PROGRESS - POSSIBLE ANSWERS

1. **Diagnostic testing means the testing meant for revealing weaknesses and difficulties in learning and thereby achievement.**

The aspects of planning a diagnostic test include scope, nature, level and time schedule of the test.

Content area selected for a diagnostic test should be small. As many questions possible did necessary should be developed from the small bit of content. The duration of the test should be according to the need of pupils.

2. **The essential elements of a diagnostic chart are as follows**

- i) **Name of pupils**
- ii) **Type of questions**
- iii) **Responses of each student to each question.**
- iv) **Total number of correct answers, partial correct answers, wrong answers and omitted questions.**
- v) **Total marks and remarks such as passed or failed.**
- vi) **Consolidated table including the total number of students responded correctly, wrongly partial correctly and omitted each question, using this procedure one should identify easy questions, difficult questions, areas of content which is not mastered well, and those students have difficulties with the areas of difficulty in order to organise remedial instruction.**

3. **The procedure in remedial teaching is as follows :-**

Planning is the first step of remedial teaching the areas of difficulty should be identified and determine the nature and type of difficulties. The number of students who committed errors in answering each question should be found out then. The nature and type of remedial programs should be developed on the basis of difficulties in teaching and learning occurred previously. The effectiveness of the programme should be evaluated finally.

UNIT 9 SELF EVALUATION

Contents

- 9.0 Objectives
- 9.1 Introduction
- 9.2 Self-evaluation - concept
- 9.3 Purpose of self-evaluation
- 9.4 methods of self evaluation
 - 9.4.1 Observation
 - 9.4.2 Extended observation
 - 9.4.3 Self - assessment.
 - 9.4.3.1. Techniques of self assessment.
- 9.5 Let us sum up.

9.0 OBJECTIVES

We have seen that the major techniques and tools of evaluation. You know evaluation is meant for improvement in abilities, skills and performance of an individual. So evaluation of teachers also is an essential component in improving the effect of learning process. There are so many situations, which help you to evaluate yourselves in your class room. Systematic self evaluation will help you to know your weakness and to strengthen such weak points. In this unit you will see the important aspects of self-evaluation. At the end of the unit you will be able to

- * interpret the concept of self evaluation.
- * identify the purposes of self evaluation.
- * develop a positive attitude towards self - evaluation.
- * use different methods for self evaluation.

9.1 INTRODUCTION

Evaluating yourself is an essential part of your teaching, because self evaluation will help you to improve your teaching. Increase in quality of teaching results in better teaching. At the same time self evaluation helps you for your personal development also. You can understand the essential aspects of self evaluation from this unit. First of all we will discuss the concept of self evaluation.

9.2 SELF EVALUATION CONCEPT

Self evaluation is a traditional concept, which is practised very rarely. Self evaluation means evaluating the effectiveness of an individual by him self. In the case of a teacher, he/she should evaluate one's own teaching efficiency and performance. Of course there are systematic methods and procedures for self-evaluation. Such self-evaluating methods will help you to improve yourself. In addition to individual development, self evaluation influences other teachers in your school and have influence on teachers in other institutions also. Thus self-evaluation creates a motive towards improving instructional processes. Self evaluation also helps you to assess yourself without the knowledge of other teachers, if you wanted so. That is, you may keep your weakness as a secret and develop steps to eliminate such

Notes : a) Space is given for your answer

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

You may have suggested the following difficulties such as, unfamiliarity with actual classroom situation, students, instructional activities, accessory learning materials, classroom management, and conduct of evaluation. Usually beginner will have difficulty to understand the effect of his/her teaching on students and their extend of learning. The role of assessment and assistance is highly esserial at this beginning stage. So evaluation provides necessary directions to bginners.

Individual Improvement

Another important purpose of self evaluation is individual improvement. That is, improvement of performance. Evaluation helps to understand problems in performance and strategies, and to develop suitable remedial programmes. Such remedial programmes will help you to improve your teaching performance.

Professional development

Professional development is another basic purpose of self evaluation. This involves collection of data to determine the extend to which teachers have achieved minimum acceptance levels of competence and performance standards. Collection of data will be helpful to assist teachers who have minimum level of competence to develop further. Professional development can occur in the following five areas.

- * Instruction - The deve opment of skills involved with instruction technology, courses, media etc.
- * Professional-growth of an individual in professional roles (i.e as a teacher)
- * Organizational - growth in identifying needs, priorities and organization of the institution.
- * Career - preparation for career advancement.
- * Personal-include planing for professional growth, interpersonal skills etc.,

Professional development is very important since most of the teachers seems to desire it.

School improvement

Professional development of teachers will contribute to school improvement. Such professional could be able to develop programmes for improving school instruction. This can be attained only through evaluation of professional competence and adopting suitable remedial measures. Thus school improvement also becomes a purpose of self evaluation.

These are the purposes of self evaluation. Before we pass on the next section please check your progress in this unit.

Check your progress 2.

What are the major purposes of self-evaluation ?

Notes : a) *Space is given for your answer*
 b) *Compare your answer with the one given at the end of this unit*

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

9.4 METHODS OF SELF EVALUATION

Now we shall discuss the different methods of evaluation. The important methods are extended observation and self assessment. Let us discuss each of these in detail.

9.4.1. Observation

We have already discussed different observational techniques for evaluating our self. Evaluation can be done using observation with the help of other teachers or experts in the field of observation. Naturally a question will arise as to what should be observed ?

Certain essential aspects of instructional activity should be observed to evaluate your own teaching. Those aspects include teacher activity, pupil activity, instructional media used, use of access materials, class room climate, class room management, periodical review, etc.

How do we observe the essential aspects of class room instruction ? Observation is done with the help of a special format, which is prepared well in advance. Such a format should include the essential aspects to be observed. This type of observation can be termed as closed system of observation.

Observation can be done without such a special format. Here the observer marks the activities seen in the classroom and makes a summary of his observation. This type of observation is called as closed system of observation.

In closed-type observation system checklists or behavior categories can be used to make observations. We had discussed observational check lists in unit 4 of this block. Such check lists are the most suitable device to make the observation. And finally a summary of generalization for student improvement.

A format of a model check list is given below.

1. The teacher dominates in classroom.
2. The teacher interferes with student activity unnecessarily.
3. Students get enough freedom to learn
4. Classroom climate is unsuitable for maximizing learning.
5. Periodical review is done.
6. There is no periodical review.

Only a sample format of a check list is given above. You should make this complete by including statements to check all the activities that you are going to observe in a classroom. While observing a class you should put a tick mark in the boxes of appropriate statements. And at the end you could a general summary and suggestions.

'Who should observe?' May be another questions, that will arise in connection with this observation. Here the answer is most preferably your colleagues. You should select your co-workers as observers mainly because of two reasons. Firstly, they are easily available and secondly, you could avoid the feeling of being observed. So you can observe your friend's teaching and your friends can observe your teaching. Here the thing important is that your observation should be constructive and should not be destructive. Now we shall discuss extended observation as a means for self evaluation.

9.4.2 Extended observation :

Extended observation means observation with the help of rating scales. You are familiar with rating scales, as we discussed in Unit -4 of this block. So it is not essential to explain the details of rating scale once again. A rating scale is used to measure how good or bad is one's performance in different aspects of an activity, here instruction. This is done by providing different points for each aspect. Say for example the points can be very poor-poor-average-good-excellent in a five point scale. You can make a list of teacher activities in the class room and mark your response on the right point of the scale.

We can see a model format for a teacher-rating-scale used for extended observation as in figure.27.

Qualities of teacher	Very Poor	Poor	Average	good	Excellent
I. Personnel					
1. General Appearance					
2. Health and Hygiene					
3. Voice					
4. Resourcefulness					
5. Accuracy					
6. Sincerity					
7. Self control.					
8. Promptness					
9. Sense of justice					
10. Enthusiasm.					
II. Social and professional					
1. Academic ability					
2. Content matcry					
3. Understanding of children					
4. Co-operation and loyalty					
5. Daily preparation					
6. Interest in the needs of school and community.					

Fig 27. A model format for a teacher rating scale

9.4.3 Self - Assessment

Self-assessment is the most useful method of evaluating your teaching behaviour, instructional strategies and techniques. The rate of improvement by this method will be greater than that of other methods used for evaluation. Because, in self-assessment, you, yourself feel your difficulties and weakness. We can use the following three steps for increasing the effectiveness of self-assessment.

- * Identification of present teaching behavior
- * Identification of problem areas and weakness in present teaching.
- * Elimination of problems and weakness and adopting to a new teaching behavior.

Then you should evaluate the new behavior for its effectiveness. So the process of self-assessment is ongoing and unending, directed towards one's professional development to its maximum.

There are different techniques for self-assessment. Now let's see the important techniques for self-assessment.

9.4.3.1 Techniques of self-assessment

There is a variety of techniques for self - assessment such as video of audiotape feed back, self-rating forms, self-reports, comparison to standards, self-study materials and students achievement. Let us see each of these in detail.

Video tape or audio tape feed back.

This technique involves the recording of the teaching either in video tape or in audio tape. Here the purpose of recording is self-assessment. This type of recording helps you to view or to hear your own teaching and to understand the weakness of your teaching. This will be the best objective feed back of your teaching. Such recording will also help you to improve your teaching competence upto a greater extent. Audio tape is cheaper than video tape and easily available for you. So you can use audiotapes for recording your teaching.

Self-rating forms

Self-rating form is just like a rating scale, which involve a variety of teaching skills listed in logical order. You should use rating scales in the same fashion of rating scales for students. Rating scales of this type are simply checklists of specific teaching behaviors, frequency of behaviors and sequence of behaviors. Here you should rate your own behaviors from memory in the list provided in the self-rating forms after teaching. We have discussed rating scales in detail in Unit 3 of this block.

Self reports

Self-reports resemble self rating forms, as it demands your response of you against a predetermined format. But the format of self-report forms consists of open-ended questions related to instruction. This device helps you to evaluate your teaching behaviors, aims, priorities and shortcomings. These forms should be clear, brief and should be used on a regular basis ie. at least once in a month. Now let us see some statements, that should be included in self reports.

1. Whether the aims of teaching this content are realized ?
2. Have I covered all the priority areas in a given content ?
3. Did I think the pre-requisites required for the instruction with the given content ?
4. Did I utilize all media suitable for effective instruction of the content ?
5. What was the nature of learning activities ? Were they effective ?
6. Could I utilize all the useful accessory learning materials for instruction ?
7. How was the evaluation of instruction of the given content organized ?

9.5 LET US SUM UP

In this unit we have discussed the details of self evaluation. Self evaluation is necessary to remove weakness in teaching. The purposes of self evaluation are,

- i) Assessment and assistance of teachers.
- ii) individual improvement.
- iii) Professional development, and
- iv) School improvement.

There are various methods for self evaluation, such as, observation, extended observation and self assessment. Different technique for self assessment are,

- i) Video tape or audio tape feed back.
- ii) Self-rating forms
- ii) Self-reports
- iv) Comparison to standards
- v) Self-study materials, and
- vi) student's achievement

Check your progress - Possible answers

1. *Self-evaluation means evaluating the effectiveness of an individual by himself. In the case of teaching, effectiveness in teaching and performance should be evaluated by the teacher himself. Self-evaluation helps individual improvement and improvement of the institution.*
2. *The major purposes of self-evaluation are assessment and assistance, individual improvement, professional development and school improvement.*
3. *The major observational methods of self-evaluation are observation and extended observation through rating scales, observation by the other teachers using checklist is a suitable method for self evaluation. Through observational type of rating scale you should evaluate how good or bad one's performance is.*
4. *The major techniques for self-assessment are video-tape or audio-tape feed back, self-rating form a, self-reports, comparison to standards, self-study material, and students' achievement.*

ASSIGNMENT QUESTION

Develop the following tools for the purposes selected by you.

- i) *Achievement test*
- ii) *Observational checklist*
- iii) *Rating scale*

- iv) *Cumulative record*
- v) *Questionnaire*
- vi) *Opinionnaire*
- vii) *Interview schedule*
- viii) *Sociometry, and*
- ix) *Diagnostic test.*

SOURCES

- Ary, D., Jacob, I.C. & Razariah, A. (1972). *Introduction to Research in Education*. New York : Holt Rinehart & Winsten Inc.
- Bloom, B.S. (1979). *Taxonomy of Educational Objectives*. London : Longman Group.
- Brog, N.R. & Gall, M.D. (1983). *Educational Research an Introduction* New York ; Longmann.
- Cariy, C.M. (1988) *Measuring and Evaluating School learning*. Boston : Allyana & Bacon Inc.
- Divesta, F.J. & Thompson G.G. (1970) *Educational psychology*. new York : Mc Grw Hill
- Dressel, P.L. (1976) *Handbook of Academic Evaluation*. London: Jossy bass Pub.
- Ebel, R.L. Fransbie, D.A. (1991) *Essentials of Educational Measurement*. New Delhi : Prentice Hall India.
- Goldmann, L. (1978). *Research Methods for counsellors*. new york : John Wiely & Sons.
- Mason, EJ & Bramble, W.J. (1988) *Understanding and conducting Research*. New York Graw Hill.
- Mehrens, W.A. & Lehmann, I.J.(1978) *Measurement and Evaluation in Education and psychology* new York: Holt Rineheart & Winsten pub.
- Millman, J & Hammond, L.D. (1990). *The new handbook of Teacher Evaluation*. New Delhi. Sage Pub.
- Nunnally, J.C. & Ator, N.A. (1972) *Educational Measurement and Evaluation* New York . Mc. Graw Hill

BLOCK 7 CLASS ROOM MANAGEMENT

Unit 1 Aspects of Classroom Management

Unit 2 Problems in Classroom Management

Unit 3 Procedure of Class room Mangement.

BLOCK INTRODUCTION

We had seen a lot of information on the different aspects of teaching and learning through the earlier blocks. But all efforts of the teachers for effective teaching will become futile, if the teacher fails in effective classroom management. Therefore, as a concluding section of this material we will see the essential aspects of classroom management in this Block.

There are three Units in this block

1. Aspects of Classroom Management
2. Problems in Classroom Management
3. Procedure of Classroom Management

The purpose of this block is to give you a basic orientation towards classroom Management identify problems in Classroom Management, and apply necessary steps for better classroom Management.

Unit-1. Presents the relationship of discipline, personality of teacher and classroom climate with classroom management.

Unit-2. Discusses various problems in class room management due to indiscipline. The problems in classroom a management due to indiscipline. The problems arising from physical, phycological social and instructional causes are discussed in detail.

Unit-3 gives the necessary procedure for better classroom management are described in detail.

UNIT 1 ASPECTS OF CLASS ROOM MANAGEMENT

Contents

- 1.0 Objectives
- 1.1 Introduction
- 1.2 Classroom management - Meaning
- 1.3 Discipline and Classroom Management
 - 1.3.1 Concept of Discipline
 - 1.3.2 Stages of Discipline
- 1.4 Characteristics of Teacher and classroom Management.
 - 1.4.1 Role of a teacher
 - 1.4.2 Characteristics of Outstanding teachers
- 1.5 Class Room Climate and Class room Management.
 - 1.5.1 Factors of Classroom Climate
 - 1.5.2 Guideline for productive Classroom Climate
 - 1.5.3 Influence of Classroom Climate on Classroom Management.

1.6 Let us sum up.

1.0 OBJECTIVES

It is clear that the Teacher is the sole authority for managing his class. But smooth Management is possible only with the help of students. In this unit, we will see the important aspects of Classroom Management. These include developmental stages of discipline of students and characteristics of teacher. The teacher can determine the nature of the classroom climate also. The influence of these three aspects on classroom management also is discussed in this unit. At the end of this unit you will be able to :

- * interpret the meaning of classroom management
- * identify the stages of development of discipline
- * identify the relation between discipline and classroom management
- * identify the relation between characteristics of a teacher and classroom management
- * practice the characteristics of the outstanding teachers.
- * discriminate among different types of classroom climate.
- * apply the principles of productive classroom climate for better classroom management.

1.1 INTRODUCTION

Educational institutions in our state can be categorized into different groups such as rural, urban coastal, etc. You know that the students belonging to all these areas are enrolled in institutions in their own locality. We also have English medium schools and school with the regional language as the medium of instruction. Students belonging to each of such types of schools have peculiar discipline problems. So, as teachers, it is our duty to understand the discipline problems of students which influence classroom management. The developmental stage of discipline, characteristics of teacher, and classroom climate have influence on classroom management. In this unit we will discuss the concept of classroom management, classroom discipline and its developmental stages, characteristics of teachers, classroom climate and influence of these on classroom management.

1.2 CLASSROOM MANAGEMENT - MEANING

management is the sum total of activities that a manager does in order to obtain better product of an enterprise. In this sense, we teachers also have a managerial role, that is classroom management. Classroom management of activities in the classroom in order to maximize learning. You are familiar with various activities that are organized for learning. Usually you have planned those activities in relation to the topic, levels of students and facilities available for learning. Since, classroom for maximum learning it is essential to know the factors influencing classroom activities. You should know about discipline, characteristics of teachers, classrooms climate and influence of these on classroom management.

On the basis of these aspects you can develop a better plan of action and be able to organize it well. Then you will be able to manage classroom activities better than you have done earlier.

1.3 DISCIPLINE AND CLASSROOM MANAGEMENT

Discipline influences classroom management to a greater extent. So it is essential to know the concept of discipline, and the states of development of discipline, to tackle well with disciplinary problems and to have a better classroom management.

Now we shall discuss the concept of discipline and stages of discipline. Before we proceed to it, mark your response to following learning activity.

Learning Activity 1.

What do you mean by discipline in children ?

Notes : a) *Space is given for your answer*

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

3.1 Concept of Discipline

Discipline is one of the concepts we usually misinterpret, as in the case of personality. Now try to examine the meaning of the discipline. Usually you will have discussions in the staff room about students of different classes. You may say 'XB is a worse class, the students are not disciplined'. Others will also support your opinion. Here what do you mean by discipline ? Simply obedience and orderly conduct. It is not discipline that we mean to achieve through education. You mean that students of those classes were making noise, passing unnecessary comments, raising unwanted questions etc. while we are teaching. We all think that children must keep mum, when we are talking. To certain extent it is correct, because, it will help them to be more attentive. But this is a type of 'obey the order' discipline, which is not suitable for the purpose of education.

The discipline which we mean is the dynamic self-directing process, by which children are responsible to direct energy towards learning goals. When the teacher make them simple obey, they will be afraid of generating suggestions of asking doubts. But in self-directive process, they themselves are responsible for learning, so there may not be the question of fear. For example you are going to teach diffusion.

You take a beaker with water and add one drop of ink to it. Then ask your students to observe and report what is happening? And why is it happening so? Here your studnets will generate idea of their own, and explore the truth, though they are a bit noisy. So discipline is self directing process, leading to learning goals regardless of noise produced or not. Our duty is to help our students to use this self directing process.

Check your progress - 1

Bring out the concept of discipline

- Notes :**
- a) *Space is given for your answer*
 - b) *Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

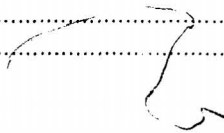
.....

.....

.....

.....

.....



1.3.2. Stages of Discipline

We have already discussed the various stages of development in Bloc: 1. And now, we are going to discuss about the stages of discipline.

On the basis of the theories of Piaget and Kohl berg, three stages of development of discipline are put forward. These stages are ment to give a guideline to students and teachers of what to do to foster development of discipline. The stages are as follows.

- 1. Basic disciplinary stage
- 2. Constructive stage and
- 3. Generative stage.

Now let us examine the important responsibilites of students and role of teacher at each stage.

Stage I. Basic Disciplinary Stage.

This is the first and the basic stage of discipline. This stage is the characteristic feature of those who come to school first in their life without any home training. The classroom environment will be new to the children. So they will not know how to behave properly, in such a set-up. You must have experience or your own children. A child who is first brought to a classroom, will take some time or days or months to adopt to the new environment.

Now, let's see what is the role of the teachers at this stage.

- i) You should give necessary directions to your pupils.

you should encourage your students to participate in group activities such as project work, group investigation, Cultural activities and field trip. While taking part in the organization and execution of such activities, students should get an opportunity for further development through a constructive stage of discipline.

ii) You should give necessary guidance

Necessary guidance should be given to your students, during the conduct of group activities. Because each student should know his role in the activity, and how his performance affects others. These two are the minimum requirement for a democratic society. So you should help your students to understand their role and duties. Now, we shall pass on to the next, generative stage by which we could lead our students, to the highest level of discipline. Before this you might check what you have learned already.

Check your progress 3.

Bring out the characteristics of pupils at the constructive stage and enlist the role of teachers at this stage.

- Notes : a) *Space is given for your answer*
 b) *Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Stage III Generative stage.

The students at this stage have initiative in social responsibilities than students at constructive stage. Say for example, suppose we are exposed to an accident site. An injured man is lying on the road. People from a crowd around him and are watching. A person who is at the highest stage of discipline will take necessary steps to help the injured man. But others will be still in doubt about the police case and such affairs.

Students at this stage will show such a leadership as in the previous example. They will stand for justice. They can understand the problems in the society and generate solutions form these problems. So at the completion of development of this stage, a student should become as enlighten citizen, that is a citizen to always search for his duties than his rights. He can also stand aright and fight against conflicts in life.

Now let us see the role of teachers the generative stage of discipline. At this stage also you should provide leadership opportunities to your students. Say for example, suppose you make a plan for a field trip and ask your students to make necessary arrangements, the students will get enough opportunities for social responsibilities, leadership and problem solving. You must give necessary suggestions to your students as and when required.

Effective role-performance of teachers is necessary for better classroom management. If the characteristics and there by the behavior of the teacher is not upto the mark, will be problem sin classroom management.

Suppose for example, Raju is a Secondary School Teacher, who does not possess outstanding characteristics. He is the sole authority to determine overall activities of the class. He is always preferred lecture and recitation methods of teaching. Naturally problems in classroom management are occurring in Raju's class.

Now let us have a look at Ms. Julie's class. The teacher co-operates with her students in organising various activities in the class. She acts as a facilitator of student's activities. She always give necessary guidelines to her students. These good characteristics of teacher create the feeling of oneness among her students. They are highly responsible and generative., So, problems in classroom management never occur in her class. From these examples, it is cleared that characteristics of teacher have high influence on classroom management.

1.5 CLASS ROOM CLIMATE AND CLASS ROOM MANAGEMENT

Now, let us see what is the meaning of classroom climate and the influence of classroom climate on classroom management. Climate is a familiar term to you, but classroom climate is an unfamiliar one. Climate means, almost all aspects of climatic changes on environment and living beings are familiar to us.

Classroom climate also has similar features of environmental climate such as warmth, cold etc. A warmth classroom will give acceptance to students and makes them feel secure.

A cold classroom climate is the one that threatens students and makes them feel insecure and fearful. Proper learning can happen in a class room with warm climate only. So classroom climate means the emotional set up prevailing in the classroom that influences learning.

The factors determining the nature of classroom climate are degree of formality, flexibility, structure of class, anxiety, teacher control and stimulation. All these factors contribute classroom climate. Now let us discuss these factors in detail.

1.5.1 Factors of Classroom climate

The various factors involved in classroom climate are discussed as follows.

1) Degree of formality

Formality is a familiar term and you know, what it is. In our daily life we have to show formality at many occasions. Here, degrees of formality means the degree of relationship between teacher and pupils. Let us remember our teachers, some of them might be informal and they should have had a very good relationship with students. So degree of formality means, how far formal is the teacher in the classroom. Highly formal class is not suitable for developing good classroom discipline.

2) Flexibility and structure of Classroom

Flexibility and structure of class are related factors. So, we shall discuss these two together. In certain classes teacher adopt a particular teaching method or assigns a particular activity to all students regardless of their ability. Many of them may not follow the teacher or could not do the activity successfully. Hence the teacher should adopt another method of teaching or suggest any other activity, that can help the children properly. Here, by suggesting alternative activities, the teacher makes the situation flexible. I.

the teacher does not do so, learning will be impossible and disciplinary problems may arise. So, here flexibility means provision of alternative situations or activities for facilitating learning.

You will normally prepare a lesson plan or plan of activities before teaching a lesson. In certain situations, as we mentioned in the case of flexibility, you have to deviate from your teaching plan to a certain extent. You have to develop the lesson through a series of activities, structures well in advance. The structuring may be very high, if you are not deviated from your teaching plan. So, structure of classroom means predetermination of activities that should happen in the classroom. But a classroom which is moderately structured, or low structured alone contribute to productive classroom climate there by will be a disciplined class.

3. Anxiety, Teacher control and Stimulation.

Now we shall discuss the three factors which are dependent of the factors already discussed. Let us see what if the meaning of each factor and how these relate to the factors discussed earlier.

Anxiety, you know is a psychological process, which is exhibited by almost all individuals during stressful situation. The degree of anxiety is dependent on the individuals. In classroom situations, teacher and structure of classroom influence anxiety to children. If the teacher is informal and classroom is low structured, anxiety will be reduced.

As teachers, all of you should supervise activities of students during the learning process, in order to facilitate learning. This teacher-control, to a certain extent, is good for productive classroom climate. But too much control is not productive. So try to exist minimum control while your students are learning.

In your daily teaching, you should stimulate your students for learning. For stimulating them you may narrate incidents, show specimens, ask them to contribute their views and encourage them for answering your questions. Such stimulative activities are very essential for a productive classroom climate and is dependent on the will of the teacher.

We have discussed various factors of a classroom climate. And now we shall discuss about certain points to be borne in mind for establishing productive classroom climate.

1.5.2 Guidelines for productive classroom climate

You should follow certain guidelines to establish a productive classroom climate and thereby avoiding disciplinary problems.

- i) **Know yourself** : You should thoroughly understand your scope and limitations before going to teach.
- ii) **Know your students** : You should establish informal contact with your students and try to understand their ability, needs and background.
- iii) **Know past experience of students** : You should know the past experiences of your students before you are going to develop a new content area.
- iv) **Activities in classroom** : You should begin the class naturally and proceed with the participation of students. You should be sincere, authentic and helpful to students, while they are learning.

These guidelines will help you to establish a productive classroom climate. Now let us see classroom climate influence classroom management.

- vi) An outstanding teacher have the following characteristics. He/She will be excellent in communication, expert in his subject, expert in teaching, always give priority to pupil's interest, responsible, systematic, stimulative and warm.
- vii) Characteristics of teachers have influence on classroom management is two ways namely, through.
 - a) Factors influenced by teachers - such as parent - teacher relationship, out of school activities and administrative aspects.
 - b) Factors controlled by teachers - such as instruction, classroom management and evaluation.
- viii) Factors determining the nature of classroom climate are degree of formality, flexibility, structure, anxiety, teacher control and stimulation.
- ix) To establish a productive classroom climate you should know; yourself, your students, past experience of students, and develop best set of instructional activities.
- x) Discipline problems are unlikely to occur in classes with appropriate classroom climate.

Check your progress - possible answers

1. *Discipline is a dynamic process of self-control and self-direction by which a child develops properly. Self control is the process of obedience of students without force and self direction means responsibility of learning is one oneself.*

2. *Children at basic disciplinary stage would not have received any training for behaving in a public place. So everything at school is new for them and they would not know how to behave properly in different situations.*

Teacher should give necessary directions to pupils about their behavior in different situations. He should also encourage the pupils to ask questions and express their ideas and feelings.

3. *Pupils at constructive could perform constructive activities co-operatively. They could group activity and share and feelings between them.*

Teacher should provide maximum opportunity for group work. And he should also give necessary directions regarding the work of each group.

4. *Pupils have initiative and show leadership qualities at generative stage. They also show interest in social responsibilities.*

Teacher should create maximum opportunities for his students to develop their responsibility and leadership quality. He should also give necessary suggestions as and when required.

5. *A teacher has to perform a very crucial role in classroom management. Because he is the director of instructional process. He could influence certain factors and he could control some other factors influencing instruction. The proper manipulation of such factors will depend on the characteristics of a teacher.*

6. *The following characteristics should be taken purpose of comparison.*

- i) *Communication ability*
- ii) *Content mastery and expertise in instructional methods*
- iii) *Priority to learner's interest.*
- iv) *Warm, understanding and friendly*

- v) *Responsible, systematic and stimulative*
- vi) *Fair and smart*
- vii) *Empathy for students*

7. *The factors involved in classroom climate are :*

- i) *Degree of formality,*
- ii) *Flexibility and structure of class, and*
- iii) *anxiety, teacher control and stimulation*

In order to develop a productive classroom climate. One should know oneself (strength and weakness), know students (abilities and level of performance), know past experience of students, and should know the organization of activities in the classroom.

UNIT 2 PROBLEMS IN CLASSROOM MANAGEMENT

Contents

- 2.0 Objectives
- 2.1 Introduction
- 2.2 Indiscipline - Meaning.
- 2.3 Causes of indiscipline
 - 2.3.1 Physical causes
 - 2.3.2 physiological causes
 - 2.3.3 Psychological causes
 - 2.3.4 Social causes
 - 2.3.5 Instructional causes.
- 2.4 Over coming the causes of indiscipline
 - 2.4.1 Overcoming physical causes
 - 2.4.2 Overcoming physiological causes
 - 2.4.3 Overcoming psychological causes
 - 2.4.4 overcoming social causes
 - 2.4.5 Overcoming instructional causes.
- 2.5 Let us sum up.

2.0 OBJECTIVES

In unit 1 we had seen that discipline is a major aspect of classroom management. Lack of discipline, i.e. indiscipline, will raise many problems in classroom management. Indiscipline can happen at any point during the development of discipline due to varied type of causes. In this unit we will see the major problems of class room management, causes of indiscipline and the ways to overcome those causes. At the end of this unit you will be able to.

- * Interpret the meaning of indiscipline
- * Identify the causes of indiscipline
- * locate the ways to overcome the causes of indiscipline.

2.1 INTRODUCTION

Students belonging to different physical, social and psychological set ups are enrolled in our schools. So school is a place of conflict and compromise naturally problems arise, due to the differences among pupils. These problems will give raise to indiscipline in your classrooms. Solving of such problems are very essential for the appropriate development of discipline. You are the sole authority in solving such problems in your classroom. In this unit we shall discuss the major causes of indiscipline and the ways to overcome those causes, which will have influence a classroom management.

2.2 INDISCIPLINE - MEANING

We have seen that discipline is self-directive and self controlling process. (Unit.1 Sec.3) Indiscipline is diametrically opposite to concept of discipline. We teachers, usually misinterpret the term indiscipline. According to this view a classroom in which all students properly dressed, sit all right without making many noise is a disciplined class. But if we examine this class in the light of our definition of discipline, we will see that it is not a well disciplined class. One thing is correct, that is they

are attentive and obeying the orders of the teacher. They will be disciplined only if they get opportunity for self-direction and self-development. So, indiscipline develops from lack of attention and lack of opportunity for self-development, self-control and self-direction.

2.3 CAUSES OF INDISCIPLINE

Now let's discuss the various causes of indiscipline. The major causes are physical, physiological, psychological, social and instructional. We shall discuss each of these causes in detail.

2.3.1 Physical Causes

First of all we shall discuss physical causes of indiscipline. Physical causes mean any kind of physical disabilities causing disciplinary problems. The physical disabilities involve physically handicapped, mentally handicapped, hearing impaired and visually handicapped conditions. This kind of physical inadequacy will lead to indiscipline, because these will adversely affect attention and self-direction.

2.3.2 Physiological Causes

Physiological causes are directly dependent on physiological needs of children. Physiological needs are the basic needs of human beings, which you might have heard of. Now let us see what are the basic needs. The basic physiological needs of students are need for food, clothing, seating, studying etc. A student who is not getting enough food cannot attend in the class. It is the same thing happening in the case of those who lack suitable clothing, enough seating and studying facilities. So a student with unsatisfied basic needs could not acquire basic discipline. And now we pass on to the psychological causes of indiscipline.

2.3.3 Psychological causes

Psychological causes of indiscipline arise from psychological problems. The major psychological problems involve problems of adolescents, and self-actualization need of pupils. Since secondary school pupils are at the beginning of adolescence, they will have problems of adolescence. You know that the pupils at this stage are in role confusion. At one and the same time they wish for attention - getting and they are a little shy to take initiation in activities. The appearance of secondary sexual characteristics will also cause day-dreaming and frustrations. At this stage pupils will do everything to attract the opposite sex. Need for perfection of self-actualisation is the ultimate need for a person. Each one strives to satisfy this need when the other needs are satisfied. All these psychological aspects will give rise to number of indiscipline problems. Solving of such problems are very important as far as the further development of the individual is concerned. Details of overcoming such problems are described in sub-section 2.4 of this unit.

2.3.4 Social Causes

Now, we shall pass on to the social causes of indiscipline. Among the social causes acceptance, socialisation and social class are the three important problem areas. You know that classroom is a miniature society, and has vital role in socialisation. Sharing of ideas and objects is very essential in classroom. Such give and take principle is the basis for socialisation. A more-cared child or a single-child will be poorly socialized and have some problems in social adjustment in the classroom. A better socialized child will get acceptance among his class mates very soon. A poorly socialized child will have some problems at for acceptance. Along with these the social class of the individual also is a determinant factor of social acceptance. There will be superiority and inferiority feelings among individuals of higher class and backward class respectively which will create acceptance and adjustment problems. All these social aspects will lead to indiscipline in classrooms. Here also you have to analyse the right cause of indiscipline and solve it in the most appropriate way. Now we shall pass on to the instructional causes of indiscipline.

2.3.5 Instructional causes

Along with other causes, there are instructional causes of indiscipline also. Now let us see what are the instructional causes of indiscipline. We have discussed about classroom climate and factors influencing classroom climate in Unit 1 of this Block. There we have seen that classroom climate and the characteristics of the teacher are very important as far as classroom discipline is concerned.

Consider a highly structured classroom with high formality and no flexibility. This will lead to many indiscipline problems. Sometimes learning activities are very easy and sometimes they are very tough. In both these cases your pupils will have some problems. Excess teacher control curtails student's need for freedom which also causes certain problems of discipline.

These are the various instructional causes of indiscipline.

Check your progress 1

Describe briefly the major causes of indiscipline ?

- Notes :**
- a) *Space is given for your answer*
 - b) *Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

2.4 OVERCOMING THE CAUSES OF INDISCIPLINE

We have discussed the major causes of indiscipline. Now, let us see how can we overcome those causes of indiscipline ? We shall discuss it in the same order, in which we discussed the causes.

2.4.1 Overcoming physical causes

First of all we have discussed the physical causes. You have to identify your pupils with any physical disability. There of course are special educational institutions for blind, deaf, dumb, etc. So you should identify orthopedically handicapped pupils and those with hearing and/or visual disabilities. You should provide convenient seats for them and direct one or two pupils to help the disabled children. You should also take care of those children from being teased of by other children. These will help them to avoid inferiority.

2.4.2 Overcoming Physiological causes

Secondly we have discussed the physiological causes leading to indiscipline. Our basic needs are more profound among physiological causes. The basic needs are needs for food, dress, seating and studying facilities. Now let us think how could we overcome these causes. In our school midday meal program is going on for the benefit of children upto seventh standard. At the secondary level we have no such programmes. So, you may organise mid-day meal programme with local help for those who deserve

it. Usually uniforms are common in our schools. So if there is any pupil without proper dress, you could give them a set of dress using the school fund. Providing seating and studying facilities can be done more easily with aid of enough furniture.

2.4.3 Overcoming psychological Causes

The third cause we discussed is the psychological cause. The most relevant causes in this category are the role confusion of adolescents and their self-actualisation need. Most of the psychological problems can be solved using counselling. You should act as a right model in the adult role for your students. Their role confusion can be removed by making them participate in instructional activities and assigning them certain activities which they themselves can do. Say for example, you are going to arrange a field trip. Organising of various aspects of the field trip can be assigned to small groups of students of your class. This type of participation will help your students to overcome their frustrations to a considerable extent. In addition to these you should enquire into the causes of frustrations and give them appropriate suggestions and assign suitable discipline developing activities. It is described in U.3) Along with these, involving them in creative works will help your pupils to realize the way to self-actualisation. Once you could win the approval and respect of the adolescents, then there will not be indiscipline problems in your classrooms.

2.4.4 Overcoming Social Causes

Now, we shall discuss about the ways to overcome social causes of indiscipline. The major problems are in relation to social acceptance and adjustment. You should adopt group activities for teaching selected topics to promote sharing mentality and respect for others in your pupils. By taking parton such group activities your pupils will be gradually socialized. They learn what are their roles and how their work influences others and vise versa. So, your duty is to provide enough opportunity for your pupils to work together. Sometimes, there may be students who are poorly socialized and having difficulty to work with others. They may be isolated children. With the help of other students they may be included in small groups and providing positive reinforcement and praising them as and when required, gradually they also can be socialized.

2.4.5 Overcoming Instructional Causes

Lastly we have discussed the instructional causes of indiscipline. Among these causes classroom climate and characteristics of teacher are the important influencing factors. The nature of classroom climate is greatly dependent on you. So you should design the classroom climate in such a way that it will maximize learning. You are the sole authority, who determine the structuring and formality of the class. The structure and formality should be low in order to reduce indiscipline problems. You should design instructional activities of various types, which will help to cater to needs of children with differing interests. You should make adequate changes in your teaching plan if required. So you should design your classroom with less structure, low formality and adequate flexibility.

These suggestions will be helpful in overcoming the problems in classroom management.

Check your progress 2.

Explain briefly the ways to overcome each cause of indiscipline.

- Notes :
- a) *Space is given for your answer*
 - b) *Compare your answer with the one given at the end of this unit.*

.....

.....

.....

.....

.....

2.5 LET US SUM UP

In this unit we have discussed the major causes of indiscipline and the ways to overcome each of these causes. The major points of our discussion can be summarized as follows.

- i) Indiscipline means lack of attention and lack of self development self control and self direction.
- ii) The major causes of indiscipline are
 - a) Physical causes - such as physical disabilities
 - b) Physiological causes - such as unsatisfied basic needs.
 - c) psychological causes - such as role confusion and unsatisfied strive for self - actualisation.
 - d) Social causes - such as less social acceptance and social stratification and
 - e) Instructional causes - such as rigid classroom climate and unsuitable characteristics of teachers.
- iii) The ways to overcome these causes are
 - a) Physical causes - to give special care
 - b) Physiological - to organise programmes to satisfy basic needs
 - c) Psychological - give counseling and discipline developing activities.
 - d) Social causes - Providing more group activities.
 - e) Instructional causes - by providing productive class rom climate and establishing good support with pupils
- iv) Overcoming of indiscipline problems will be helpful for better classroom management.

Check your progress - Possible answers

- 1) *There are various causes of indiscipline.*
 - i) *Physical causes such as physical disabilities*
 - ii) *Physiological causes such as unsatisfied need for food, clothing, seating, studying etc.*
 - iii) *Psychological causes such as unsatisfied needs for food, clothing, seating and studying.*
 - iv) *Social causes such as problems of adolescence and unsatisfied need for self-actualization.*
 - v) *Instructional causes such as rigid classroom climate and unsuitable characteristics of teachers.*
- 2. *There are ways to overcome each cause of discipline.*

Physical causes can be overcome by identification and providing special education. Physiological causes can be overcome by organizing programmes to satisfy basic needs of pupils. Psychological causes can be overcome to an extent through counselling and discipline developing activities. Social causes can be eliminated to a certain extent by providing more and more group activities. Instructional causes can be overcome by proper planning, fostering productive classroom climate and organizing support with pupils.

UNIT 3 PROCEDURE OF CLASSROOM MANAGEMENT

Contents

- 3.0 Objectives
- 3.1 Introduction
- 3.2 Guidelines for better classroom management.
 - 3.2.1 Elimination of physical distractions
 - 3.2.2 Treat students with respect
 - 3.2.3 Seek students help in organising learning activity
 - 3.2.4 Maintain expectation on students
 - 3.2.5 Use a variety of instructional procedures
 - 3.2.6 Provision of appropriate feedback
 - 3.2.7 Provision of positive reinforcement
 - 3.2.8 Teacher must be consistent
 - 3.2.9 Developing peer acceptance.
 - 3.2.10 Training for pupils.
- 3.3 Discipline developing activities.
 - 3.3.1 Models of discipline developing activities.
 - 3.3.2 Criteria for selecting discipline developing activities.
- 3.4 Let us sum up.

3.0 OBJECTIVES

Better classroom management is very essential for effective teaching. In order to manage classroom activities in an effective manner maintaining discipline is essential. Certain guidelines and practice of discipline developing activities are helpful to maintain discipline in the classroom and thereby to have a better managed class.

At the end of this unit you will be able to.

- * interpret the guidelines for better classroom management.
- * apply these guidelines in teaching.
- * identifying the discipline developing activities.
- * identify criteria to select discipline developing activities.
- * Apply the discipline developing activities.

3.1 INTRODUCTION

management of classroom activities is a headache to many of us. Both beginners and experienced teachers may have confronted with discipline problems in their professional life. Usually we are trying to maintain discipline in our own way. It may not have any systematic guide lines. In Unit 2 the different specific causes of indiscipline and their remedies were discussed. In this unit we will discuss certain general guidelines for better classroom management which will include those remedies and criteria for selecting the discipline developing activities also are provided which will help you in your professional life to have a better classroom management.

3.2 GUIDELINES FOR BETTER CLASSROOM MANAGEMENT

We have discussed various aspects of classroom management in detail. Now let us discuss the

guidelines which help us for better management of classroom activities. The guide lines are discussed in detail as follows.

3.2.1 Eliminations of physical distractions

Here physical distractions means the physical characteristics of classroom such as acretion, lighting temperature and seating which are not properly arranged. The classroom would be arranged in such a way to get enough acretion, lighting and seating facilities. The chalk board would be placed in such a manner to avoid glare on it. Furniture should be placed in a manner to avoid a congestive nature to the classroom. You have eliminate these physical distractions to your classroom, before you are going to teach.

3.2.2 Treat students with respect

You know that, what Mahatma Gandhi said is "Child is the father of the man" In present day teaching, we must give more importance to pupils. In the development of discipline you should act as an effective model So you should treat your pupils with respect. If you treat your pupils with respect, they will give respect to you. The respect, that you show to you pupils in turn, will encourage them to respect their classmates and elders of the society.

3.2.3 Seek students help in Organizing Learning Activity.

As a teacher, your aim is to help your pupils to reach the final stage of discipline. So you should give enough opportunity to your pupils to take part in organizing and executing activities. If they are involved in such activities, they will be more interested in learning. Holding of responsibilities in this way will help your students to attain the final stage of development of discipline, that is self-direction.

Suppose for example, you are going to teach parts of flower. You could ask your students to bring different types of flowers to the classroom. Then ask them to separate the different parts of flowers. Then ask them to compare the parts of different flowers. Like wise you should ensure participation of your students in learning activities.

3.2.4 Maintain expectation on students.

Usually teachers have expectations on students learning. We try to understand each pupil on the basis of his performance in classroom, we assure a certain level of achievement from him. Your students should know about your expectations on them. Knowledge of this expectations will prompt you students for more learning. These expectations will help your children to be disciplined.

3.2.5 Use a variety of instructional Procedures.

You know that, classroom with a single type of instructional procedure will make learning as a boring activity. You could adopt various instructional procedures in your classroom, with the co-operation of your students to cater to the intrest of pupils. This will also help you to cater to individual differences as different individuals have interest in different activities. Once the pupils are interested in the learning activity, then there will not be discipline problems.

Say for example you can teach a lesson on our environment using lecture type presentation , or more effectively, by using procedures such as lecture, narration, discussion, experimentation and, field study. Such type of multiple procedure are helpful to maintain classroom discipline.

3.2.6 Provision of Appropriate feedback.

You might have experienced that, your pupils demand for valued answer paper on the very next y of the test, what does this show ? Of course, this is the indication of individuals eagerness to have the

knowledge of result. So you have to give immediate and appropriate feed back to your students. Periodical questioning that questioning in between the lesson relating to different objectives of the lesson will provide feedback to your students. If you are not asking periodical questions, your students would think that learning of the particular area is not necessary. So be careful about your questioning. The periodical questioning prompt your pupils to be attentive in the class room, as they may have a question posed to them at any time. Naturally, this will reduce problems of indiscipline to a certain extent.

3.2.7 Provision of Positive Reinforcement

Positive reinforcement, is known to you. In simple terms it is rewards. Usually we teachers try to highlight the errors made by children. Actually it is an incorrect way, though we mean it for the good of the children. Say for example Rajesh is a tenth standard student, who is good in mathematics. But in the half yearly examination he got only forty marks out of fifty in mathematics. Both the teacher and parents scolded him for his mistakes. But no body cared for his achievements. This shocked him deeply and he got only minimum marks required for a pass in mathematics in the next test.

From this example you could see the importance of positive reinforcement, or reward or praise. Certainly simple praising will encourage your pupils generally for learning more effectively. So try to provide positive rewards as and when required. This will minimize your efforts considerably for reducing discipline problems.

3.2.8. Teacher must be consistent

It is said that an intelligent student can rate a teacher within the first ten minutes of his very first class. So, be vigilant in classrooms, because our pupils are more advanced in many respects than us. You know that one could build up a good image through months or years long strenuous effort, but everything can collapse within a moment or two. So, a teacher must be consistent in his thought and action. If pupils know that you are saying one thing and doing another thing, they will not respect you and discipline problems will emerge soon. So try to be more consistent, it helps you to enjoy teaching.

3.2.9. Develop peer acceptance

You know that peer acceptance is one of the important factors in the life of individuals, especially adolescents, usually a teacher can win the respect and approval of majority of pupils in a classroom. An intelligent teacher is able to redirect pupils towards learning with the help of his peers. Say for example Jose is class teacher of XB class. Majority of pupils respect him, but some of them are not in good terms with him. One day he announced in the class that they needed a class leader and who would be the best choice. As planned earlier most of the students approved Ramesh as their leader. Once he became leader, Ramesh became a well disciplined student.

From this example we can see that peer approval has vital importance in avoiding or solving discipline problems. So remember that once majority of students are with you, you could bring all of them towards you using certain tactics and be able to avoid problems in classrooms.

3.2.10. Training for pupils

In many occasions of your teaching life, you might have seen that pupils work disorderly. What can you do at these times? You should give necessary training for students. Say for example it is the time for morning assembly and your students are going for assembly in zig zag manner and talking to each other. What will you do? You can call them back and ask them to go in a straight line without making any noise. You should also give training in this regard. Like wise you could train them at proper occasions to avoid generating problems. But at times we may have to use punishment. Punishment is the last resort maintaining discipline. Instead of punishment you should give one more chance to the pupil which will help him to develop his behavior through training. So you should design your teaching plan in such a way to avoid discipline problems.

4. Preparation and maintenance of accessory learning aids

Preparation and maintaining of accessory learning aids such as aquarium, terrarium, greenhouse and vegetable garden is a very effective discipline developing activity.

5. Develop working plan for field study

You know that field study is an essential part of biology teaching. In order to conduct effective field study, it is essential to develop suitable plan of action. You should ask your pupils to make a list of places to where field trips can be conducted. You can also direct them to develop working plan for field trip to each of such selected places.

6. Framing of questions

You should ask your pupils to frame questions, on selected topics, preferably on the lessons which are already complicated. This will help them to learning more meaningfully and easily.

7. Preparation of handwritten magazines

Preparation of handwritten magazines is essentially a very good activity leading towards the proper development of discipline. You can suggest one subject for each edition or allow your students to propose one. You may edit the articles and the writing should be assigned to pupils having good handwriting.

8. Organization of peer teaching

You might have heard of peer teaching. It is a very good activity to foster discipline in your classrooms. A group of students are selected in advance and assigned with teaching of certain topics, either to groups or to individual as per the toughness of the lesson. This will help to increase the interest of students in learning and help them to clarify many of their doubts.

9. Voluntary activities

It is proved that voluntary activities will help to develop discipline to a greater extent. You know that a variety of voluntary activities can be organized in your schools with the help of students. Some of such activities are organizing sports, celebration of important national days, cleaning school surroundings, play ground or garden etc. during special occasions help to foster service mindedness in children.

These are the some of the major discipline development activities. You can develop such activities as per the needs of your pupils. While adopting these activities you could consider the following as the criteria for organizing discipline developing activities. Before seeing that, let us have a check of what we have learned so far.

Check your progress 2.

Make a list of discipline developing activities ? Describe briefly how do they help to develop discipline ?

- Notes : a) *Space is given for your answer*
 b) *Compare your answer with the one given at the end of this unit.*

.....
.....
.....
.....

.....
.....
.....
.....
.....
.....
.....
.....

3.3.2 Criteria for selecting Discipline Developing Activities

Now let us see the important criteria for selecting, discipline developing activities. There are five important criteria for selecting discipline developing activities. They are activities should be structured, activities should be according to interest, number of students and toughness of activity, activities should be relevant and the result of the activity should be seen. Now let us see those criteria one by one.

1. Activities should be structured

Structuring means planning almost all activities upto the completion of activity meant for development of discipline. Structuring is very important, because we were dealing with pupils need to develop discipline. So the activities provided should be well organized. Say for example you are asking to compose questions of the topic sense organs. For the sake of convenience groups are formed. Separate sections of the topic are given to each group. Then ask them to read the given portion, have a discussion on it and to frame different types of questions. You should also make them aware of the need to find out the answer while they frame each question. This kind of structuring will help your pupils to proceed correctly.

2. Number of students and toughness of activity.

The number of students needed to work on a given activity depends on the toughness of the activity. Too many students on a simple activity and very few students on a tough activity will not serve the purpose of the activity. So the number of pupils per activity should be determined. Say for example in the case of developing a working plan for field study the whole class can be divided into group of five to eight students and duties should assign to each group. This shall include making list of places, determining transport facilities, objectives of the trip arrangement of food and collection of materials. The question framing activity discussed above can even be assigned as individual work also.

So, you should take care of the number of students needed to work on each activity before students are exposed to various activities.

3. Activity should be according to the interest

You know that certain children do not like certain activity. So while assigning the activities, you should taken the interest of children into consideration. It is very easy for you to know the interest of your pupils as you have so much experience with them. So give a chance for them to select activity asper their choice.

4. Activity should be relevant.

We have already discussed the major activities. While selecting an activity you should Mach the relevancy of the activity with the ability and the level of your pupils. Activities which are irrelevant will bring about negative attitude in pupils.

5. Children would see the result of the Activity

You know that the knowledge of results is a crucial factor in the life of an individual. It is not

3. Preparation of learning aids
4. preparation of and maintaining accessory learning aids.
5. Develop working plan for field study.
6. Compose questions.
7. Preparation of hand written magazines.
8. Organize peer teaching and
9. Voluntary activities.

III) There are certain criteria for selecting discipline developing activities, they are

- a) Activities should be structured to get optimum results.
- b) Number of students required to work per activity should be pre-determined.
- c) Activities should be according to the interest of child.
- d) Activity should be relevant to the age and ability of pupils.
- e) Children should get the result of their activity, which will help to encourage them greatly.

Check your progress - Possible answers

1. *Guidelines for better classroom management are as follows.*

- i) *Elimination of physical distractions.*
- ii) *Treat students with respect.*
- iii) *Seek students help in organizing learning activities.*
- iv) *Maintain expectations on students.*
- v) *Use a variety of instructional procedure.*
- vi) *Provision of appropriate feed back.*
- vii) *Provision of positive re-inforcement.*
- viii) *Teacher must be consistent.*
- ix) *Develop peer acceptance.*
- x) *Training for pupils*

2. *Major discipline developing activities are as follows :-*

- i) *Construction of notice board & bulletin Board*
- ii) *Design posters, collect pictures and newsclips.*
- iii) *Preparation of learning aids*
- iv) *Preparation and maintenance of accessory learning aids*
- v) *Develop working plan for field study*
- vi) *Framing of questions*
- vii) *Preparation of hand written magazines.*
- viii) *Organization of peer teaching.*
- ix) *Voluntary activities.*

3. *The following criteria should be taken into consideration while you use discipline developing activities.*

- i) *Activities should be structured.*
- ii) *Number of students should work on the activity is determined by the toughness of the activity.*
- iii) *Activities should be according to the interest of the child.*
- iv) *Activities should be relevant as per the age level and ability of children.*
- v) *Children should get the result of the activity soon after its completion.*

ASSIGNMENT QUESTION

Illustrate an ideal way of managing the classroom by arranging its aspects in an appropriate manner.

Note : a) *No space is given for your answer So you should prepare your answer in separate sheets.*

SOURCES

Hurlock E.B. (1973) *Adolescents Development*. London's Mc Graw Hill.

Goldman, L. (1978). *Research Methods for counsellors*. New York John Wiley & Sons.

Reilly, R.R. & Lewis, E.L. (1983). *Educational Psychology*. Canada: Collier Mac Millan.

Ross, A.O. (1977), *Learning Disability* New York: Mc Graw Hill.

Tanner L.N. (1978) *Class room Discipline*. New York : Holt Rinehart & Winsten.

APPENDIX VII.A

Achievement Test - I

Sec. A

Each question carries 20 Marks.

Max. Marks: 100

Answer each in about 1000 words.

Time: 3 Hrs.

1. Take a content area from high school biology and develop it to a lesson that could be taught through any one of the following models of teaching.
 - a) Concept attainment model
 - b) Advance Organiser model
 - c) Biological Science inquiry model
 - d) Cognitive Growth model
 - e) Group Investigation model
 - f) Mastery learning model
2. Briefly discuss how different media and materials are useful for biology instruction at Secondary level.

Sec. B

Answer each in about 100 words.

Each question carries 5 Marks.

3. Discuss the major principles for analysing pedagogy.
4. How will you, develop a resource unit? Bring out its relation with unit planning.

5. Which are the major extended curricular activities useful for teaching biology at Std.X. Develop a plan for an year for organising those activities.
6. Make a list of community resources at your locality and briefly discuss what procedure you will use to utilise them effectively for teaching biology at Secondary level.
7. Bring out the difference between expository and comparative organisor.
8. Briefly discuss mastery learning in the light of the modern concept of aptitude.
9. Bring out the importance of long term planning.
10. Explain how you will develop a lesson plan.
11. Briefly discuss the major activities you will carry out while developing a unit plan.
12. "Both long term planning and short term planning are essential for effective instruction". Substantiate the statement.
13. Bring out the difference between pedagogical analysis and content analysis.
14. Briefly discuss the difference between selection learning condition and reception learning conditions.

APPENDIX VII-B

Scoring Scheme of Achievement Test I

Value point		Marks
Choosing of appropriate content for the model illustrated	-	2
Syntax - Description with detailed activities in each phase	-	10
Social system	-	2
Principles of reaction	-	2
Support system	-	2
Effects of the lesson	-	2
		<hr/>
		20
		<hr/>
2. Different media and materials - listing	-	2
i) Lab - organise curricular & extended curricular activities	-	3
ii) Learning aids - visual, auditory, Audio visual - Help mastery, Sustainment & active learning	-	3
iii) Accessory Learning aids - Museum, Aquarium, terrarium, green house - Learning of life processes	-	3
iv) Community resources - Provide practical knowledge in real life setting	-	3
v) Extended curricular Activities - Science club, Science fair, Quiz, Field trip & projects.Help		

- further learning and application of already learned material - 3
- vi) Resource Unit - Give the basis for teaching unit - 3
3. Principles - Meta cognition, Identification of teaching strategies, content analysis, identification of attributes, Exemplar planning, Identification of problematic situations, mediator planning, Anticipation of possible errors & preventive measures. 1/2 marks for each principle 1 mark for discussion
4. Steps in Resource unit - Collection of data, preparation of materials, and organisation of materials 4
- Resource unit - source for teaching unit. 1 = 5
5. Activities - Science club, Science exhibition, Science quiz, Field trip & Science projects. 1
- 4 = 5

Plan	Name of Activity	Time to conduct	Purpose	Inclusions	Finance
------	------------------	-----------------	---------	------------	---------

6. Material resources and human resources 2
- Survey of resources, Alphabetical list of utilisable resources, Area map, permission procedure 3
7. Expository organizer - Unfamiliar material in a deductive manner 2 1/2
- Comparative organizer - New concept presented on a comparative

- basis with familiar material 2 1/2
8. Learning almost all parts completely through a time span, which is individual specific. Amount of time required for learning given material 5
9. Plan for a year or more. 1 mark for Help to realise existing facilities each point identify additional requirements, determine strategies of instruction & evaluation, develop accessory learning materials, manage the class room activities.
10. The following points are essential for preparing a lesson plan. Identification of objectives, Determination of previous knowledge, determine content outline, selection of instructional methods, determine learning activities, selection of materials and resources and selection of evaluation procedure. 1/2 mark for each point 1 1/2 for discussion
11. Activities in unit planning. 1 mark Stating the objectives, outline of content, determining learning activities, determine instructional and evaluation procedure. for each point
12. Long term planning - Explore total facilities and requirement of an institution for an year. Essential for the progress of whole institution. 2 1/2

- Short term planning - Unit & lesson Planning - Essential for proper learning of each lesson of all subjects. According to the need of pupils at different levels. 2½
13. Pedagogical analysis - Brings out essential elements of the content, process of concept formation, applications of hidden concepts and promotes mastery learning 2½
- Content analysis - involves analysis to know new terms, facts, Principles and processes. 2½
14. Reception learning - Labelled examples are given, then to label unlabelled egs. 2½
- Selection learning - Unlabelled examples are given - students should identify attributes and identify the concept 2½

APPENDIX VIII.A

Achievement Test II

Max. Marks : 100

Time : 3 Hrs.

Sec. A

Answer Each question in about 1000 words.

Each question carries 20 Marks.

1. Briefly discuss the peculiar characteristics of adolescents. Explain how you will create a productive class room climate for such a group.
2. Present a case known to you and explain the method to conduct a study on it.

Sec. B

Answer all questions in about 100 words.

Each question carries 5 Marks.

3. Compare between the stages of cognitive development and the stages of development of discipline.
4. Briefly discuss the major discipline developing activities. How do these activities help in class room management.
5. Bring out the significance of evaluation in education. Point out the major techniques and tools of evaluation necessary for teaching biology at secondary level.

6. Develop a rating scale for 8th standard pupils to understand their nature of attention in class room activities.
7. Point out the advantages of preparing a blue print for an achievement test.
8. The following grade points are awarded for a pupil in different subjects. Find out his grade point for the examination.

<u>Subject</u>	<u>Grade Points</u>
Malayalam	4.21
English	2.84
Hindi	4.31
Social Science	4.13
Basic Science	4.01
Mathematics	3.5

9. How can you diagnose the weaknesses in learning of a content ?
Explain briefly, how you will organise remedial teaching for the same.
10. Discuss the need of self-evaluation in the light of characteristics of outstanding teachers.
11. Which are the major observational techniques of evaluation ? How do they differ from self reporting techniques ?
12. Briefly discuss the major implications of cognitive development to class room learning.

13. Who are exceptional children ? How should you deal with exceptional children ?
14. How will you overcome indiscipline problems in your classroom ?

APPENDIX VIII.B

Scoring Scheme of Achievement Test II

1. Characteristics of Adolescents. 2 1/2 marks
- i) Role confusion ii) Openness iii) Needs for for
attention getting, independence and achievement. each point
- iv) Biological growth and appearance of secondary
sexual characteristics
- Class room climate - To create a productive climate 2 marks for
following points are essential. each point
- i) Degree of formality ii) Flexibility and structure of
class iii) Anxiety and teacher control iv) know oneself,
know students, and their past experiences.
- v) Activities in the class room.
2. Steps in conducting a case study
- i) Collection of information 5 marks
- ii) Formulation of hypothesis each point
- iii) Design and try out of remedial programme
- iv) Evaluation of outcome.
3. Stages of cognitive development - 4 stages - Sensori motor
period, pre-operational period, concrete operational, and
formal operational. 2
- Stages of development of discipline - 3 stages 2

Basic disciplinary stage -

Constructive stage -

Generative stage -

Discussion of the parallel development of cognition and discipline. 1.

4. Discipline developing activities are ;

Construction of notice board & Bulletin board, Design posters,

Collect pictures and news clips, preparation of learning aids, 2 1/2

Preparation and maintenance of accessory learning aids, develop

working plan for field study, Framing of questions, preparation of hand written magazines, organisation of peer teaching and voluntary activities.

These activities provide opportunities for the development of 2 1/2

discipline. Help to develop initiative, self control, self-expression and self direction.

5. Evaluation judges which all objectives are achieved and how far achieved. Nature of behavioural changes can be realised. Help to direct instruction. 2

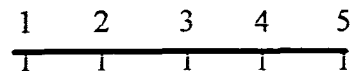
Techniques and tools of evaluation

Achievement testing - Achievement test

Self-reporting techniques - Inventory, questionnaire, opinionnaire, check list

- Observational techniques - Observational check list,
Rating scale, situational tests,
Anecdotal records.
- Miscellaneous techniques - Records & documents, interview
sociometry, Guess who technique
Social distance scale
- Case study - All tools
- Diagnostic testing - Diagnostic test 3

6. A five point scale serves this purpose



- i) How much attentive was in the class
- ii) How was participation in classroom activities
- iii) How was responses in the class
- iv) How was answers for review questions 5

7. Preparation of blue print help to give weightage to objectives, content, type of questions, and to difficulty level. This will help to test the level of achievement. 5

8. Total grade point =

$$\frac{4.21 + 2.84 + 4.31 + 4.13 + 4.01 + 35}{6} = \frac{23.00}{6} = 3.83. \quad 5$$

9. After administering diagnostic test, prepare diagnostic chart which provide information and weaknesses. 2 1/2

- Remedial teaching - includes planning, identify areas of difficulty and its nature and type. Then design remedial programme - Evaluation of the effectiveness of programme. 2 1/2
10. Self evaluation is necessary for assessment of individual improvement, professional development and school improvement. 2 1/2
- Characteristics of outstanding teachers - well qualified, excellent in communication, expert in teaching. Consider students needs, responsible, systematic, well prepared and skilled in various aspects of teaching. Discussion of the need of self evaluation to ascertain these characteristics in oneself.
11. Observational techniques - Observational check list, Rating scales, Anecdotal records, situational test. All these are rated by an external observer.
- Self-reporting techniques - Inventories, questionnaire, opinionnaire and check list. All these tools require reporting by self. 2 1/2
12. Implications - Teaching cater to needs of children at different stages, providing more experiments and activities, Instructional methods according to children. 5
13. Child deviating from average or normal. It includes gifted, backward, mentally retarded, mentally ill, physically handicapped and learning disabled. 3

Identify the nature of deviation. Employ special instructional methods.

2

14. The causes of indiscipline are physical, physiological, psychological, social and instructional.

In order to overcome the causes of indiscipline the following activities are helpful. 1 mark for

- a) Special care is given to pupils having indiscipline. each point
- b) Programmes to satisfy basic needs.
- c) Counselling and discipline developing activities.
- d) More group activities should be organised.
- e) Productive classroom climate should be developed.

4. Educational Qualifications :
5. Experience as HSA :
6. Name of the School :
7. Location of School : Rural/Urban

II. 1. Is the self instructional material (SIM) helpful to fulfill your needs ?

Yes/No.

2. Is the content in the self instructional material (SIM) relevant for your teaching ?

Yes/No.

3. a) Is the content presented in adequate depth of knowledge ?

Yes/No.

b) If no, does the material involve only known content ?

Yes/No.

4. Are the objectives stated in simple, and clear form ?

Yes/No.

5. The number of objectives in each unit are;

Excess/Adequate/Inadequate.

6. The arrangement of content is suitable for the realisation of objectives.

Agree/undecided/disagree.

7. a) Is the content given in each section adequate for the realisation of the objective?

Yes/No.

b) If no, specify the changes required

8. a) Is the information presented in the material correct ?

Yes/No.

b) If no, specify the points where changes are required

9. a) Are you interested in learning the material ?

Yes/No.

b) If not interested, specify reasons

10. Are the activities and exercises given in the material interesting ?

Yes/No.

11. The units of the material are ;

Lengthy/of adequate length/too short.

12. a) The introduction of each unit deals with known facts

Yes/No.

b) If no, specify the units where changes are required

13. The exercises given are useful and interesting

Agree/Undecided/disagree.

14. The application type questions in the material help to sustain interest

Yes/No.

15. The cover page is attractive and motivating

Agree/Undecided/Disagree

16. a) Do you think that dividing the whole content of the SIM to the seven blocks concerned is suitable ?

Yes/No.

b) If no, what changes do you prefer ?

17. a) Is dividing those blocks to the units concerned appropriate ?

Yes/No.

b) If no, what changes do you suggest ? (Specify units)

18. a) The units are arranged in sequential order

Yes/No.

62

b) If change in order of the units required specify the order.

19. a) Is continuity of the content maintained when the Blocks and Units are sequenced

Yes/No.

b) If no, specify where the continuity is lacking

20. a) Are the sections in a unit linked properly ?

Yes/No.

b) If no, specify the points where changes required

21. a) Are the Units linked together with adequate cross reference ?

Yes/No.

b) If no, specify the changes.

22. a) The content presented in the material have

Good Clarity/Moderate Clarity/Not Clear.

b) If not clear, specify the changes required,

- -----
23. Familiar words are used for explanation of the content
Agree/Undecided/Disagree
24. Explanations are given in short small sentences
Agree/Undecided/Disagree
25. Examples given are useful
Agree/Undecided/Disagree
26. Diagrams given are simple and clear
Agree/Undecided/Disagree
27. a) The style of presentation is appropriate
Agree/Undecided/Disagree
- b) If any change is required please specify

28. The media selected for the self-learning material are appropriate
Agree/Undecided/Disagree
29. The material is presented in personalised style
Agree/Undecided/Disagree
30. The explanations proceed from known to unknown

Yes/No.

31. a) Is the structure of the material useful for self learning

Yes/No.

b) If no, what changes are required? (Specify)

32. Learning Activities provided in the material are

Sufficient/Insufficient/Excess

33. Are the learning activities relevant for learning the content ?

Yes/No.

34. a) Are the learning activities arranged at suitable places of the material ?

Yes/No.

b) If no, specify the changes required.

35. Are the Learning Activities thought provoking ?

Yes/No.

36. Are the self check questions appropriate to check the objectives
selected?

Yes/No.

37. Do the self check questions ask you to apply the new information given
to you ?

Yes/No.

38. The self check questions are of appropriate difficulty.

Very easy/Very difficult.

39. a) The directions given in learning activities and self check questions are appropriate.

Agree/Undecided/Disagree

b) If disagree mention the changes required.

40. The assignment questions are of appropriate difficulty.

Easy/Confusing/Difficult

41. a) Are the assignment questions appropriate ?

Yes/No.

b) If no, what are the changes required ?

42. Are the assignment questions thought provoking ?

Yes/No.

43. Do the assignment questions demand information from the block as a whole than from individual units?

Yes/No.

44. Are the explanations given in the content related with your experiences ?

Yes/No.

86

45. The explanations given are directly linked with daily life.
Agree/Undecided/Disagree
46. Does the material utilise knowledge of everyday life at the appropriate places ?
Yes/No.
47. Does it make use of the information given in previous units or sections while presenting new information ?
Yes/No.
48. Questions given in the content are useful for easy memorisation.
Yes/No.
49. The summaries given are helpful for memorising the content.
Yes/No.
50. The self-check questions are useful for memorising the content.
Yes/No.
51. The possible answers given are adequate for memorisation of content.
Yes/No.
52. Adequate number of illustrations and explanations are provided to enable memorisation.
Yes/No.
53. The whole material is meaningfully presented to help easy memorisation of content.
Yes/No.

54. The application type questions help for transferring the knowledge gathered to new situations. Yes/No.
55. Provision is given in the material for
I) identification of similar situations in own life. Yes/No.
ii) using the knowledge in building similar examples. Yes/No.
56. Do you get knowledge of your progress immediately through this materials ? Yes/No.
57. Do the possible answers provide enough feed back about the progress in your learning ? Yes/No.
58. The 'let us sum up' section provides enough feed back. Yes/No.
59. Do the self check questions provide adequate feed back. Yes/No.
60. The assignment questions are useful to get an overall idea presented in each block Yes/No.
61. a) The references given in the material are adequate. Yes/No.

b) If no, specify the required changes.

62. a) Does the typography of the material give a guidance for proper learning.

Yes/No.

63. Does the numbering of headings in the material help you to study easily ?

Yes/No.

64. a) The nature of heading and sub headings are appropriate.

Yes/No.

b) If inappropriate specify the changes you prefer

65. The introduction section gives a guidance to learn each unit.

Yes/No.

66. Does the material provide answer for the probable doubts arising while reading it ?

Yes/No.

67. The cross references given in the material are appropriate.

Yes/No.

68. The directions given for change in the media for learning are clear.

Yes/No.

69. a) Are the diagrams well drawn and adequately labelled ?

Yes/No.

b) If no, specify the changes required.

70. a) Are the diagrams correct ?

Yes/No.

b) If no, point out the mistakes ?

71. a) Are the diagrams/figures/tables directly linked to the content by direct references.

Yes/No.

b) If no, specify the changes required.

72. a) The size and shape of the SIM is appropriate.

Yes/No.

b) If inappropriate specify the changes required.

73. a) The binding of the book helps for easy handling of the book.

Yes/No.

b) If no, mention the required changes.

74. The paper used for printing the material is of good quality.

Yes/No.

75. The audio cassette is properly attached with the print material.

Yes/No.

76. a) The number of words per sentences in the SIM is adequate.

Yes/No.

b) If no, specify the required changes.

77. The size of the type helps for easy reading.

Yes/No.

78. There is sufficient space in between lines.

Yes/No.

79. The marginal space at four sides are adequate.

Yes/No.

80. The audio cassette is of good quality
Yes/No.
81. Is the content in the audio cassette illustrating the respective teaching model correctly ?
Yes/No.
82. Is the cassette properly audible?
Yes/No.
83. Is the time used for each lesson adequate for the understanding of the model ?
Yes/No.
84. Has the oral presentation maintained the sequence of steps in each model ?
Yes/No.
85. Is there unnecessary pauses in the oral presentation in the cassette ?
Yes/No.
86. Are the voices of teacher and different students in the cassettes distinguishable ?
Yes/No.
87. Is the pronunciation in the cassette correct.
Yes/No.
88. Does the cassette contain unwanted noises ?
Yes/No.

89. Any other defect ? (Specify)

90. Overall impression of the audio cassette.

91. Which units in the material do you like best? Give reasons also, (Write Block No. 2 Unit Nos.)

92. Which units should be changed ? Mark the parts of units where changes are required.

Block No.	Unit No.	Section	Change that you desire	Reason for change
-----------	----------	---------	------------------------	-------------------

-----	-----	-----	-----	-----
-----	-----	-----	-----	-----
-----	-----	-----	-----	-----
-----	-----	-----	-----	-----
-----	-----	-----	-----	-----

93. Which units do not contain adequate information specify where the inadequacy ?

94. Which units consist of excess of information. Specify with regard to what the excess information is ?

95. Write the Unit numbers in appropriate places. With block numbers (As B1, U1, 2, 3, etc.)

The Unit was

Stimulating -----
Boring -----
Informative -----
Confusing -----

NB-2650
TH
371-146
BA1/D



94