CHAPTER - IV : METHODOLOGY

4.1. Introduction 113
4.2. Procedure for Identifying Problem Students 113
4.2.1. Observation 114
4.2.2. Curriculum Based Assessment 115
4.2.3. Development and Administration of Problem Checklist to Identify Problem Students 117
4.3. Classification of Problem Students Identified 118
4.4. Construction of Tools 119
4.4.1. Construction of an Achievement Test for Assessing the Academic Deficiency of Problem Students 119
4.4.2. Reliability and Validity of the Tool for Assessing the Academic Deficiency of Problem Students 122
4.4.3. Development of Social Skill Assessment Scale for Assessing the Social Skill Deficiency of Problem Students 124
4.4.4. Reliability and Validity of the Social Skill Assessment Scale 125
4.5. Development of Instructional Strategy (Multimedia based Modular Approach) to Overcome the Academic Deficiencies of Problem Students 126
4.6. Development of a Comprehensive Social Skill Strategy to Overcome Social Skill Deficiencies in Problem Students 134
4.7. Sample of the Study 136
4.8. Providing Remedial Programmes (Multimedia Based Modular Instruction and Social Skill Strategy) to Overcome Academic and Social Deficiencies in the Problem Students 138
4.9. Data Collection 140
4.10 Scoring Procedure 140
4.11. Statistical Techniques Used in the Study 140
CHAPTER-IV

4.1. Introduction

This chapter deals with the methodology followed in this study. The methodology followed in this study is discussed under different headings namely developing checklist to identify the problem students, procedure followed for identifying the problem students, construction of achievement test to assess academic deficiency as well as to measure the progress made before and after the experimental treatment, development of Social Skill Assessment Scale to assess social deficiency as well as to measure the development of social skills achieved after the experimental treatment, development of instructional strategy and Social Skill Strategy to overcome the academic and social deficiency of problem students, sample of the study, providing remedial programmes for overcoming academic and social deficiencies, data collection, scoring procedure and statistical techniques used in the study.

4.2. Procedure for Identifying Problem Students

A teacher must be able to identify problem students to make his teaching task a successful one. Identifying the problem students is very essential for a teacher to know about the specific behavioural problem, to classify them into appropriate category, to make correct assessment and placement and to decide upon the appropriate instructional strategy.
In this study, the following procedures were followed to identify the problem students.

1. Observation
2. Curriculum based assessment
3. Problem checklist developed by the investigator

4.2.1. Observation

Early attempts to observe the children's behaviour made use of diaries or contiguous observation and narration that were deliberately non-selective (Wright, 1960). From this tradition evolved observations of a more focused, pinpointed set of behaviours that could be reliably coded by observers (Bijon et al., 1969). Such observations are similar or even identical to those done in research studies. Recent observational methods have come largely from workers with a behavioural / social learning perspective. The observations are freely made in child's natural environment although some times-planned situations are created in clinic and laboratory settings to approximate naturally. Observations range from single, relatively simple and discrete behaviour of the child such as the occurrence of toileting to complex system of interactions of family members (Kolko, Israel, Pravder & Knight, 1989 and Reid, 1988). Clearly on going interactions are more difficult and the first step in any behavioural observation system involves explicitly pinpointing and defining behaviours. Observers who are trained to use the system then note whether a particular behaviour or sequence of behaviour occur. The observers are the persons who are already in the situation, for examples, the teachers, family members and peers. Behavioural observation is the most direct method in identification and assessment of behaviour difficulties and requires atleast inference. The difficulty and expense of time involved in maintaining the reliable observation is one of the primary obstacles to use this method. Hence observation is just one aspect of a multimethod approach to behavioural assessment that include self monitoring behaviour, interviews, ratings and checklist and self report instrument (Allen C. Isreal and Rita Wicks – Nelson, 1997).
By virtue of his key position in the classroom, a teacher's observation is of paramount importance in identifying the problem students in his classroom. It is he who spends most of his time with the students in the actual classroom, sitting and observing the students' behaviour, their interaction & transaction and also their overt and covert behaviours. So he develops a first hand knowledge about his students in his classroom. The problem students are such that their deviating behaviour or performance can be easily observed by the class teacher. Hence, in this study the investigator held a discussion with the class teachers and their observation was effectively made use of in identifying the problem students needed for this investigation. In addition to the teachers observation, the researcher relied on his own observation of the students as well as the on-going observations made by the parents of those students. Observations made by these three key and closely related persons formed the base for identifying the problem students in the initial phase. By the observation procedure, about 41 students were classified as problem students based on the overt problem behaviour manifested by them. To countercheck the reliability, the accuracy, the precision of identification, a thorough curriculum based assessment was made as suggested by Tucker (1985).

4.2.2. Curriculum Based Assessment

Curriculum based assessment is the process of determining instructional needs by directly assessing specific curriculum skills (Choate et al., 1992). The term curriculum based assessment is a technique that measures students achievement in the curriculum (Bursuck and Lessen, 1987; Gickling, 1981 and Tucker, 1987). It is defined as any approach that uses direct observation and recording of a student's performance in local school curriculum as a basis for gathering information to make instructional decision (Deno, 1987, p. 41). Gickling and associates pioneered the current movement of tying the assessment directly to the curricula (Shinn, 1989) and are credited with first using the term 'curriculum-based assessment' (Tucker, 1985).
**Advantages of Curriculum based Assessment**

i) Curriculum-based assessment is very useful at all levels of the assessment process from initial screening to programme evaluation. For the purpose of screening and referral, curriculum-based assessment provides systematic observational data concerning students' performance, measures the degree of deviance from peer performance and provides information for instructional intervention that would either legitimise or correct the need for the referral. When making referrals, general education using curriculum based assessment measures is able to specify skill deficits (Blankenship and Lilly, 1981). In short, curriculum based assessment would cure the palpable illegalities presently afflicting the subjective referral systems operating nation-wide (Galagan, 1985).

ii) Curriculum based measurement, which is one type of curriculum-based assessment, has been found to be an effective tool for identifying students with special needs (Deno, 1987; Galagan, 1985; Germann & Tindal, 1985; Jenkins et al., 1979; Marston & Magnusson, 1985 and Marrston et al., 1984).

A curriculum based assessment of the students brings to light the problem students. This curriculum based assessment was made with the help of the concerned class teacher who spends most of the time with those students, by direct observation and by scrutiny of relevant school records. This type of curriculum based assessment provides a detailed description of the child in the school setting, giving information about eight factors.

1. The child’s level of attainment in the basic subjects in terms of what he can do and what his special difficulties appear to be.
2. The child’s level of language development and speech.
3. Standards of achievement in other areas of curriculum, e.g., art, practical subject, physical education.
4. Emotional and social behaviour as displayed both in and out of the classroom.

5. Interest in and attitude towards school.

6. Previous school history.

7. The child’s interest and background knowledge.

8. Degree of parental co-operation and parental control.

By making a curriculum-based assessment of the target population by observation techniques as well as by scrutiny of records, which gave a subtle insight into the students’ capacity and achievement, about 53 problem students were identified. Some of the students with achievement problem did not manifest adequate overt problem behaviour. But the curriculum based assessment could expose their achievement problem. So in the second phase the number of problem students came to 53. This countercheck phase was followed by scientific confirmatory phase. To make a concrete as well as valid confirmation, the checklist developed by the investigator with seventy test items each covering a specific behavioural problem was administered to the students.

4.2.3. Development and Administration of Problem Checklist to Identify Problem Students

There are many tools used to collect data for any research work. John W. Best (1977) says ‘like the tools in the carpenter’s chest, each tool is appropriate in a given situation’. In studies done earlier (Achenbach, 1991; Barkley, 1990; Bernstein & Gafinkel, 1986; Kaufman, 1990 and March, 1997), the problem checklist is widely used as a tool in identifying children with behaviour difficulties and it also proved to be effective. As general rating scale, it may help a professional to judge the parents / family members / teacher’s view of the child’s behaviour patterns. This procedure can help in evaluating the appropriateness of the referral. Once a particular problem is identified, particular checklist will be helpful to specify the difficulties (Achenbach, 1991). Such instruments make it to compare multiple interment reports about the child with respect to a common set of problems, items and dimensions.
In the present study, to confirm the problem students scientifically on the basis of behavioural problems, a checklist consisting seventy statements relating to the behavioural problems of the students was developed by the investigator. First a pool of 82 items was constructed by the investigator. The statements were gulled out from the theoretical expositions given by various authors. And the first draft of the checklist was prepared with eighty two items each specifying a specific problem behaviour. The final form of checklist contained 70 items, consisting of 20 items each for achievement problem, hostility problem, role adjustment problem and 10 items for social relationship problem. All the items under each category were related to inadequacies of social skills. This checklist was administered to 10 teachers for pilot study. On the basis of the scores obtained in the pilot study, reliability of the checklist was established by using split-half method. The half test reliability (0.99) and the whole test reliability (0.99) obtained through split-half method is high and hence, the problem checklist used in the study is reliable.

The validity of the checklist was obtained from a panel of experts who have done research in the field of special education. They testified to the content and construct validity of the checklist. Their agreement was taken as the index of validity.

The developed checklist was given to the teachers to answer for each of the seventy items given in the checklist. Similarly, copy of the checklist in Tamil version was administered to the parents who were also required to answer all the seventy items given in the checklist. Both the teachers and the parents were instructed by the investigator to be free, frank and truthful so that the data obtained can be reliable and accurate assessment can be made for the purpose of research. The served checklist is given in Appendix-I.

4.3. Classification of Problem Students Identified

Problem students were selected on the basis of teachers observation, curriculum based measurement and observation made by the investigator
and the parents themselves. In addition, the investigator had wide ranging discussions with the teacher as well as the parents to know more about the problem behaviours of students. The agreement among the teacher, researcher and the parents was taken as an index of confirmation of problem behaviour. Thus 63 students were identified as problem students for the purpose of this study. On the basis of the responses obtained from the teachers and parents, 63 problem students were identified and these students were classified into four distinct categories i.e. students with achievement problem, hostility problem, role adjustment problem and social relationship problems.

4.4. Construction of Tools

To assess the effectiveness of the multimedia based modular strategy designed to circumvent the academic deficiency of problem students, an achievement test was constructed with 100 test items of equal weight. To assess the effectiveness of comprehensive social skill strategy designed for circumventing the social deficiencies of problem students, a social skill assessment scale was framed by the investigator with 60 items, consisting of 20 each under three categories such as classroom environment, school environment and social environment. The construction process is elaboratively discussed below.

4.4.1. Construction of an Achievement Test for Assessing the Academic Deficiency of Problem Students

To evaluate the effectiveness of the multimedia based modules and to compare the achievement of the problem students taught through multimedia based modular approach, an achievement test was framed. The test was framed covering all the science subjects chosen for the study. Equal weightage was given to each subject. For each subject, only two units were selected for the purpose of this study.

**Achievement Test**

Questions of objective type nature were framed covering all the selected units. Multiple choice, fillin the blanks, true or false and match the
following were the types of questions used in this achievement test. The questions were framed so as to suit the level of VIII standard students. Utmost care was taken to avoid ambiguity and ambivalence. The items included in the final form of achievement test were selected on the basis of item analysis.

Initially 120 questions of objective type in nature were framed for tryouts. Thirty five percent multiple choice test items, 35 percent fill in the blanks or supply test items, 5 percent true or false test items and 25 percent matching type test items were framed for the achievement test. Multiple choice test items were composed of a stem followed by a series of possible responses or options. The stem was a direct question or an incomplete statement with four options of which only one was the correct response. Due importance and weightage, the investigator had given to multiple choice test items because its level of difficulty would be varied with relative ease, and it was capable of reflecting simple student behavioural patterns such as recall of information as well as complex student behavioural patterns such as the ability to analyse and synthesise.

Supply test item or fill in the blanks test items constituted 35% test items. These test items were questions or incomplete statements which required highly short and specific answers. The answer was usually a significant word or expression. Matching test items constituted 25% of test items. Matching test items consisted of two lists of items and a set of instructions for matching one of the items in the first list with one of the items in the second list and True or false test items accounted for 5% of the test items.

**Item Analysis**

After this pool of 120 test items was constructed, the framed test items were subjected to careful scrutiny and critical judgments by a panel of subject experts. Each item was critically examined for what might be termed 'formal defects'. The next stage was that this was given as a test to 20 students belonging to the target population. The obtained data were then
used for an elaborate set of statistical procedures known as item analysis which gave the investigator information regarding.

1. Item difficulty
2. Item discrimination

**Item Difficulty**

Test item difficulty refers to the percentage of students who correctly answer to a given test item. The level of difficulty was determined by using the formula

\[ P = \left( \frac{N_r}{N_t} \right) \times 100 \]

Where

- \( P \) – percentage of students who answered the test item correctly
- \( N_r \) – number of students who answered the test item correctly
- \( N_t \) – total number of students who attempted to answer the test item

In most of the cases the percentage clustered about the 50 percent level. On the basis of this analysis, too easy and too difficult test items were deleted in the final form of achievement test.

**Item Discriminating Power**

A test item is said to possess adequate discriminating power when it is capable of differentiating between superior and inferior students. To determine item discriminating power, the following simple formula was used eventhough there are many different computational schemes.

\[ D = \frac{(U - L)}{N} \]

Where

- \( D \) – index of item discriminating power
- \( U \) = Number of students in the upper group who answer the test items correctly (usually 27% of the total group)
- \( L \) = Number of students in the lower group who answer the test items correctly (usually 27% of the total group)
- \( N \) = Number of students in each group
For more than 50% of the test items, the computed 'D' value exceeded to 0.40 which indicated that the test item were good and for the remaining items, the computed 'D' value ranged between +0.40 and +0.20 which was a clear indication to the satisfactory condition of the test item. Those items which failed to differentiate between the superior and the inferior students were not included in the final form of achievement test. The P-value and D-value for each of the 120 test items in the initial form of achievement test were calculated and they are given in appendix-II. The final form of achievement test in Tamil is given in appendix-III.

Each item was scored ‘one’ mark for the correct response and ‘zero’ for the wrong response. The duration of the test was 2 hours. The same achievement test was used as pre-test and post-test in the study. The English version of the final form of achievement test is given in appendix-IV.

The test was administered to twenty students belonging to the target population. The main purpose of the testing was to establish the reliability of the achievement test. The test scores obtained from the students formed the basis for establishing the reliability of the test.

4.4.2. Reliability and Validity of the Tool for Assessing the Academic Deficiency of Problem Students

a) Reliability of Tool

The test reliability means the consistency with which a set of test scores measures what they do measure (Ebel, 1975). It relates to the accuracy with which skill and knowledge are measured (Slavin, 1987). Reliability is a necessary condition for validity. Reliability co-efficient provides the most revealing statistical index of validity that is ordinarily available.

There are different methods to estimate the reliability of a test. Some of the commonly used methods are:

1. Test -- retest reliability
2. Split-half reliability
3. Alternative or parallel form reliability
4. Kuder-Richardson Estimates
In the present study, the split-half method is used to estimate the reliability of the test. The split-half method is considered to be one of the best methods for measuring the reliability, because all the data for computing reliability are obtained by one testing. Also, the variations likely to be brought about by difference between the two testing situations are eliminated.

In this method, the test items were divided into two equivalent halves by pooling the scores on odd numbered items and pooling the scores on even numbered items, and the correlation was found for these half tests by using the Karl Pearson's correlation coefficient formula,

\[ r = \frac{N \Sigma XY - \Sigma X \Sigma Y}{\sqrt{(N \Sigma X^2 - (\Sigma X)^2) (N \Sigma Y^2 - (\Sigma Y)^2)}} \]

\[ r = \frac{(20 \times 9894 - (431 \times 434)}{\sqrt{(20 \times 9987 - 185761) ![199740 - 185761] (201920 - 183356)}} \]

\[ = \frac{197880 - 187054}{\sqrt{199740 - 185761} (201920 - 183356)} \]

\[ = \frac{10826}{\sqrt{13979} (13564)} \]

\[ = \frac{10826}{13769} = 0.78 \]

From the reliability of half test correlation, the self correlation of the whole test is then estimated by using Spearman – Brown's prophecy formula

\[ r_{xx} = \frac{2r_{oe}}{1+r_{oe}} = \frac{2 \times 0.78}{1 + 0.78} = 1.56 \]

\[ r_{xx} = 0.88 \]

Where, \( r_{xx} \) – coefficient of internal consistency

\( r_{oe} \) – coefficient of correlation between the odd half scores and even half scores.
(The obtained $r_{xx}$ value indicates that coefficient of internal consistency is high and positive).

The obtained value 0.88 shows that the achievement test used in the study is highly reliable.

**b) Validity of the Tool**

A research tool is said to be valid when it measures what it purports to measure. Any achievement test should possess validity. Validity indicates how adequately the content of the test is sampling that domain about which inferences are to be made. It is particularly very important for achievement tests. A logical examination of instructional objectives and the content to be taught was done by panel experts. The panel consisted of two professors from Education, one professor from Rajapalayam Raju's college and four noteworthy P.G. Assistants of Rajapalayam taluk in addition to the P.G. Assistants serving in the school where the experiment was carried out. The agreement of the views of the ten experts was taken as the index of validity of the content of the achievement test. The intrinsic validity is also estimated through the square root of the reliability of the achievement test. The obtained square root of reliability (0.93) is high and hence the achievement test possesses intrinsic validity.

**4.4.3. Development of Social Skill Assessment Scale for Assessing the Social Skill Deficiency of Problem Students**

The achievement test constructed by the investigator served the purpose to assess the academic deficiency of the identified problem students. At the same time, there was need to assess the social deficiency of the problem students. For that purpose, a social skill assessment scale was developed by the investigator. As in the case of achievement test, the same procedure was adopted for the development of social skill assessment scale. The skill areas were divided into three broad categories as classroom environment, school environment, and social environment. First a pool of 75 items was developed by the investigator. The framed assessment scale items were subjected to careful scrutiny and critical judgments by panel
experts in that field. Each item was critically examined for what might be termed 'formal defects'. The final form of social skill assessment scale contained 60 items, covering 20 items each for classroom environment, school environment, and social environment. All the items under each category were related to social deficiencies of problem students.

Against each item, three are given namely frequently, sometimes and rarely having scores 3, 2 and 1 respectively. The problems students identified were asked to answer each of the 60 items given in the social skill assessment scale keeping the above stated gradation in mind. Further, the social skill assessment scale consists of Part A in which the problem students are required to provide their personal details.

4.4.4. Reliability and Validity of the Social Skill Assessment Scale

a) Reliability

The social skill assessment scale was administered to 20 students. On the basis of the scores obtained, the reliability of the social skill assessment scale was calculated by using Split-half method.

\[
r = \frac{N \Sigma XY - \Sigma X \Sigma Y}{\sqrt{(N \Sigma X^2 - (\Sigma X)^2) (N \Sigma Y^2 - (\Sigma Y)^2)}}
\]

\[
r = \frac{(20 \times 188928) - (1357 \times 1395)}{\sqrt{[(20 \times 185273) - (1841449)] [(20 \times 196641) - (1946025)]}}
\]

\[
r = \frac{3778560 - 1893015}{\sqrt{(3705460 - 1841449) (3932820 - 1946025)}}
\]

\[
r = \frac{1885545}{\sqrt{(1864011) (1986795)}}
\]

\[
r = \frac{1885545}{19244224} = 0.97
\]

From the reliability of half test correlation, the self-correlation of the whole test is then estimated by using Spearman – Brown's prophecy formula
\[ r_{xx} = \frac{2r_{oe}}{1+r_{oe}} = \frac{2 \times 0.97}{1 + 0.97} = \frac{1.94}{1.97} = 0.98 \]

Where, \( r_{xx} \) – coefficient of internal consistency

\( r_{oe} \) – coefficient of correlation between the odd half scores and even half scores.

(The obtained \( r_{xx} \) value indicates that coefficient of internal consistency is high and positive).

The obtained \( r \)-value 0.98 shows that the social skill assessment scale used in the study is highly reliable.

**b) Validity**

The validity of the social skill assessment scale was obtained from a panel of experts who have done research in the field of special education. They testified to the content and construct validity of the social skill assessment scale. Their agreement was taken as the index of validity. The intrinsic validity of the social skill assessment scale was found to be 0.99 and hence the scale possesses intrinsic validity.

The served Social Skill Assessment Scale in English and Tamil version is given in Appendices-V and VI.

**4.5. Development of Instructional Strategy (Multimedia based Modular Approach) to Overcome the Academic Deficiencies of Problem Students**

Instructional strategy refers to the application of appropriate psychological principles or definite methods and technique in the instructional process. Instructional strategy is a means of achieving the instructional objectives in the best possible manner at the lowest cost.

Without proper instructional strategy one cannot circumvent the academic deficiencies of the problem students. An instructional strategy like
multimedia based modular instructional strategy which encompasses maximum utilisation of media can alone ensure effective teaching learning process and modular instructions are found more feasible and profitable.

Development of Modules

The main objective of this study is to prepare modules for science in VIII standard. In the development of modules, the guidelines by the National Council of Educational Research and Training (NCERT) and the models of Subramania Pillai of Madurai Kamaraj University (1992) have been followed by the investigator. Two units each of subjects Physics, Chemistry, Botany, and Zoology were selected. Sound and electricity for physics, chemical equations, acids, bases and salts for chemistry, organisation of plants and ecology for botany, cellular organisation and nutrition and hygiene for zoology were included in this study for developing multimedia based modules. Each of the above units was divided into three to four conceptual sub units. A sub unit constituted the subject content for development of one module. All the modules were developed in self-contained and self-instructional manner. Module has at its first page the overview of the modules, which specifies the unit, the conceptual sub unit and the pattern of the module. Below the overview is given the list of multimedia packages available for auto learning to the users.

In the succeeding page, instruction is given to the students as to how to use the module for self-learning. The third page contains the entry test consisting of objective type test items to assess the preliminary knowledge or the entering level of competence of the students required for learning the module. If a student fails to obtain the prescribed minimum level of competence or achievement, he may not understand the module and he should go for remedial mini courses to strengthen his entering level of competence. When he believes that he is ready to take the entry test again, he may be allowed to take the test and may be further allowed to proceed to the pre-test, if found competent enough. Then the pre-test comes, which is again an objective type test. It helps to self evaluate the students’ status when he proceeds with the module. It is followed by introduction of the topic. General and specific objectives are delineated in behavioural terms. Next,
the learning materials for objectives I and II are presented. Necessary
diagrams, sketches, pictures, worksheets, examples, dimensional drawings,
practicum and project work etc, are included in the materials suitably.

Since module is a self instructional package, there is a greater need
for formative evaluation, to measure the progress and guide the content and
pace of the lessons. Formative evaluation is done to discover the strengths
and weakness in learning to make midcourse corrections, in pace or content
of instructions (Slavin, 1987). In the modules, provision is made for formative
evaluation in the form of embedded tests. These tests are useful to the
degree that it is informative closely tied to the curriculum being taught, timely
and frequent. Also, they provide feed back to the students that they can use
to improve their learning. After all the learning materials are presented, a
post-test is given. This is also of objective type in nature. It is used to make
summative evaluation of student’s knowledge or skills. It allows for
comparison among students. Necessary bibliographical references,
assignments and guidelines for further follow up action are also furnished in
the modules. Practicum and project works listed out in the modules promote
learning by doing; field trips, experimentation and above all the involvement
of the students which facilitate interaction with one another, ameliorate
smooth learning, deepen understanding, lengthen retention and facilitate
transfer or recall. Finally, keys to all the tests are appended at the end.

The above provisions enable the students to make self study with the
help of the modules. The modules thus developed were keenly edited with
reference to accuracy and relevance of the material, style, vocabulary,
density of presenting the facts and content interest. This scanning was very
useful to eliminate ambiguities, obscurities and other inadequacies. It also
helped to improve the logical sequence of the presentation and also to
improve the technical accuracy of the content presented. For proper editing
of the modules, the services of the colleagues and subject experts in the
respective disciplines were utilised.

Once the editing was over, the modules were ready for tryouts. Tryout
is an essential process of validation and the tryouts help in refining the
module and make it relevant to the target population. So the modules prepared for this study were subjected to individual as well as group try outs.

In the individual try out, the researcher sat face to face with randomly selected individuals of the target students one at a time. This gave him an opportunity to study the reactions of the learner in respect to the materials presented. He noted down the time taken for reading and understanding. Clarification asked, remarks made, and the pre-test and post-test scores were also noted down. On the basis of these ratings and analysis of the try out, necessary corrections, modifications, refinements etc. were made then and there itself. Thus after completion of ten individual tryouts, the material became better refined.

After this, the developed modules were subjected to a group tryout. The group contained students of the same target population. Separate answer sheets were provided for writing the answers to the pre-test and post-test items. Sufficient time was given for the students to use the module and answer the questions. Congenial atmosphere was created and proper rapport was established since these are the requirements of any group tryout. The students were instructed about the nature of this auto instructional material and what is expected of them along with the purpose of this tryout. The reactions of the students during the tryout were noted down. Answer sheets of the students were finally evaluated for finding out the percentage of incorrect responses and their level of mastery achievement. On the basis of these ratings and analysis of the try out, required correction, modification, refinements etc. were made wherever necessary. Both the try outs ensured better refinement and perfection of modules. The agreement of views of experts who reviewed the modules was taken as the index of validity of the content of the modules. One specimen module for each subject is given in appendix-VII.

Development of Multimedia Packages

After developing the modules, the investigator had to shoulder the herculean task of providing multimedia base to the prepared modules. Every possible effort was taken to develop LTIM for each module prepared by the
investigator. It ranged from colour chart to thermocol model. The lists of LTIM and HTIM used in this study are given in the Appendix—VIII. Video cassettes had been procured from the International Educational Research Centre, New Delhi for this purpose before hand. Similarly, audio cassettes had also been procured from commercial agencies for this purpose. For science two cassettes on" science experiments" were purchased, all audio cassettes were purchased covering the entire science units. Even then all the units could not be covered. Some of the cassettes were of high standard suitable to high school and higher secondary students only. So, there was need to develop video and audio cassettes by the researcher himself to provide multimedia base to the developed modules.

**Video Recording**

Different video cassettes were procured from different sources like International Educational Research Centre, New Delhi and District Science Centre, Thirunelveli. To maintain a logical sequence, these cassettes were recorded in proper sequential order for the use of the problem students during the period of the experimental treatment. It was ensured that they were recorded in such order as to correspond to the order of the modules and this recording was done in the order of the modules for each component of the subjects of science i.e. physics, chemistry and biology.

**Editing**

Since the video cassettes had been subjected to proper editing in the production stage itself in the recording, editing was restricted to the extent of arranging them in the sequential order and providing Tamil sub titles. For this purpose renowned subject teachers and experts were consulted and their services were utilised in the process of editing. The video cassettes thus recorded and Tamil sub titles provided were made ready for instructional presentation to problem students during the period of experimental treatment.

**Audio Recording**

Having completed the video programme, the investigator had to develop audio cassettes. Audio lecture was based on the developed
modules. Since audio recording was comparatively less expensive, the teachers were instructed to be more elaborative in their presentation. At the same time, they were advised also to set the pace of presentation so as to suit the problem students. The duration of each of the five final cassettes was an hour.

**Development of Computer Software for CAI**

Since a multimedia approach would be incomplete without application of computer software, an earnest effort was made to develop computer software for CAI. A computer expert was consulted for this purpose and it was discussed with him how to develop software for CAI based on modules. Though there are various CAI programme such as 'drill and practice programme', 'tutorial programmes', the investigator decided to follow the first one i.e. drill and practice programme, since this is the most widely used type of computer programme (Slavin, 1986). The purpose of this programme was to provide practice on skills and knowledge so that students can remember and use what they have been taught.

The methodology involves repetition of a format in which the computer presents an exercise, the student types his answer and the computer indicates if the answer is correct. Diagram and sketches were also incorporated in the software in appropriate places through scanning procedure. For subjects and units different codes were allotted. The software was prepared in such a way that it ensured the following.

1. Letting students work at their own pace
2. Providing immediate feedback and reinforcement
3. Measuring performance quickly and giving students information on their performance

The cost of the software was Rs. 3000/- since they charge at exorbitant rate for development of software in Tamil language, which is a rare phenomenon here. The software had to be developed in Tamil language since it was meant for Tamil medium students. Once the programming was over, it was subjected to tryouts. In the tryouts the
students expressed that it was more conducive for learning at their own pace. Also they found it more effective since the interaction with the computer had a motivating quality of its own. After this, the software for CAI programme was made ready for the use of problem students.

**Multimedia Based Modular Plan to Overcome the Academic Deficiencies of Problem Students**

To start with, an entry test is given to the students to determine their own entering level of competence or achievement: If a student fails to obtain the prescribed minimum level of competence or achievement, he may not understand the module. So he should go for remedial mini course to strengthen his level of competence. Others can proceed with the module. Those who do not make it, should get their entering level of competence strengthened by way of remedial mini course and then they can proceed to the pre - test. Pre - test helps to self - evaluate the student’s status when he proceeds with the module. Then, they pursue the learning material for general objectives. Their learning is accentuated by media as well as teacher support. Next, their learning is assessed by means of a formative evaluation in the form of embedded test. After this, the students study the learning materials presented for specific objectives, they are adequately provided with media and teacher support to facilitate better learning. Then a formative evaluation of specific objectives is done. It is followed by practicum and project activities related to the concept dealt with. These provide for experimentation and work experience which in turn, facilitate learning by doing. Lastly, a summative evaluation is done in the form of a post-test or modular test. Those who fail to obtain the specified mastery level in the post-test, should again go for remedial courses till they feel confident and competent. Thus in the modular plan every student will be able to attain the specified mastery level, though the time taken may vary from student to student. The modular plan of Ramar, (1996) followed in this study is presented in the form of a flow chart in the succeeding page.
FLOW CHART OF A MULTIMEDIA BASED MODULAR PLAN BASED ON THIS STUDY
A TEN STAGE PLAN

I. Entry Test
II. Pre-test
III. Reading Learning Material
IV. Media / Teacher Support
V. General Objectives
VI. Reading Learning Material
VII. Specific Objectives
VIII. Project Activity
IX. Post-test
X. Mastery Learning

Remedial Programme
The developed module and the multimedia packages were also viewed by the same panel experts. The experts who pursued the modules expressed their views that the modules would be easier than the textbook. Also, they viewed the multimedia packages like audio and video cassettes and CAI software and were of unanimous opinion that the multimedia packages were relevant to the instructional content and they had the anticipated aural and visual effect besides having a motivating quality of their own. The agreement of the views of the panel experts was taken as the index of validity of the modules and multimedia packages.

The developed multimedia based modules were given to the four categories of problem students identified, for a period of three months to see whether they are effective or not. After one month the achievements of these students were measured and it was found that the problem students’ achievement raised significantly due to the application of multimedia based modular instructional strategy.

4.6. Development of a Comprehensive Social Skill Strategy to Overcome Social Skill Deficiencies in Problem Students

The process of identification and assessment will assist in diagnosis, classification and intervention of behaviour difficulties in children. Training in problem solving has been effective in reducing behaviour problems and aggression, controlling impulsivity, and increasing social interactions (Spivack and Shure, 1974). Mastery of problem solving strategies require students to become aware of their abilities. Once that is accomplished they can learn when and how to employ social problem solving strategies.

There are several factors involving in developing social problem solving strategies with children (Spivack, Platt and Shure, 1976). These include:

i) Acknowledging the fact that environmental events may control or be related to the problem.

ii) Defining the problem and generating alternative solutions.
iii) Examining alternatives in the light of their acceptability and their short and long-term effectiveness.

iv) Devising a plan for implementing selected activities; i.e. specifying the steps necessary for social problem solving.

v) Recognizing and understanding the natural consequences of behaviour and factors that social interaction is a reciprocal and interactive process.

vi) Implementing and evaluating the plan.

Problem solving training has helped the students with behaviour problems to identify emotions, consider others feelings, generate solutions to social problems, and evaluate the results of their activities in social situations with peers (Spivack and Shure, 1974).

The mock debate, role play encourages students to talk to themselves before, during and after a social behaviour. Most of the intervention strategies are teacher strategies and focus on the role of the teachers in facilitating the development of prosocial behaviour. The comprehensive social skill strategy emphasizes students’s active involvement in their own learning.

Social skill is a crucial factor in the development of children. Lack of acquisition of adequate social skill indicate the social behaviour of children. To remain a worthy member of the society one should develop adequate competence in social skill. A child in his school environment should try to develop his skills in social cognition, social perception, social learning, interpersonal skill, social interaction and social transaction. Such students may lack adequate skills in one or more of the above said domain. In order to develop social skill, the investigator devised a social skill strategy which can provide adequate social skill training to the problem students. The comprehensive social skill strategy incorporated a 10 action programme to develop social skills in problem students. The ten action programme includes activities like brainstorming, role playing, mock debate, dramatisation, group discussion, simulation, joint work, group responsibility, peer group interaction, participation in curricular, co curricular and club activities.
Application of these comprehensive social skill strategies will bring about desirable change in the social behaviour of problem students. Though each of the above activities has its own merit, their cumulative effect on problem students can bring about some tangible results that can modify their behaviour leading to social skill development.

These remedial programmes will provide training so as to develop following adequate skills in the problem students.

i) Social cognition, perception, social learning, interpersonal relationship social interaction and transaction

ii) It enables the problem students to come out of their shell

iii) It provides a training ground for cooperation and coordination

iv) It ensures compulsory participation in the beginning and voluntary active participation at the end of training

v) It is a tool that tackles adjustment of problem students effectively

The developed comprehensive social skill strategy containing ten action programme was applied to the four categories of problem students for a period of six months and the observed significant prosocial behaviours in problem students testified to the validity of the social skill strategy used in the study.

4.7. Sample of the Study

The problem students were selected from the school where the investigator is working as Headmaster. The students of this school are from far flung villages. Almost all the students are from Scheduled caste (S.C.) and Backward class (B.C.) communities only. The district, especially the area of the school is known for communal problem. Most of the S.C. students in this school are problematic in some way or other. So are the students from the B.C. communities. These communities are warlike communities. These two communities i.e. scheduled caste (S.C.) and B.C. are at logger head often in this area. This is so because they lack social skills and they are very poor in interpersonal relationship, social interaction and social transaction. This state of affair prompted the researcher to select sample from this school. Problem students were selected on the basis of
teachers observation, curriculum based measurement and observation made by the investigator and the parents themselves. In addition, the investigator had wide ranging discussions with the teacher as well as the parents to know more about the problem behaviour of students. The agreement among the teacher, researcher and the parents was taken as an index of confirmation of problem behaviour. Thus 63 students were identified as problem students for the purpose of this study. The identification made in the initial phase was counterchecked through curriculum based assessment and then scientifically confirmed on the basis of the response made to the checklist by the teacher and the parents. How the sample i.e. fifty (50) problem students were selected is discussed in terms of sampling technique.

**Description of the Sample and Sampling Techniques**

From the total population of 200 students, 63 problem students were identified following the procedure mentioned under the sub head ‘procedure for identifying the problem students’. All the identified problem students could not be included for the study. Some students were from far off villages and so they could not be kept in the school for long time in the evening hours. Some of them were quite irregular. Such students were excluded for the purpose of experimentation. Excluding such students, finally the identified problem students were 50 in number. These students were categorized by the checklist in four sub heads. Fifteen students in the first category i.e. the students with achievement problem, 10 students in second category i.e. students with hostility problem and 10 students in third category i.e. students with social relationship problem and 15 students in the fourth category i.e. the students with social relationship problem were finally identified for the study. These 50 problem students were selected for the purpose of assessing the effectiveness of the intervention strategy in circumventing their academic and social deficiencies. For these students experimental treatment was provided.
4.8. Providing Remedial Programmes (Multimedia Based Modular Instruction and Social Skill Strategy) to Overcome Academic and Social Deficiencies in the Problem Students

**Modular Instructional Strategy to Overcome Academic Deficiency**

The problem students were taught through the multimedia based modular approach for a period of three months at the rate of one and half hours per day especially in the evening after the class hours. The students were taught by low technology instructional media (LTIM) and high technology instructional media (HTIM). Audio, video cassettes were played to the problem students as and when required. The CAI software was also used on turn basis since we could not provide sufficient number of computers. Eight units were covered inclusive of four specified subjects (Physics, Chemistry, Botany and Zoology) during the period of investigation. For eight units' 25 modules were developed.

The problem students were encouraged to make self study with the help of the multimedia based modules. They were also advised to use the modules strictly as per the instructions given in the modules. All the modules were arranged in sequential order and they were supplied to problem students in the form of handbook. The problem students were not allowed to take the handbook (modules) to home.

For conducting the experiments the laboratory was chosen. Everyday the audio and the video cassettes were played to the students covering the module they studied on that particular day. CAI software was also used for the benefit of the problem students. They had some problem initially with the code number and with the key board, since they did not know how to handle the key board but they picked up the modus operandi in a week or so.

Since CAI software had a motivating quality of its own due to the provisions for interaction by students, the problem students were very much attracted to it. The provision for knowledge of result, immediate feed back and reinforcement found in the CAI programme made their learning exciting and pleasant. As in the text, there was no need for the problem students to
scan the text to find out the correct response, which was furnished by the computer itself in the CAI programme. The diagram and the sketches which were incorporated in the CAI software through the scanning procedure made good visual impact which in turn contributed for better understanding and longer retention.

Besides using audio, video and CAI, the problem students were encouraged to do simple experiments specified in the practicum and project work. Everyday all possible equipments and apparatus were provided to the experimental group problem students to try their hands in doing simple experiments. Watching the experiments done by the teacher on the screen, they were able to do the same by themselves. This video programme was found to have imbibed a sense of self confidence in them. When enough apparatus and tools were not available for all problem students, they were advised to do the experiment as a group. For complex experiments also, the same procedure was adapted.

The teacher support system was restricted to the extent of aiding the students in the operation of HTIM equipments clarifying doubts, and guiding the problem students in experiments and project works. After a period of three months, a post - test was conducted for assessing the achievement made.

**Social Skill Strategy to Overcome Social Skill Deficiency in Problem Students**

Developing social skills is more difficult, more complex and more time consuming. Therefore, this part of the treatment was extended for a period of six months. Man by nature is resistive to change. So it is not possible to bring about modification of behaviour in a short while. The undesirable behaviours that were with the students from their childhood can not be easily modified in few weeks. That is why the devised ten action programme was implemented for a period of six months since that much of time was certainly needed for modification of undesirable behaviour and for development of right type of behaviour which all play a key role in the development of social skills in problem students.
Out of ten items, everyday the problem students had a variety of two or three items. They had to act according to the programme. All the ten programmes demand participation on the part of the problem students. It provides them with opportunities to come out of their shell, to talk to others, to share his views with others, to accommodate other's views, to co-operate with others, to coordinate his effort with others, to share the responsibilities and thereby to share the feelings and emotions which are all very essential for development of adequate social skills in the problem students. Everyday the problem students were engaged in two or three of the 10 action programme for a period of one hour. Then after the experimental period, the Social skill assessment scale was administered once again to assess how far they have developed their interpersonal relationship, social perception, social interaction and social transaction which cumulatively enhance development of social skills in the problem students.

4.9. Data Collection

At the end of the experimental period, a post-test was conducted to the problem students. The responses given by the problem students in the pre-test and post-test formed the vital data required for the analysis. The scores of the students in the achievement test and social skill assessment scale before (pre-test) and after the experiment (post-test) are given in Appendix - IX.

4.10. Scoring Procedure

The academic achievement test consists of 100 objective type questions. The total score of the test is 100. For correct answer, the score is one and wrong answer the score is zero. The Tamil and English versions of the key to the academic achievement test are given in appendix –X and XI. For Social Skill Assessment Scale 3 point scoring is given namely frequently, sometimes and rarely having the scores 3, 2 and 1 respectively.

4.11. Statistical Techniques Used in the Study

The data thus obtained were analysed by using appropriate statistical techniques such as mean, standard deviation and t / F - test.
At the first stage, distribution and classification of problem students on the basis of gender, age, community, educational qualification, income of parents and parental care were carried out.

In the second stage, mean and standard deviation (S.D.) of pre-test scores were calculated for each of the four categories of problem students.

In the next stage, to know the effectiveness of the multimedia based modular instructional strategy in overcoming the academic deficiencies of the problem students, mean and S.D. were calculated before and after implementing the instructional strategy. Based on mean and S.D., t / F-test was calculated to know the significant difference between the means. Similar procedure was adopted to assess the effectiveness of the developed comprehensive social skill strategy.

Likewise, to know how far and to what extent the developed instructional strategy and comprehensive social skill strategy were effective in overcoming the academic and social deficiency of each category of problem students, mean and S.D. for each group was worked out for the pre- and post-test scores. Based on mean and SD, t-values were calculated to know the significant difference between the groups.

The obtained results are tabulated and the details of analysis and interpretation are presented in the succeeding chapter.