CHAPTER VI

SUMMARY AND CONCLUSIONS

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CHAPTER VI

Summary and Conclusion

The summary of the study is presented in this chapter. The need and significance of the study in brief followed by the presentation of the problem and the objectives of the study, the outline of research design and the conclusions emerged from the findings obtained by the analysis of data are presented. The chapter concludes with a discussion of the implications derived from the present study and the suggestions for further research.

Need For the Study

Since no national census of the learning disabled has been taken in India, it is difficult to collect their actual number. In India the learning disabled students are not identified using reliable tests; nor are they given special support and services, while in the U.S.A. special education teachers are appointed to assist the content teachers to develop special programmes for the learning disabled students.

In the absence of reliable data in India there is a growing concern over how to meet the needs of the learning disabled students. Mainstreaming which is the regular class placement of individuals with mild learning disabilities is necessary in the Indian conditions, while the severe cases are to be referred to the special schools. Mere physical placement in a regular classroom is not enough to ensure academic achievement. If the intervention for the learning disabled students is to succeed, careful planning in all aspects of education especially in preparing instructional strategies is essential.
The models already available are not feasible in our classroom, because of the limited facilities. In all schools we come across a considerable number of children with either mild or moderate learning disabilities at all stages of education - pre-primary to higher education. It is in this context that there is an urgent need to study an alternative to improve the academic achievement of children with learning disabilities. A new programme, which can be immediately implemented, is the need of the time. The investigator presumes that using some instructional devices based on self-study approach and thinking abilities, teachers can enhance academic achievements of students with learning disabilities.

The Problem for the Study

Effectiveness of Self-Instructional Materials and Modern Instructional Strategies in Minimising Learning Disabilities of Students in Secondary Schools.

Hypotheses

The present study is aimed at finding out the effectiveness of self-instructional materials consisting of programmed learning and supervised learning module and a modern instructional strategy namely guided inductive inquiry model in minimising learning disabilities of students in secondary schools. It is assumed that student achievement depends upon the method of teaching adopted. On the basis of this assumption, the following hypotheses were formulated.
**Hypothesis I**

There is significant difference in the initial and final achievements of the secondary school students with learning disabilities when self-study approach and modern instructional strategy are adopted for their learning.

**Hypothesis II**

The self-study approach and the modern instructional strategy are more effective than the traditional lecture demonstration method for the achievement in biology of learning disabled (LD) students of secondary schools.

**Hypothesis III**

The self-study approach and the modern instructional strategy are more effective than the traditional lecture demonstration method for the achievement in biology of non-disabled (ND) students of secondary schools.

**Hypothesis IV**

The progress of the learning disabled (LD) students of self-study approach and modern instructional strategy groups is considerably high when their achievements are compared with those of the LD students and ND (non-disabled) students of the lecture demonstration method groups.

**Hypothesis V**

The effectiveness of self-study approach and modern instructional strategies in the achievement of LD (learning disabled) and ND (non-disabled) students is dependent on certain extraneous variables.
Objectives

The following are the objectives formulated to carry out the study:

1. To find out the effect of programmed learning, supervised learning module and the guided inductive inquiry model on the achievement in biology of secondary school students with learning disabilities.

2. To find out the effect of programmed learning, supervised learning module and the guided inductive inquiry model in comparison with that of the conventional lecture demonstration method in minimising the learning disabilities of secondary school students in learning biology.

3. To compare the achievement of LD students and ND students when they are taught biology using programmed learning material, supervised learning module and guided inductive inquiry model.

4. To compare the progress in the achievement of LD students and ND students when programmed learning material, supervised learning module and guided inductive inquiry model are adopted for teaching.

5. To compare the objective-wise achievement of LD students and ND students when they are taught biology using programmed learning material, supervised learning module and guided inductive inquiry model.

6. To find out the relationship of achievement motivation, study habits, home learning facility and socio-economic status of parents in the learning of LD and ND students, when they are taught biology using self-instructional materials and modern instructional strategies.
Research Design

Since lessons in biology for grade IX on the topic Reproduction in Plants were not available in self-instructional materials and modern instructional strategy the investigator prepared programmed learning materials, supervised learning module and guided inductive inquiry lessons on the topic selected for the experiment. The achievement test in biology for the same topic was prepared and standardized by the investigator. Due to the unavailability of appropriate tests to identify adolescents with learning disabilities the investigator constructed a diagnostic test of learning disability, pupil behaviour rating scale and a learning problem checklist. The other tests used are Raven's progressive matrices sets A, B, C, D&E, study habits inventory, home learning facility inventory, achievement motivation scale and socio-economic status scale (revised).

Experimental Design

The experimental method was found appropriate for the present study. Since the three instructional methods had to be used in the classroom in Indian conditions the investigator conducted the experiment in intact un-equated classroom groups and then the groups were equated statistically by applying the technique of analysis of covariance to analyse the pretest and posttest scores. So the non-equivalent pretest/posttest design was selected for this study.

The teaching strategy became the independent (experimental) variable with four levels of treatments viz. Programmed Learning Material (PLM), Supervised Learning Module (SLM), Guided Inductive Inquiry Model (GII) and Lecture Demonstration Method (LDM).
Student performance (achievement) is the dependent variable. There is every chance of many extraneous variables to affect the experiment. Among them achievement motivation, study habits, home learning facility and socio-economic status scales were statistically analysed so as to determine their influence on the achievement. All the students selected were average to above average intelligence.

**Sample Selected for the Experiment**

The initial sample consisted of all the students studying in IX standard in the selected schools (N=895). For the experiment adopted for the study, experimental and control groups of students were selected from four educational institutions following the state syllabus. All these schools were matched on instructional variables, viz., medium of instruction, qualification of teachers and teacher pupil ratio. From the initial sample of 895 students 204 students were identified as learning disabled with the help of the tools prepared for identification. Since the experiment aimed at comparing the learning disabled (LD) and non-disabled (ND), 204 ND students were also selected for the study. Thus the sample consisted of 408 students.

**Experiments Conducted**

Three experiments were conducted in the intact classroom groups to test the effectiveness of Programmed Learning Material (PLM), Supervised Learning Module (SLM) and Guided Inductive Inquiry Model (GII) lessons. The control group of LD students was formed for the conventional Lecture Demonstration Method (LDM). In order to compare the achievements and the progress of LD and ND students taught under all the four strategies (PLM, SLM, GII and LDM), four control groups of ND
students were also formed. The following procedure was adopted in conducting the experiments.

1. The groups were pretested with the Achievement Test in biology. The following tests were administered in all the groups.
   (a) Raven's Progression Matrices sets A, B, C, D & E.
   (b) Diagnostic Test of Learning Disability
   (c) Study Habits Inventory (SHI)
   (d) Home Learning Facility Inventory (HLFI)
   (e) Achievement Motivation Scale (AM)
   (f) Socio-economic Status Scale (Revised)

2. Different groups were treated with different methods of teaching. In all the groups the achievement test used for pretest was administered after the experiment.

3. The Pupil Behaviour Rating Scale was given to the parents of those identified as learning disabled by the diagnostic test.

4. The class teachers were given the Learning Problem Checklist

**Analysis of Data**

The pre-test and post-test scores of the experimental and control groups were consolidated for analysis along with the intelligent test, achievement motivation scale (AM), home learning facility inventory (HLFI), socio-economic status scale (SES), and study habits inventory (SHI) scores. The total achievement test scores of the experimental groups were tested for significance using paired ‘t’ test. The total achievement gain scores were tested for effectiveness over the traditional lecture demonstration method using the Critical Ratio (C.R), but since the experiment was
conducted in unequalled intact groups, testing for significance using C.R may not be a mature and reliable method. On such occasions analysis of covariance (ANCOVA) would be a suitable technique to effect adjustments in final (posttest) scores which allow for differences in some initial variable. This method was therefore adopted for comparison. The difference in adjusted posttest mean scores was tested for significance to determine the effectiveness of PLM, SLM and GII methods of class teaching. Multiple regression analysis was computed with the scores of AM, HLFI, SES, SHI and the gain scores in achievement test to determine the relationship between these extraneous variables and the gain in achievement.

**Major Conclusions of the Study**

The following are the major conclusions that emerged from analysing the data using the Paired ‘t’ Test, ANCOVA and Multiple Regression.

**Conclusion 1:** The self-instructional materials and the modern instructional strategy are effective in the achievement of biology for Grade IX LD and ND students.

The above conclusion is deduced from the following findings:

1. LD Students under programmed learning method (PLM) supervised learning module (SLM) and guided inductive inquiry (GII) showed significant difference between the pretest and posttest scores in the achievement test in biology.

   The ‘t’ value obtained from Paired ‘t’ Test for pretest and posttest scores in biology of the LD students (PLM = 26.21, SLM = 51.52, GII = 38.00) for a maximum score of 50 are highly significant at 0.01 level indicating PLM, SLM and GII are effective methods.
The adjusted posttest mean scores of the LD students studied in the self-study approach (PLM = 32.42, SLM = 28.31,) and modern instructional strategy (GII=31.07) for the maximum score of 50 are very high.

(2) ND Students under programmed learning method (PLM) supervised learning module (SLM) and guided inductive inquiry (GII) showed significant difference between the pretest and posttest scores in the achievement test in biology.

The 't' value obtained from Paired 't' Test for pretest and posttest scores in biology of the ND students (PLM = 49.97, SLM = 22.73, GII = 37.18) for a maximum score of 50 are highly significant at 0.01 level indicating PLM, SLM and GII are effective methods.

The adjusted posttest mean scores of the ND students studied using the self-instructional materials (PLM = 33.56, SLM = 32.88,) and modern instructional strategy (GII=33.34) for the maximum score of 50 are very high.

**Conclusion II:** The self-instructional materials and the modern instructional strategy are more effective than the conventional lecture demonstration method in the achievement in biology of LD and ND students.

(1) LD students under programmed learning material (PLM), supervised learning module (SLM) and guided inductive inquiry model(GII) scored higher in the achievement test in biology than their counterparts in the lecture demonstration method (LDM) group.

The test of significance of the difference between mean gain scores of each of the experimental groups and control group and the higher mean scores show that self-instructional materials (PLM & SLM) and the modern instructional strategy (GII) are
more effective than the conventional lecture demonstration method (LDM) in the achievements of students with learning disabilities. The results are:

(a) Between PLM \((M=16.94)\) and LDM \((M=12.28)\) \(CR = 5.68; \ p< .01\)

(b) Between SLM \((M=14.24)\) and LDM \((M=12.28)\) \(CR = 2.59; \ p< .01\)

(c) Between GII \((M=16.16)\) and LDM \((M=12.28)\) \(CR = 3.98; \ p< .01\)

When the adjusted means of posttest scores obtained by ANCOVA and correlation and regression were tested for significance of the difference among them, all the three methods namely PLM, SLM and GII were found significantly more effective than the conventional lecture demonstration method in the achievement in biology of students with learning disabilities. The results are:

(a) Between PLM \((M_{x}=32.42)\) and LDM \((M_{x}=21.45)\) \(t = 7.89; \ p< .01\)

(b) Between SLM \((M_{x}=28.31)\) and LDM \((M_{x}=21.45)\) \(t = 4.93; \ p< .01\)

(c) Between GII \((M_{x}=31.07)\) and LDM \((M_{x}=21.45)\) \(t = 6.96; \ p< .01\)

(2) ND students under programmed learning method (PLM), supervised learning module (SLM) and guided inductive inquiry (GII) scored higher in the achievement test in biology than their counterparts in the lecture demonstration method (LDM) group.

The test of significance of the difference between mean gain scores of each of the experimental groups and control group and the higher mean scores show that the self-instructional materials (PLM and SLM) and the modern instructional strategy (GII) are more effective than the conventional lecture demonstration method (LDM) in the achievement of the non-disabled (ND) students. The results are:

(a) Between PLM \((M=19.47)\) and LDM \((M=11.47)\) \(CR = 13.16; \ p< .01\)

(b) Between SLM \((M=18.41)\) and LDM \((M=11.47)\) \(CR = 7.49; \ p< .01\)
When the adjusted means of posttest scores obtained by ANCOVA and correlation and regression were tested for significance of the difference among them, all the three methods namely PLM, SLM and GI1 were found significantly more effective than the conventional lecture demonstration method in the achievement in biology of non-disabled students.

The results are:

a) Between PLM (My.x=33.56) and LDM (My.x=24.55) t =9.7;  p< .01

b) Between SLM (My.x=32.88 and LDM (My.x=24.55) t =9.05; p< .01

c) Between GI1 (My.x=33.34) and LDM (My.x=24.55) t =9.50; p< .01

All the above findings support the conclusion that the self-study approach (PLM & SLM) and modern instructional strategy (GI1) are significantly more effective than the conventional method of lecture demonstration (LDM) in the achievement of biology by the LD and ND students.

**Conclusion III:** The self-instructional materials and the modern instructional strategy are effective for significantly higher progress in the achievement in Biology by the LD and ND students. This conclusion is deduced from the following finding.

(i) The progress made by LD and ND students in the experimental groups in comparison with their counterparts in control group was found to be appreciably high (PLM = 10.97 for LD students and 9.01 for ND students, SLM = 6.86 for LD and 8.33 for ND, GI1 = 6.86 for LD and 8.79 for ND).

(ii) The progress (7.87, 3.76, 6.52) of LD students in the three experimental groups namely programmed learning, supervised learning module and guided inductive inquiry
model was found appreciably high when their achievements were compared with that of the ND students who learned in the conventional lecture demonstration method (LDM) in the control group.

**Conclusion IV**: The self-instructional materials and the modern instructional strategy are effective for significantly higher achievement in biology by the LD and ND students under the objectives: knowledge, understanding, application and skill.

**Knowledge**

(1) When the adjusted means of the posttest scores of the LD students in the PLM, SLM, GII groups were compared with that of the LDM group and the differences in means were tested for significance, the 't' values 5.52 for PLM, 5.09 for SLM and 4.38 for GII were found significant (p<0.01). The significant 't' value shows that PLM, SLM and GII are better methods than LDM in acquiring the objective knowledge for LD students.

(2). When the adjusted means of posttest scores of the ND students in the PLM, SLM and GII groups were compared with that of the LDM group and the differences in means were tested for significance, the 't' values 5.91 for PLM, 6.34 for SLM and 6.63 for GII were found significant (p<0.01). The significant 't' value shows that PLM, SLM and GII are better methods than LDM in acquiring the objective knowledge for ND students.

**Understanding**

(1) When the adjusted means of the posttest scores of the LD students in the PLM, SLM, GII groups were compared with that of the LDM group and the differences in means were tested for significance, the 't' values 8.13 for PLM, 6.43 for SLM and
7.70 for GI1 were found significant (p<0.01). The significant 't' value shows that PLM, SLM and GI1 are better methods than LDM in acquiring the objective understanding for LD students.

(2) When the adjusted means of posttest scores of the ND students in the PLM, SLM and GI1 groups were compared with that of the LDM group and the differences in means were tested for significance, the 't' values 8.01 for PLM, 6.40 for SLM and 7.14 for GI1 were found significant (p<0.01). The significant 't' value shows that PLM, SLM and GI1 are better methods than LDM in acquiring the objective understanding for ND students.

Application

(1) When the adjusted means of posttest scores of the LD students in the PLM, SLM, GI1 groups were compared with that of the LDM group and the differences in means were tested for significance, the 't' values 3.55 for PLM and 3.17 for GI1 were found significant (p<0.01) and it was not significant for SLM (t =0.06, p>0.05). It shows that there is no difference in the effectiveness of SLM and LDM.

(2) When the adjusted means of posttest scores of the ND students in the PLM, SLM and GI1 groups were compared with that of the LDM group and the differences in means were tested for significance, the 't' values 4.06 for PLM, 5.80 for SLM and 4.97 for GI1 were found significant (p<0.01). The significant 't' value shows that PLM, SLM and GI1 are better methods than LDM in acquiring the objective understanding for ND students.
Skill

1. When the adjusted means of the posttest scores of the LD students in the PLM, SLM, GII groups were compared with that of the LDM group and the differences in means were tested for significance, the 't' values 8.11 for PLM, 3.81 for SLM and 5.69 for GII were found significant (p<0.01). The 't' value shows that PLM, SLM and GII are better methods than LDM in acquiring the objective skill for LD students.

2. When the adjusted means of posttest scores of the ND students in the PLM, SLM and GII groups were compared with that of the LDM group and the differences in means were tested for significance, the 't' values 4.61 for PLM, 3.32 for SLM and 3.37 for GII were found significant (p<0.01). The 't' value shows that PLM, SLM and GII are better methods than LDM in acquiring the objective skill for ND students.

Conclusion V: The achievement in biology has no relationship with the extraneous variables Achievement Motivation (AM), Home Learning Facility Inventory (HLFI), Study Habits (SHI) and Socio-economic Status (SES).

The above conclusion is deduced from the following findings:

1. When multiple regression was computed to find out the relationship between the gain in achievement of the experimental groups and control groups of LD students and ND students with their home learning facility (HLF), socio-economic status (SES), achievement motivation (AM) and study habits (SH), the R squares obtained were found very low, showing that the percentage of variance for the extraneous variables are insignificant. This shows that the gain in achievement of the LD and
ND students is mainly due to the effectiveness of the methods tested. The R square with respect to LD and ND students are given below

<table>
<thead>
<tr>
<th></th>
<th>PLM</th>
<th>SLM</th>
<th>GII</th>
<th>LDM</th>
</tr>
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<tbody>
<tr>
<td>(i)LD students</td>
<td>0.05</td>
<td>0.053</td>
<td>0.11</td>
<td>0.01</td>
</tr>
<tr>
<td>(ii)ND students</td>
<td>0.04</td>
<td>0.22</td>
<td>-0.04</td>
<td>0.11</td>
</tr>
</tbody>
</table>

**Implications of the Study**

Many a study shows that a large number of children in our schools experience learning disabilities in one form or the other. Special attention is required when a child has significantly greater difficulty in learning than most children of his age. The present study shows that in the sample selected for study, twenty three percent of students have disability in learning. They were not given any special care in their studies nor do teachers identify them as the learning disabled. From the findings of the study, it is obvious that the learning disabled would also show considerable progress if the teachers select the instructional strategies that would remove their mental deficit. Three such strategies were tested for their effectiveness in enhancing the achievement of the students with learning disabilities. It was found that the Programmed Learning, Supervised Learning Module and Guided Inductive Inquiry are very effective strategies to teach the learning disabled students. Since all the prescribed subjects were not analysed and developed in the form of lessons based on these strategies, the authorities can develop centrally the materials in those strategies and supply them to the schools.

A good number of strategies have been developed for individualized learning. Most of them are in accordance with the learner characteristics and study environments.
in the developed countries. They could be modified or tested for their efficiency in the Indian conditions for the benefit of the learning disabled and the non-disabled as well.

In India, one cannot do away with traditional class teaching dominated by teacher talk all on a sudden. The transformation from the traditional lecture method to individualized learning should be gradual or else the students and teachers would find it difficult to adjust with the transformed strategy. Most of the teachers feel comfortable in the lecture method of explaining the facts that are presented in the prescribed textbook. This kind of teaching could hardly provoke the students to learn actively. So the students confine their learning to the memory level only. Both the groups of the learning disabled and non-disabled students thus embark on passive learning. In the long run, the academic achievement of the learning disabled children becomes very low. The teacher is unable to consider the needs of the individuals with learning disabilities. Few teachers are experienced in methods for adapting the curriculum or adopting methods embedded with the cognitive theories of learning.

The major findings of the present study reveal that the self-instructional materials focused on programmed learning and supervised learning module and the modern instructional strategy namely guided inductive inquiry model are definitely better than the traditional lecture demonstration method in the achievement of biology by the LD and ND students. There is significantly higher progress in the achievement of biology by the LD and ND students. The superiority of self-instructional materials and the modern instructional strategy is remarkable in the achievement of the different objectives namely knowledge, understanding, application and skill. The programmed learning and guided inductive inquiry are found to be better for the attainment of all the
four categories of objectives. Supervised learning module was found to be good for the achievement of knowledge and understanding.

Another important outcome of experiment was that the extraneous variables like achievement motivation, home learning facility, study habits and socio-economic status had no significant relationship with the achievement of the experimental and control groups of LD and ND students. It shows that if better methods are employed for teaching, better results will be produced despite the presence of extraneous variables. It also shows that in case of LD students, self-study approach is very effective in the achievement of biology.

Today schools and their teachers are blamed for the low achievement of the students. Teachers' Colleges always take the brunt of criticism for any failure of the schools. We conveniently forget the fact that a large number of students in our classrooms have either mild or moderate learning disabilities caused by cognitive deficits in thinking. The teachers who have no training in the curriculum transactions for those students with learning disabilities treat them as normal learners. The findings of the present study show that if we teach them in the traditional method dominated by lecturing, the students with learning disabilities cannot progress at the same pace of the normal learners. Meanwhile, when the students learned using self-instructional materials and modern instructional strategy that activated their thinking abilities, both the groups- the learning disabled (LD) and the non-disabled (ND) showed considerable progress in comparison with their counterparts who studied in the usual conventional method of teaching. This finding has far-reaching implications to minimise the learning disabilities of students. The teachers therefore need not be reluctant to use
instructional strategies that help students for their self-study and the development of their cognitive skills. The investigator tested only three such methods for their effectiveness. If all the lessons are planned using those methods and other modern methods, the students with learning disabilities could also become active learners.

**Suggestions for Further Research**

The present study is not much comprehensive and exhaustive due to the limitations of a doctoral work. There are some limitations in its scope and design. Though the programmed learning, supervised learning module and guided inductive inquiry approach are not new to the learners and educators of the west, it is practically new to those in the Kerala state. So it needs modification to suit the same to the special classroom conditions that exist in the state by further research. The identification of learning disabled students was very difficult for lack of standardized tests meant for adolescents of Kerala State. Some suggestions for further research are given below.

The experiments to test the effectiveness of programmed learning, supervised learning module and guided inductive inquiry were conducted in a sample of ninth grade students. This can be repeated at all levels of education and training, from primary education to higher education. The experiment was conducted in the content of biology. It can be extended to all the subjects.

There is a dearth of reliable data of the prevalence of learning disabilities of the students of Kerala State and their remedial measures. Hence a study could be undertaken in this regard.

The design had limitations regarding the sample selected for the experiments. The study could be replicated on a large sample giving adequate coverage to different
variables like gender, locality and management. The modern trend in the teaching-learning process is to move from teacher centred to learner centred self-study methods using modules, programmed learning materials etc. The present study confirms the effectiveness of these methods in the set up of the schools in Kerala State for the achievements both LD and ND students. Hence the scope of modules, programmed learning materials and guided inductive inquiry lessons in the field of special education may be studied in a wide perspective.

The investigator is of the view that the present study is useful if the findings led the curriculum designers to promote the use of other self-study materials and intervention model in the main stream where the students with learning disabilities also learn along with non disabled students. Further research is required to develop new models of teaching to minimise the mental deficits at all stages of education.