

INSTRUCTIONAL STRATEGIES TO ACCELERATE SCIENCE LEARNING AMONG SLOW LEARNERS

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CONTENTS

Chapter No.	Title
I.	INTRODUCTION
II.	REVIEW OF LITERATURE
III.	MATERIAL AND METHODS
IV.	EXPERIMENTAL RESULTS
V.	DISCUSSION
VI.	SUMMARY
VII.	REFERENCES
	APPENDICES

LIST OF TABLES

TABLE NO.	TITLE	PAGE NO.
3.1	Distribution of slow learners according to different instructional strategies	
4.1 a	Distribution of low achievers according to type of school	
4.1 b	Gender wise distribution of low achievers	
4.1 c	Standard wise distribution of low achievers	
4.2	Background information of the respondents	
4.3	Influence of gender and type of family in learning science among slow learners of experimental group	
4.4	Influence of ordinal position, size of the family, parent's education and occupation and per capita income in learning science among slow learners of experimental group	
4.5	Mean scores of students in science before and after the intervention	
4.6	Effect of various instructional strategies to improve the science learning among slow learners after intervention	
4.7	Comparison of pre test and posttest mean scores of control and experimental group students in science	
4.8	Comparison of mean scores in science of different experimental groups after the intervention	
4.9	Retention capacity of students in learning according to different instructional strategies	
4.10	Comparison of mean retention scores in science of different experimental groups	
4.11	Teacher's opinion towards different instructional strategies	

LIST OF FIGURES

FIGURE NO.	TITLE	BETWEEN PAGES
1	Distribution of low achievers according to type of school	
2	Gender wise distribution of low achievers	
3	Standard wise distribution of low achievers	
4	Mean scores of students in science before and after the intervention	

LIST OF PLATES

PLATES NO.	TITLE	BETWEEN PAGES
1	Teaching through individualized instruction	
2	Teaching through picture book	
3	Teaching through charts	
4	Teaching through charts	
5	Teaching through models	
6	Teaching through models	
7	Teaching through models	
8	Teaching through peer tutoring	

APPENDICES

APPENDIX NO.	TITLE	PAGE NO.
1	General information	
2	Achievement test	
3	Science knowledge test	
4	Intelligence test	
5	Schedule to elicit the information regarding teachers opinion	
6	Picture book	
7	List of primary schools of III, IV and V standard students in Dharwad city	

INTRODUCTION

Education plays a pivotal role to mould the personality of any individual. One of the major tasks of education is to help children to develop skills appropriate to the age. Education is the process of developing the capacities and potentialities of the individual, so as to prepare that individual to be successful in society.

Education system as a whole is expected to prepare younger generation to adopt better in the dynamic society. It is a process where in one is trained to understand and fulfill the roles expected from him. The goal of education is to create an individual who is capable of doing new things with inquisitive mind. A good system of education should contribute to the physical, social, emotional and intellectual development of the individual. All educational processes appearing in formal, and non formal contexts aim at all round development of children.

In most of the schools oral explanation is the common method of teaching. But using visual aids like pictures, models, live examples and practical experience along with oral explanation help in developing interest, increase concentration and curiosity among children, which enable to grasp easily and quickly. Modification in instructional methods is a must to bridge the gap in access to quality of education and learning according to the needs of children. Introduction of novel methods in classrooms can not only break the monotony of lecture method but can also lead to interesting and participating learning process.

Impact of various methods of education on children varies with their overall environment in which they are brought up. Not all children can learn at the same speed. It is noticed that about 18-20 per cent of school going children are slow learners. It is a considerable figure, which cannot be ignored. If they are not safeguarded and their interest is not protected, then they may become unproductive citizens of the society (Chintamanikar, 1992). Education of slow learning children raises a typical issue where, majority of slow learners do not receive right type of educational experiences. In order to design a suitable curriculum, following a dynamic method of teaching or learning to match with different goals and adapting them to the student's styles and characteristics are essential.

The term slow learner implies to those who are unable to cope with the work normally expected of their age group. Some children by nature have limited intellectual capacity and are termed as slow learners. Children cannot be called as slow learners by considering their intelligence quotient alone. They are capable of achieving academic success at a slower rate. They are normal like other children in many aspects. However, they differ from average students in the rate of learning. Children who perform inadequately in class tend to be labeled 'retarded', 'disturbed', 'back ward', 'slow learner', 'under achievers' and so on.

Slow learners are children with below average cognitive abilities who are not disabled, struggle to cope with the traditional academic demands of the regular class room. Their slower rate requires accommodation to ensure their success in school. They are limited in their capabilities, which impede their school progress and personal development. In the early school years, slow learners often face problems in reading, arithmetic and science learning. The things that are within easy reach of the majority of their peer-mates may be difficult for slow learners. They need external stimulation and encouragement to do simple type of work and also need special help in the form of special classes. They are capable of achieving a moderate degree of academic success through the additional time and help. If the needs of such children are not met, they experience failure and drop out permanently from school. The identification of slow learners is a difficult task as children show potentialities in one or the other areas but may be poor in school performance. If the child is poor in academic subjects like math's, science and other compulsory subjects, it matters a lot for parents as well as teachers. They worry and bother very much as children cannot escape studying these subjects till they pass their basic education (S.S.L.C) and moreover achievement in these academic subjects is considered as the yardstick for the higher education and career.

In case, slow learners are not identified at an early stage, the children themselves will have to face lot of problems. If the children are not up to the expectation, both parents and teachers think that children are not interested and not concentrating in studies or they are diverting their mind to other activities. Many times, teachers punish them, ridicule them and make unhealthy comparisons without realizing the consequences of humiliations experienced by students. As a result this hurts the children's ego, self-esteem and self-concept. This affects their emotional stability and school adjustment. It is already proved that various cognitive and non-cognitive factors influence learning. The overall rate, speed and ability of learning of children are directly related to their hereditary potentials and environmental factors. It is very difficult to separate the effect of genetic and environmental factors. Individuals interact with their environment in different ways depending on their genetic factors. Adverse home environment setup also hampers the development of children in many ways. Family which lacks educational background adversely affect the rate of academic achievement of young children. Similarly, the school programme is also equally important. The factors like effective teaching and learning process, ideal teacher student ratio, interest, ability and resourcefulness of the teachers, concern about the individual child and facilities for specialized instructions influences the learning ability of the student.

Theories of learning

There are number of theories of learning developed by many psychologists like Hull, Pavlov, Skinner, Gagne, Ausubel and Thorndike. But, theories that were developed during the twentieth century have the greatest and direct implications for classroom learning. Perhaps the most difficult problem of classroom organization is dealing with the fact that students come into class with different level of knowledge, skills, learning rate and motivation. This problem demands teachers to provide appropriate levels or methods of instruction. The appropriate method of instruction for a child will be influenced by the educator's, theoretical learning as well as by the child's specific deficits. Bruner (1965), opined that any concept can be taught to a child if appropriate instructional method and procedures are utilized.

Gagne's theory of learning

This theory says that learning is some thing that takes place in the individual's brain, it cannot be observed directly. Learning is inferred from observable behaviour or from change in one's capacity to perform certain action. This inference is made by comparing the individual behaviour before and after learning.

All learning depends upon certain conditions. There are internal and external conditions. External conditions are of primary importance in the learning situation. Learning in schools is greatly influenced by external conditions like teacher-pupil interaction and reinforcement. Learning in schools should be sequential and step by step process. Today every child is required to master the minimum levels of learning. Concept learning has a central position in school situations, particularly in the teaching of mathematics and science subjects.

Gagne's model calls for instruction to be varied according to the type of learning and individual student's performance required in the learning situation. Schools and teachers must be capable of implementing a design for instruction that considers the individual student rather than the classroom group as the basic unit of instruction.

Ausubel's learning theory

Ausubel was a cognitive Psychologist. His theory of learning is known as the theory of meaningful learning. He distinguishes between two dimensions of the learning processes. One dimension of learning deals with the ways by which knowledge is made available to the learner. The second one deals with the ways by which learners incorporate new information into their existing cognitive structure.

Ausubel's theory gives primary importance to meaningful reception learning. This implies that the teacher should guide children to relate the material presented in the text books, reference books or through classroom instruction to their existing knowledge, derive meaning from what they learn and this will enable them to remember the learned facts for

long. His theory of meaningful learning also implies that curriculum planners and teacher should take care to see that whatever is presented to the child is meaningful for him. Meaningful materials, models and pictures are learnt and remembered better than meaningless ones. While learning scientific concepts and propositions, children should be guided properly to understand the relationship involved among various concepts, between concepts and propositions. This will facilitate efficiency in learning and permanence of retention.

Piaget's cognitive theory

Piaget believes that good pedagogy must present the child with situations. He himself can experiment, manipulate things, pose questions and seek his own answers, reconciling what he finds at one time with what he finds at another time and comparing his findings with those of another child. Piaget believes that the learning process as self regulated transformation of old knowledge to new knowledge. Children should be given the time they need to explore, understand and remember.

Cognitive theory stresses the variables that intervene between stimuli and the responses. This theory points out that two students are likely to respond quite differently to the same stimuli because of what they have already learnt, hope to achieve and feel are capable of achieving, because of differences which distinguish one person from another. Thus, learning is far more complex process than simply linking up connections between stimuli and responses. Learning is more of an individual matter involving perception, processing and assimilation of information, the development of insight and discovery of meaning. It prefers to view learning situation as one whole and complete phenomenon.

S - R Theories

Stimulus Response theories emphasize the importance of association or connection between the stimulus and the response. These theories analyze learning situations, divide learning phenomena in to small element and investigate the simplest possible stimulus-response relationship in order to understand better and more complex total phenomena of learning. These theories emphasize drill and practice in learning. It supports a systematic, carefully preplanned, expository approach to teaching.

Association theories have implications for a classroom that is largely teacher-centered. It agrees in principle that the function of a teacher is to help students learn and the role of the teacher as a classroom manager or director of the learning process. Here, the student's interests, needs, goals and problems are taken into account at individualizing the instructional programmes. Teacher decides which particular kinds of changes are to be brought about in his students, what they will learn, and kinds of responses they will eventually come to make. Then he proceeds to plan, organize and direct the work of the class in such a way that the desired responses will be made. Thus teachers should be flexible in selecting and adapting what they regard as the better features of each system. They must accept the better point, specific applications and implication of each theory for classroom learning rather than waste their time in applying all the conflicting views of all the theories.

Learning theory by insight

A group of psychologists, known as the Gestalt psychologists, did large number of experiments on how animals and human beings learn in the laboratory and outside. According to these psychologists, human beings learn not only by trial and error method, but also by reasoning and insight. Thus, they developed a new learning phenomenon, insightful learning. Insight learning involves higher cognitive abilities like reasoning, understanding and problem solving behaviour which human beings are capable of demonstrating.

Insightful learning necessitates the condition that the various parts or elements of the problem must be clear to the learner so that he can understand the relationships involved among all parts of the problem. If some elements of the problem are missing, hidden or not clear to the learner then insight cannot take place. The learner's previous experience with similar problems greatly facilitates the occurrence of insight. Lack of previous experience makes insightful learning time taking which is characteristic of trial and error learning.

Learning becomes meaningful when the learning tasks are properly structured. The various elements of the task must be clear and open to inspection. The learner will be able to solve problems by insight, meaning full learning, learning by understanding and reasoning must be encouraged in the school. Rote learning or mechanical repetition of the task should not be encouraged. Since, insight depends upon the previous experience of the learner, the teacher must help learners recall what has been learned earlier and relate them to the new learning. Otherwise failure takes place in children.

The percentage of failures in the SSLC and Pre University examinations emphasize the fact about a great wastage of educational efforts that the state is incurring. It is noticed from the record maintained in the office of the Director of school examination that, every year the percentage of student failures ranked first in mathematics followed by science subject. The basic knowledge of these subjects is very important and necessary to lay the foundation for further learning. Though the subjects are difficult one cannot escape from studying the same, as they are compulsory subjects till SSLC. Hence, the teaching and learning process of these compulsory subjects should be an enjoyment rather than boredom in the beginning. The Secondary Education Commission has recommended that every child should study science as a compulsory subject to gain scientific knowledge as a part of education. National Research Council and American Association for the Advancement of Science (1998), jointly convened a technical forum on early childhood science and technology with the main aim that science should serve as foundation for teaching language and literacy skills. Children can best learn science when it is presented with meaningful and relevant experiments.

Science is compulsory subject in the school curriculum because of its multifarious value to the individual as well as to the society. Science is taught successfully by developing a taste for science in the minds of the students. Science education improves the power of reasoning, observation and inference. The rapid advancement of science and technology, increasing need for scientists and technologists have made it all the more important to provide for science based education in the schools. As a result vigorous methods for the cultivation and promotion of science should be adopted. In primary schools science is so framed that each chapter is dependent on the first unit. If a student does not go thoroughly in one unit, the child will find difficult to comprehend the next chapter and ultimately child may become dull in the subject. This situation affects the achievement of the students and exposes them as slow learners. To improve learning in science there should be active collaboration of parents and teachers on various topics, where learning should be conducted as teamwork, having the slow learner as a partner.

There are some studies carried out on low achievers and under achieving children using special strategies for teaching various subjects like computer assisted instruction (Reddy and Ramar, 1996), video assisted instruction (Sundararaja Rao and Rajguru, 1995) and multimedia based modular approach (Ramar, 1994 and Reddy and Ramar, 1996). However, the simple, practical oriented and feasible strategies suitable particularly to Indian situation, like use of models and pictures related to the subject matter have not been popularized.

Though the science is practical oriented, in order to make it easy every school should aim for displaying various science magazines, demonstration charts, models and specimens so as to enable the students to go through them thoroughly. Science education can be improved by the development of suitable science instructions, special talks and specialized lessons on science. In considering science instruction it is necessary to recognize that slow learners have the same basic needs as other children but the instructional materials and methods used to meet these needs may be different. Thus, the present study is designed to develop instructional strategies to accelerate science learning among slow learners and to assess their effectiveness with the following objectives.

Specific objectives of the study

1. To study the prevalence of low achievers in schools.
2. To develop instructional strategies based on the prescribed syllabus for the science.

3. To know the influence of gender, type of family, ordinal position, family size, parent's education and occupation and per capita income on the rate of learning science among slow learners.
4. To study the impact of various instructional strategies in learning science among slow learners.
5. To know the teachers opinion towards the usefulness of different instructional strategies.

REVIEW OF LITERATURE

Strategy is a diagnostic tool to identify the process deficits in children having learning problems. Slow learners fail to acquire skillful and complex strategies to activate and regulate important cognitive activities such as attention, comprehension, retention and retrieval of information. In the second decade of the present century great revolution occurred in the field of instructional technology. New methods and approaches have been evolved successfully and implemented to improve the teaching learning process in classroom situations. The literature related to concepts, definitions and effectiveness of different teaching strategies in learning of science among slow learners has been reviewed under the following headings:

- 2.1 Concepts / meanings of slow learner
- 2.2 Factors influencing academic achievement of children
 - 2.2.1 Gender
 - 2.2.2 Birth order
 - 2.2.3 Family Size
- 2.3 Influence of socio economic status on academic achievement of children
 - 2.3.1 Education of parents
 - 2.3.2 Parent's occupation
 - 2.3.3 Socio economic status
- 2.4 Influence of different methods of teaching and learning science
 - 2.4.1 Individual attention and learning science
 - 2.4.2 Classroom environment
 - 2.4.3 Creativity and science learning
 - 2.4.4 Attitude towards science
 - 2.4.5 Learning science through computer and video assisted instruction
 - 2.4.5.1 Computer assisted instruction
 - 2.4.5.2 Video assisted instruction
 - 2.4.6 Effect of using models in learning science
 - 2.4.7 Peer tutoring in learning science
 - 2.4.8 Intervention and learning science

2.1 Concepts / meanings of slow learner

Slow learners are the students who find it difficult to keep pace with their classmates. Slow learners are not mentally retarded, they are capable of achieving academic success at a slower rate compared to normal children and enrolled in the normal / regular classroom only. These students are known to be slow to 'catch on' are called slow learners.

Slow learners

According to Terman and Merrill (1960) 17 per cent of the children were borderline defective or slow learners whose IQ ranged between 75 and 85. The slow learner's both receptive and expressive language ability were typically limited.

Kirk (1970) states that the slow learning child is not considered mentally retarded because he is capable of achieving a moderate degree of academic success at a slower rate

than the average child. Also the child is educated in the regular classes with special provisions except an adaptation of the regular class programme to fit his slower learning ability.

According to Savage and Hooney (1979), slow learners are designated as those people whose scores of IQ falls within range of 75-80. Their academic achievement linked to limited learning capacity. All the slow learners have only one common characteristic, which is less than average intellectual capacity, but in behavior they could be better from others.

Jenson (1980) states that students with 80 to 90 IQ are traditionally labeled "dull normal", generally slower to "catch on" to whatever is being taught if it involves symbolic, abstract or conceptual subject matter. Chintamanikar (1992) states that, "the only difference between a slow learner and the average child is their slower rate of learning".

Pecaut (1991), the term slow learner should be restricted to the child who does not have the capacity or potentiality to learn intellectual things at the same rate as average children.

Madison (1991) defined slow learner as "a child cannot keep up scholastically with his age mates, cannot learn things as fast in school and cannot retain information as well or as long.

According to Singh (2004), slow learners are the students who find difficult to keep pace with their classmates. Slow learners are not mentally retarded, but are capable of achieving academic success at a slower rate compared to normal or regular class students only..

Low achievers

Low achiever is a student who secures 35 to 45 per cent of total marks consistently for three years in an annual examination (Shanmukappa, 1978). Panchalingappa (1994) described that; under achievers are those with a marked discrepancy between potential (as shown by ability tests) and performance (as shown by grades or achievement test) scores.

Bharati Devi (1982) states that, low achievers are those students who scored on an average less than 50 per cent marks consecutively over two years in their previous examinations.

According to Reddy and Ramar (2003), low achievers are those whose ability is not quite so limited but nevertheless who have more difficulty in learning than average students. Absences from school, unfortunate personal circumstances or inadequate environmental conditions have often further limited their progress. Their attainment is not in tune with their capability but below the expected level of achievement.

Backward children

A backward child is one who is two years above the average age of the class, which is the result of stagnation and not of late enrolment or interrupted schooling and has experienced difficulty in working up to the normal in school subjects.

Burt (1966) defined the backward child as one who would in the middle of his school career, is unable to do the work even of the class next below which is normal for his age. The child is not able to exploit fully his innate capacities and does not register or show up educational success with his abilities.

Schonell (1966) called a backward child as "one who compared with other child of the same chronological age that showed marked educational deficiency". Accordingly, a backward child would not perform as well as the children of his age would normally perform in relation to subjects prescribed with a school system. A backward child is one, whose average total achievement score is less than one standard.

2.2 Factors influencing academic achievement of children

2.2.1 Gender

Sontakey (1988) focused on personality factors of high and low achievers in biological sciences. The sample consisted of 295 students (195 high achievers and 100 low achievers) both boys and girls together from grade 9th and 10th of Nagapur district. The results showed that, higher levels of perseverance, and assurance contributed to higher achievement of girls in biology sciences. The high achieving boys scored better than low achieving boys in biology sciences.

Kaur and Gill (1993) carried out a study to examine the sex differences in academic achievement in different subjects of rural and urban children. The sample consisted of 160 from 9th grade students. The results revealed that, boys scored higher than girls in science achievement and highest marks were obtained by students of urban boys followed by urban girls, rural boys and girls.

Verma *et. al.*, (1993) conducted a study to find out the influence of gender on academic courses. The sample consisted of 120 students of both gender belonging to science course. The students were randomly selected from two institutions located in Sangaria and Mandi of Haryana. The results revealed that, male science students had higher mean scores on comprehension learning and use of evidence than art students. Female science students did not show any marked differences in their study approaches related to science learning.

Jovanovic *et. al.*, (1998) conducted a study to examine the boys and girls in the performance based science classroom. The sample comprised of 165 students studying in grades 4th, 5th and 6th standard. Performance based science classroom, where teachers are associated with these classroom were identified not only as hands on science instructions but also instructors sensitive to increasing girls participation in science. Results indicated that boys and girls did not participate equally in performance based science classroom. Moreover, it was found that there was a decrease in science ability perception of girls not boys over the school years, whereas boys and girls experienced these classrooms differently.

Thomas *et. al.*, (1999) focused on the development pattern of student's attitudes and beliefs towards school subject matter during the elementary years. The sample consisted of 437 students of grade 6th. Results indicated that, girl's perceived higher competence in reading than boys. Boys perceived higher competence in physical science than girls. . The results provided a more comprehensive picture of attitudes and beliefs about science in the elementary school and suggested that had attitudinal gender differences related to physical science began to develop by the earliest elementary school years. Further, Bhuden (1999) conducted a study on " Impact of mastery learning strategy (MIS) on secondary school students attitude towards science and their self concept" A total of 70 girls and 60 boys from standard 8th and 9th of municipal high school students were included in the study and revealed that mastery learning strategies (MLS) affects on the attitude towards science of girls of 8th standard and among boys of 9th standard.

Jones *et. al.*, (2000) carried out a study to examine student's attitudes and experiences related to science. A survey was designed of 437 of 6th grade students completed a survey designed to elicit perceptions of science, school science experiences, science topics of interest and students perceptions of science. The results showed that, more females than males reported that science was difficult to understand, whereas boys reported that science had destructive and suitable to boys.

Rathore (2000) conducted a study on " A study of scholastic achievement of children studying at primary level in environment studies with special reference to MLL and development of remedial teaching strategies" and revealed that, the performance of boys was better than girls studying at NFE centers and FPS schools. Performance of FPS was found to be better than those of NFE children in science because teacher-learning material could not be supplied to the NFE centers for the last three years. The sample consisted of 1000 children (500 FPS and 500 NFE centers) drawn from Khandwa district covering both rural and urban area. Similarly, Teresa and Michal (2000) investigated the motivational differences of

gender, science class type and ability level of 242 high school students. The results revealed that boys had higher scores than girls on perceived ability and stereotyped views of science.

Mohapatre and Mishra (2000) examined the effect of gender on science achievement with a special reference to primary and secondary school years. The sample consisted of 185 students of both boys and girls from D M School Bhubaneswar. A questionnaire was prepared that included simple concepts of science books of 5th, 7th and 9th standard. The results depicted that, the boys had steady achievement in science, whereas little effort in lower class towards the girls made them equalize with the boys in science achievement.

Ghetiya (2000) conducted a study on "Effectiveness of sex and method of teaching on academic achievement for science teaching". The sample consisted of 88 boys and 113 girls of 8th standard drawn from Rajkot based Gujarati medium schools. Teaching methods namely programme learning and demonstration method considered as dependent variables and two levels of sex (boys and girls) as independent variables. Two-group test was applied for the analysis of data. The results revealed that there was no effect of sex on academic achievement, where as the methods of teaching had effect on academic achievement.

Hence, from the above studies it can be concluded that boys scored better than the girls in achievement of science.

2.2.2 Birth order

Birth order is another variable, which affects the academic achievement. The first-born child occupies a unique position in the family structure. For at least a year and probably more he / she is the only child and receive all the attention that would be normally distributed among the children in the family.

Munroe and Munroe (1984) conducted a study on "Birth order and intellectual performance in three East African societies". The sample consisted of 147 secondary school girls in the Gursii, Kipsigis and Logoli tribal areas of East Africa. The results indicated that overall school grades and performance were negatively related to birth order in all the three societies.

Miner, 1998 conducted a study to find out the relationship between birth order and academic achievement of the children. The results revealed that a higher level of academic achievement was found in first-born child and children of small families than later born child and children of large families.

The above studies showed that birth order is negatively related to academic achievement of children.

2.2.3 Family size

Sunder Raj and Krishnan (1980) carried out a study to determine the relationship between academic achievements and family size. The sample consisted of 300 pupils (149 boys and 151 girls) studying in 9th standard of secondary schools in Trivendrum city. The results revealed that the correlation between academic achievement and family size was negative and significantly related.

Cherian (1990) conducted a study on family size and academic achievement of children. The sample consisted of 369 boys and 652 girls in the age range of 13 to 17 years who represented total 7th standard population. The marks obtained by the pupils at the 7th standard external examination conducted by the Department of Education of the Government of Transkei was used to know their academic performance. The results showed a negative relationship between family size and their academic achievement.

Hence, from the above studies it can be concluded that there is negative relationship between family size and academic achievement of children.

2.3 Influence of socio-economic status on academic achievement of children

The following studies reveal the combined effect of both education and occupation of the parents, in addition to the effect of income on academic achievement of children.

2.3.1 Education of parents

Educational status of parents is an important factor that influences their children's academic well being at school. Of the various home conditions, parent's educational attainment is vital so far as the academic achievement of the children is concerned. The general indifference towards education of the uneducated parents often puts the child in a position of handicap for intellectual growth of development.

A study was conducted by Krishnan (1977) on non-intellectual factors and their influence on academic achievement. The sample consisted of 180 students studying in 4th to 7th classes in a central school at Tirupati in Andhra Pradesh. The sample was divided into three groups depending upon their parent's education as high, middle and low groups. The results showed that parent's educational status had significant and positive influence on the academic achievement of the children. In the same year Saini (1977) conducted a study on academic achievement as a function of economic status and educational standard of parents. The sample consisted of 196 students from four colleges of Chandigarh. The results revealed that the economic status as well as educational standard of parents had significant effect on the academic achievement of arts and science students at the college level.

Thakur *et al.*, (1982) studied on "Impact of parent's literacy on academic achievement of primary school children". The sample consisted of 165 primary school children of rural area of an eastern district of U.P. The children were from grade I and grade V. The results revealed that parental literacy affected children's academic achievement in the beginning (class I to III), where as later academic achievement scores are affected by many other factors like teacher, peer group, study habits. Academic achievement was not affected by parental literacy at higher grade.

Singhal (1983) carried out a study to find out the relationship between parent's educational level and academic achievement of their children. The sample consisted of 276 primary school children from Delhi and Calcutta. The children were classified into three groups such as high, medium and low on the basis of parents education. The educational status of both the parents were taken based on the completion of elementary school, high school and college education. The results revealed that, differences in educational background of parents contributed to difference in the performance of their children.

A study on effect of parental educational level on academic achievement of children was studied by Sarma (1984). The sample consisted of 237 students of class 9th and the levels of educational attainment of both the parents were assessed. The results revealed that, parental educational level was positively correlated with the academic achievement of their sons and daughters.

Bhatnagar and Sharma (1992) carried out a research to investigate the relationship between education of parents and academic achievement of students in a semi rural setting. A total of 185 students in a semi rural setting in Rajasthan were selected. The results revealed that, the children whose parents attended school performed higher academic performance than the children whose parent's did not attended the school. Similarly Poonam and Balda (2001) found that parental education is significantly related to the academic achievement of students. Higher the educational level of the parents, higher was the school achievement of children.

Hence, from the above studies it can be concluded that parents educational level has a good effect on the academic achievement of children. Higher the educational level of the parents, higher was the scholastic achievement of children.

2.3.2 Parent's occupation

Parent's occupation is another important variable, which determines the status of the family. Higher occupational level of the parents indicates better economic condition and this results in material support for the education of their children.

George Will (1987) supports the above findings. He studied on the effect of parental occupation on their children's academic achievement. The sample consisted of 500 parents in Port Hartcourt city. The results revealed that civil servants children performed better than children of business parents. But the poorest performance came from farmer's children.

Gill and Sidhu (1988) carried out a study on "intelligence and academic achievement of the children belonging to different socioeconomic groups in rural Punjab". The sample consisted of 80 students studying in 9th class. On the basis of information collected from the students the subjects were divided into three socio-economic groups i.e, service men, agriculturists and laborers. The total marks obtained in 8th standard, verbal intelligence scores and non-verbal intelligence scores were taken. The results showed that highest marks were obtained in the service group followed by agriculturists and then laborers. Verbal intelligence scores were highest in agriculturists followed by servicemen and labors class. Hence the results showed that occupation of parents influenced the school performance of children.

Similar findings were observed in the study of Cherian and Cherian (1995) on relationship between parental occupation and academic achievement of children from polygamous and monogamous families. Stratified sample consisted of 1021 urban and rural children of age between 13 and 17 years were taken for the study. Academic achievement was obtained by using grades in school exams. A statistically significant positive relationship was found between parental occupation and mental development of the children, which resulted in a high academic achievement.

Budhev (1999) conducted a study on " Academic achievement among children of working and non-working mother ". The study was designed to compare academic achievement among children of working and non-working mothers, studying in secondary schools of Saurashtra region. Sample included 307 boys and 343 girls of working mothers and same number of boys and girls of non-working mothers. Academic achievement score was collected from the annual work sheet of schools. Results revealed that academic achievement of the children of working mother is greater than the children of non-working mothers.

From the above studies it can be inferred that the higher occupational level of parents had a positive effect on school performance of their children.

2.3.3 Socio-economic status

Children from different social, economic and educational classes in modern and urban societies function at different intellectual levels and in school despite providing similar classroom instruction and other educational facilities outside their homes. Psychologists declare that there is a positive correlation between socio-economic status, intelligence and academic achievement.

Mathur and Hundal (1972) studied school achievement and intelligence in relation to some socio-economic background factors. One hundred students studying in class IX of a higher secondary school in Amritsar were chosen as the sample for the study. The results revealed a positive correlation between academic achievement and family income.

Further, Saini (1977) carried out a study to examine the effects of economic status of parents on the academic achievement of their children. The sample for the study included 196 students from four colleges of Chandigarh. The economic status of the parents was assessed in terms of the aggregate income of both father and mother along with income from all other sources. The results revealed a positive correlation between academic achievement and economic status of parents.

Similarly, Sundar Raj and Krishan (1980) revealed that the correlation between academic achievement and socio-economic status was moderate, positive and significant.

Study was conducted to examine the relation of academic achievement with socio-economic status. A sample of 300 pupils (149 boys and 151 girls) studying in standard IX of secondary school in Trivendrum city were included in this study. SES scale was assessed by using Nair scale (1970).

Chauhan, 1982 carried out a study on academic motivation in relation to intelligence and socio-economic status. The sample consisted of 70 girls from 5th classes from a girl's primary school, Simla. SES scale developed by Pareek and Trivedi was administered. For measuring academic motivation, Keral academic motivation questionnaire was used. Intelligence was measured by Mehta's group test of mental ability. The results revealed that academic motivation was influenced by socio-economic status of the subjects. But it was found to be highly correlated with intelligence.

Grewal (1985) conducted a study on cognitive and socio-economic correlates of school achievement of children. The sample consisted of 550 students (355 boys and 200 girls) from 16 higher secondary schools of Bhopal studying in class X of age group 16 years. SES of parents was assessed by using Kuppuswamy's SES scale. The results indicated that SES level of students was one of the main sources of variation in the students school achievement.

Jagannadhan (1986) stated that socio-economic factors namely father's education , occupation and income had great impact on the academic achievement of children. The sample included 614 urban children studying in 5th, 6th and 7th classes at Sri Venkateshwara University area. SES scale developed by Srivastavva (1978) was adopted.

Wangoo and Khan (1991) carried out a comparative study of Government and Private school students to know their socio-economic status on academic achievement. The sample of 180 female students from ten Government and ten Private schools within the age group of 10+ were selected from Srinagar Kapoor's SES scale (1988) was administered and the mean of two Annual examination results was considered as the criteria for the academic achievement. The results revealed that Government and Private school students differ significantly as their SES is concerned. Significant difference on academic achievement was found between students from Private and Government schools. The relationship between academic achievement and socio-economic status when computed on total sample was statistically significant.

However, Chaudhari *et. al.*, (1998) found out a non-significant interaction between teaching strategies and socio-economic status. They carried out a study on factors affecting the teaching strategies and socio-economic status. The sample comprised of 162 learners of VI grade divided into two experimental and one control group. The experiment was carried out for the period of four months.

Khan and Jernberu (2002) carried out a study on " Influence of family socio economic status on educational and occupational aspirations of high and low achieving adolescents " and found that the impact of SES on education aspirations was minimal, its influence on occupational aspirations was larger. Achievement highly influenced educational aspiration, but its impact on occupational aspiration was significant.

Saritadevi *et. al.*, (2003) compared the effects of family and school on the academic achievement of residential school children. The sample consisted of 120 children from Hyderabad city. An interview schedule was used to study the familial factors. The results indicated that girls were superior than boys. Family factors like socio-economic status and parental aspirations significantly contributed to academic achievement of the school children.

Many of the studies discussed have pointed out that better economic status of parents increased the academic achievement of children.

2.4 Influence of different methods of teaching in learning science

Selection of teaching methods and designing of suitable teaching aids to match the subject matter help the teacher to increase the impact of teaching on students by motivating them to learn faster, remember longer, assimilate more accurate information and understand concepts efficiently. Educational technology has emphasized the importance of different teaching methods in learning science from primary to college education (Ghadekar and Patwardhan, 1994).

2.4.1 Individual attention and learning science

Individualized instruction is the “pre requisite educational theme” which is very essential for meaningful learning in a democracy. Individual instruction deals with individuality and gives additional instruction to follow and understand the concepts of the subject matter.

During 1972, Greenberg's study was concerned with the differential effects of the traditional and individual teaching methods on achievement gains. Male students enrolled in the 9th grade at Memorial Junior High School, New Jersey were used as subjects for the study. Four experimental groups received individualized instruction, four groups received conventional instruction and four control groups received instruction in a different course of study. Statistically significant differences in gain in knowledge occurred between the individualized and conventional instructional groups and these differences favored the conventional instructional group.

Slavin *et. al.*, (1984) studied the effectiveness of team-assisted individualization on the science achievement. Sample consisted of 1371 students in third, fourth and fifth grade classroom in a sub-urban school. Out of these, 113 students (8.2%) received special education services for two hours per day. Results indicated statistically significant treatment effect favoring team-assisted individualization for science achievement.

Lidho and Khan (1990) carried out a study on bright under achievers among socially backward counseling and remedial measures. The samples comprised of 60 subjects were divided into control and experimental group (30 each). The experimental groups were treated to individual counseling in order to help under achievers to improve their scholastic achievement. The results revealed that, individual counseling helped the scholastic achievement of the experimental group.

Rajan (1996) conducted a study to investigate the effect of three modes of analogy presentation- individualized instruction, pictorial and computer stimulation in chemistry. Sample consisted of 308 students from 9th grade classes, taught by three chemistry teachers in three high schools in Kerala. The results revealed that, the computer stimulation group scored greater than the pictorial and individualized instruction group.

From the above studies it is indicated that individualized instruction in schools is considered necessary for meaningful learning in helping the slow learners.

2.4.2 Classroom environment

In the school system, classroom is the most vital for the transactional business going on between school and society. The uniqueness of the classroom is due to the type of membership enjoyed by its members. The study of classroom environment is of great significance, as learning is the product of environment. As an agent of intellectual stimulation conducive classroom environment is an important factor in strengthening the child's level of education. Schooling has been widely recognized to have influence in ones cognitive development. Several studies indicated that, good classroom environment is essential for improving the learning potential of the students.

Rice *et. al.*, during 1998 conducted a study to assess knowledge and comprehension levels of science achievers in 7th grade classes. Results suggested that a concept map might be used in assessing declarative and procedural knowledge both of which have a place in the science classroom.

A similar study was conducted by Mellad (1998) compared to teacher's concepts of the learning and teaching of science with their classroom practice when teaching science lessons. The results revealed that a general correspondence to be established between pre service teacher's conceptions about teaching and learning science and their classroom environment.

Jean (1999) examined teacher student interactions in urban at risk classrooms, differential behaviour and student satisfaction with school. Multiple methods of data collection including classroom observation, interviews and self-support questionnaire were used for 61 children studying in 3rd grade. Results suggest that, perception of caring, supportive relationship with a teacher and positive classroom environments were related to school satisfaction as early as 3rd grade.

Marrison (1999) studied two behavioral dimensions of classroom structure. Results showed that high structured classrooms had the most work involvement. There were no interaction effects of classroom structure with gender of child.

Kalyani and Radhakrishna (2002) conducted the study to measure the impact of classroom environment on the intelligence of Ashrama school children. The sample of 180 tribal schoolchildren was randomly selected in the age range of 9-12 years. RPM was used to assess the intelligence and a pre-tested schedule with a maximum score of 159 with 61 items was used to measure the classroom environment of the children. The results indicated that, some of the components of classroom environment namely, physical facility, methods of teaching, teacher's characteristics were significantly correlated with the intelligence.

A study on perception of classroom environment of middle school children was studied by Mishra during the year (2002). Totally 200 children, 100 each from tribal and non-tribal students from Bilaspur district was subjected to classroom environment test. The results revealed that urban and non-tribal male students perceived classroom environment better than rural and tribal girl students.

Thus, it is clear from the above studies that students outcome may be improved by creating conducive classroom environment in learning.

2.4.3 Creativity and science learning

Science is the product of creative thinking by scientists over a period of time. Children tend to be naturally creative, but their creativity is dampened as a result of authoritarian system of education. The discovery and development of the creative genius of our children should be of prime importance in our education system. Teachers and education have a great responsibility to children and society to see that this ability is manifested to the maximum of the individual's potential.

Creativity is a cognitive variable and has been defined as an ability to bring something new into existence. Torrance (1979) defines creativity as the process of sensing problems or gap in information, forming ideas or hypotheses and communicating the results. Passi (1971) found a positive correlation between creativity and achievement in science. The teacher in the class as well as outside may encourage the spirit of science in students. The school should develop the power of creativity in the children through different school programmes for the betterment of achievement of their students in the school subjects also.

Pathak and Verma (1995) studied on creativity and their scholastic achievement. The sample consisted of 200 male students of X class of Bihar district. The results revealed that, the high and low creative subjects were found to be significantly differed on scholastic achievement in the field of science. It signifies that, the high creatives were of high scholastic achievement in science field.

Chowdhary and Ghosh (1996) conducted a study to find out the relationship between the achievement in science and creativity. The sample comprised of 160 students of class 9th (85 boys and 75 girls) studying in the English medium schools under CBSE. Achievement test in science and Wallach Kagan test of creativity were used to assess the factors of the learners. It was found that, there were significant relationship among the achievement in science and scores in creativity.

Dutta (1988) reported that, there is positive and significant relationship of achievement in science with various factors of creativity and total verbal creativity.

From the above studies it is clear that, creativity in children through different school programmes helped students for the better achievement in their school subjects.

2.4.4 Attitude towards science

Attitude towards science involves linking of science lessons, enjoyment of laboratory work and visiting places of scientific interests. It seems scientific attitude has predominantly cognitive orientation, while attitude towards science have effective orientations. A number of studies indicated that, the science attitude is a powerful determinant of science learning.

Sathyanarayana Murthy and Gopalkrishna (1989) focused on scientific attitude and attitude towards science of X class students. Purposive sampling methods were implemented on 78 students (46 boys and 32 girls). Scientific attitude test (developed by Victor Biels and George Zakharide) and attitude towards science (developed by Wilson) were administered to the whole group. Results revealed that, there is no development in scientific attitude in the subjects regarding attitude towards science but, the activities like guest lecture, educational film shows brought a positive change in the attitude of the children to some extent.

A study by Pillai (1990) found that biology achievement in children significantly differed according to the differences in science attitude and attitude towards science. These two variables are contributing independently to biology achievement. The sample comprised of 800 students studying in 9th standard in Kerala. Test standardized by Nayar was used for measuring science aptitude and attitude towards science.

From the above studies it is clear that, attitude and attitude towards science brought a positive change in the attitude of the children.

2.4.5 Learning science through computer and video assisted instruction

Computer and video assisted instruction effectively caters to individual differences. Students can learn at their own rate. Student will have no pinch of inhibition when they learn through computer and video assisted instruction. The feeling that they are not preyed upon the supervisors and the free relaxed readiness to learn by themselves at their own rates give the slow learners to learn better and manifest their best.

2.4.5.1 Computer assisted instruction

Computer assisted instruction provides unique experience to the learners in respect of the presentation of the content. It ensures easy and effective transmission of instruction to the learner. It effectively caters to individual differences. Students can learn at their own rates. It gives instant knowledge of results and provides immediate feedback, which are very essential for slow learners in their learning process.

In case of teaching science through computer assisted instruction programmes, important diagrams can be magnified (even part by part) so that the slow learners can understand in a better way. Moreover, the stimulation technique, which is possible in a CAI programme, will also facilitate learning of slow learners.

Rieber (1991) conducted a study to examine the effects of animated presentation and practices in a computer based science lesson involving 4th and 5th grade students. Three levels of visual elaboration (static graphics, animated graphics and no practice) were crossed with three levels of practice (behavioral, cognitive and no practice). Results suggested that, animated presentation could promote learning under certain conditions and demonstrate a successful application of interactive graphics in the design of cognitively based practice activities.

Further, Jeyamani and Chandramani (1992) illustrated the effect of stimulation model through the computer-assisted instruction for science achievement. The students using computer-assisted instruction of stimulation methods performed better than the other groups.

Reddy and Ramar (1995) conducted a study on effectiveness of multimedia based modular approach in teaching science to low achievers. The results revealed that, there was significant difference between the post test mean scores of control group slow learners taught through traditional lecture method and experimental group slow learners taught through computer assisted instruction for science subject. Further, the achievement of experimental group slow learners was higher than the achievement of control group slow learners.

Jankavalli and Gopalkrishnan (1998) found the impact of multimedia approach in teaching environmental education at the secondary level. Sample comprised of 540 students from four standards selected from two schools of Coimbatore. Two groups were treated as experimental and one as control group. One of the experimental groups was exposed to audiovisual method and the other to multimedia method. Whereas, the control group was exposed to traditional method of teaching. The results indicated that, among the two media groups, multimedia group showed tremendous impact upon enhancing the achievement level of students in environmental education at the secondary level.

All the above studies proved that computer assisted instruction is superior over the traditional teaching methods employed for science instruction.

2.4.5.2 Video assisted instruction

Video instruction provides for considerable visualization of objects and processes, which is very essential for better perception of concepts. The video instruction provides unique experience to the slow learners in the presentation of instructional content. It penetrates more deeply in to human character with an immediate excitement than any other single method. Concrete presentation of instructional content ensured in video instruction is very conducive for the slow-learner for making a better perception of the concept. The dual effect of audio and video strengthens and enriches the understanding of the concept.

Soundararaja Rao and Rajaguru (1995) conducted a study to examine the effectiveness of video assisted instruction on the achievement of slow learners. The sample consisted of 100 slow learners (34 girls and 66 boys) randomly selected from two different types of schools viz, government schools and aided schools. The Raven's Progressive Matrices and Achievement Test were used to assess the intelligence of pupils. The findings indicated that female slow learners of video assisted instruction groups performed better in immediate retention than conventional learning group.

Swatantradevi (1996) compared the effectiveness of video assisted instructional programme in teaching chemistry. Over the conventional method of teaching, equated groups were selected after conducting a pre test and collecting personal data. Video film on the selected unit was used. The results indicated that video assisted instruction is more effective than conventional method in teaching chemistry.

Reddy and Ramar (1995) conducted the experimental study to measure the effectiveness of video instruction in teaching science to slow learners. There was significant difference between the pretest and the posttest mean scores of experimental group slow learners when they were taught science through video instruction. Further, their achievement was higher in the post test than in the pre test. Video instruction enabled the experimental group slow learners to cope with the normal students to a considerable extent.

From the above studies it is proved that video instruction is more effective than conventional method in teaching science.

2.4.6 Effect of using models in learning science

Teaching is a process by which the teacher creates a shared environment with students including sets of values and beliefs, which in turn colour views of reality. A model of teaching is a plan or pattern that can be used to shape curriculum or to design instruction in the classroom settings. Models are prescriptive teaching strategies designed to accomplish particular instructional goals.

Mehra and khare (2002) conducted a study to compare the effect of three teaching strategies viz - inductive thinking model, advanced organizer model and conventional method

of teaching on attitudes of students towards science technology. The sample consisted of 108 students belonging to two colleges of Rewari. The results showed that students taught by inductive thinking model lead to development of better attitudes towards science technology as compared to advanced organizer model or conventional method of teaching. But low intelligence group was benefited more than their high intelligence counterparts.

Ponnusamy and Natarajan (2002) conducted a study on utilization of various instructional materials by primary school teachers. The sample consisted of 103 teachers from 15 different schools of Coimbatore. Among them 53 were schoolteachers and 50 were upper primary school teachers. The main objective of the study is to measure the frequency of use of selected seven different instructional materials by elementary school teachers in their classroom activities. The results revealed that primary school teachers were using charts and models more frequently than upper primary school teachers in their classes.

Hence, results indicated that teaching through models was more effective than the traditional teaching techniques in learning of science.

2.4.7 Peer tutoring in science learning

Peer tutoring is a face-to-face, one to one relationship or situation in which the tutor has the primary responsibility of helping a child in his learning difficulty. Tutoring may be also done in a small group consisting of 4 to 5 children, but the essence of the situation remains the same in a small group as in one to one situation.

Usually teacher acts, as tutor but able classmates and other students can also be tutors. Children teaching children can provide excellent models for them and children can talk their language. Peer tutoring has been proposed as a means of providing time, cost and efficient individualized instruction for the children. When implementing peer tutoring, it is important that the rules for tutors be quite explicit that is, tutors show or tell their students what to do, then, watch as the students perform, they repeat the demonstration / instructions if the student makes an error and then praise the student when the response is correct.

David *et al.*, (1976) evaluated the effect of peer tutoring on student achievement and found that this strategy increased the achievement of both tutees and tutors. Peer tutoring is often used to improve the achievement of under achievers as that of the students being tutored.

Dale (1979) suggested that peer tutoring could help the mainstreamed exceptional students to accomplish specific goals and in the process it helped the tutor to accept more of differences and likeness in individuals. Similarly Larsen and Ehly (1980) indicated that cross age tutoring studies have been reported more frequently than studies of classroom tutoring. The learner's achievement gains may be transferred to the regular classroom and that tutoring seemed to facilitate improvement in learning. Further, investigation of class wide peer tutoring programme have demonstrated that the principles of effective instruction opportunity to respond and functionality of academic areas were critical in student's math's and science achievement (Delquadri *et al.* 1986).

Fantuzzo *et al.*(1995) in their study examined the relative impact of structured peer tutoring and group reward components of the reciprocal peer tutoring intervention on the science performance of elementary school students at high risk for academic failure. So academically at risk children were selected from 4th and 5th grade students attending an urban public elementary school in West Philadelphia. Results indicated that students who received reward plus structured peer tutoring scored significantly higher than students in the other conditions.

Effects of class wide peer tutoring on the academic performance of 14 mildly handicapped and 36 non disabled students enrolled in three 10th grade environmental studies class rooms were examined by Maheady *et al.* (1998) and found that, the implementation of class wide peer tutoring produced an average increase of 21 points on weekly tests. With class wide peer tutoring 60 per cent of all students earned "A" grades, failing grade were virtually eliminated and no mildly handicapped students received grades below "C".

Peterson and Janicki (1999) compared individual characteristics and children's learning in large group and small group approaches. The sample consisted of 4th, 5th and 6th grade students learning in large group and small group teaching approaches. Results indicated that students who initially preferred small group approach. High ability students and low ability students did better and had more positive attitudes in the small group approaches. High ability students benefited by teaching their peers in the small group.

Further, Dill *et. al.*, (2000) studied on peer tutoring strategies that tend to use structured peer interactions and group reward contingency. The purpose of the study was to offer a peer-learning environment to facilitate learning on and academic task. Findings revealed that, subjects assigned to the peer tutoring recalled significantly more text than subjects assigned to the communal learning context.

From the above results it can be concluded that science performance was influenced by the peer tutoring procedures.

2.4.8 Intervention and learning science

Studies encompassed that early intervention through enrichment and stimulation fostered cognitive development and science learning of children. Arnold *et. al.*, (1994) reported that intervention during early years showed significant improvement in measures of perceptual development. Long-term programmes had significant improvement in the development of children after intervention.

Rawat (1977) studied an intervention programme included science experiments, science related career options and self esteem issues. Results revealed that, intervention training produced significant improvements in science achievement. Science attitude inventory posttest scores after the 12th week of intervention program indicated that the intervention programme was helpful to improve the ability of students to apply the knowledge of process and principles in science.

Further, Wilson (2000) in his study on "The effect of birth, sex of cognitive abilities on the assessment of special methods" and found that teaching through different instructional training methods was more effective than the other strategy teaching components in teaching primary school subjects. The sample consisted of instructional groups of 5 students and training materials were selected from first and second grade science materials.

Reddy and Ramar (1995) found that there was significant difference between the post test mean scores of control group slow learners in science subject taught through traditional lecture method and experimental group slow learners taught through instructional method of intervention programme. The results showed that the achievement of experimental group slow learners was higher than the achievement of control group slow learners.

Pandey *et. al.*, (2000) found that the remedial teaching strategy was effective to teach the mastery level of learning among the children studying at the primary schools and NFE centers. Similarly Mohanasundaram and Dharmasekar (2001) conducted a study on effectiveness of remedial teaching in improving the map ability of students in social sciences. Results revealed that remedial teaching strategy was found to be more effective to improve the map drawing ability of the students in social sciences than the conventional method.

Philip and Marcia (2002) developed science skills for under achieving students through curriculum-based assessment. Findings indicated positive intervention effects on achievement grades and measures of academic learning time. Students showed simple cognitive ecologies about science based on varied sources and experiences.

All the above studies proved that intervention through enrichment and stimulation are more effective in learning science than the conventional method of teaching.

MATERIAL AND METHODS

The study on “Instructional strategies to accelerate science learning among slow learners” was conducted during the year 2003-04 in Dharwad taluka of Karnataka state. The material and methods used to carry out the study are presented under the following subheadings:

- 3.1. Population for the study
- 3.2. Selection of the sample
- 3.3. Tools used for the data collection
- 3.4. Pilot Study
- 3.5. Classification and quantification of independent variables
- 3.6. Development of the instructional strategies
- 3.7. Collection of data
- 3.8. Statistical analysis
- 3.9. Operational definitions
- 3.10. Hypotheses for the study

3.1 POPULATION FOR THE STUDY

Population for the study comprised of third standard children studying in Government and Private co-educational Kannada medium primary schools situated in Dharwad taluka of Karnataka state.

Table 3.1. Distribution of slow learners according to different instructional strategies

3.2 SELECTION OF THE SAMPLE

A preliminary survey was carried out to collect information regarding the total number of primary schools prevailing in Dharwad taluka. The list of schools was obtained from the office of the Block Education Officer, Dharwad. There were 68 primary schools in Dharwad city. Among them 25 Government, 17 Aided and 26 Private schools. Both Government and Aided schools were Kannada medium co-educational and single sex schools. Whereas among Private schools there were 17 Kannada medium and 9 English medium schools as medium of instruction at the time of survey.

3.2.1 Sample for prevalence study

To study the prevalence of low achievers it was decided to select primary schools situated within 10-15 kilometer distance from the Dharwad city. There were ten Government, four Aided and ten Private schools within that distance at the time of survey. After getting the permission from principals, the list of students studying in III, IV and V standards of these schools were obtained from the class teacher. The total strength of students studying in III, IV and V standard in Government, Aided and Private schools from both Kannada and English medium were 2095, 1733 and 1463 respectively during the year 2004. Low achievers from these schools were identified based on the teacher’s assessment that students found to be dull and below average in extracurricular and academic performance those who scored below 40 per cent of total marks for the previous year in the final examination were selected. Further, slow learners from these schools were selected using the different screening methods.

3.2.2 Sample for experimental study

The total strength of students studying in III standard in all the Government, Aided and Private schools from both Kannada and English medium were 4258 during the year 2004. Out of which 1512 (35.5%) were from Government, 1469 (34.5%) from Aided and 1277 (30%) from Private schools.

It was decided to take schools situated within 10-kilometer radius from the Dharwad city. There were four Government and two Private primary schools within that distance at the time of survey. Further considering the timings of the school and strength of the students two Government and two Private schools were selected for the study. Then the principals of the four schools were approached to accord permission to carry out the research work. The details of the purpose and procedure of conducting the study was explained to convince the principal. However, the principal of one Government school (Yettingudda) and one Private school (Krishinagar) gave permission to carry out the research work after getting the written permission from the concerned Block Education Officer. The authorities of other schools did not permit to carry out the study during school hours expressing that the research work would affect the regular class of the students and parents may object for the same.

Further, the list of students studying in third standard in both the schools were obtained from the class teacher. In third standard there were 78 students in Government schools and 97 students in Private schools. In order to have the homogeneity in the sample, they were matched for age, gender, intelligent quotient and mother tongue as Kannada. Further, slow learners were selected using the following four screening methods.

- i. Academic achievement
- ii. Teacher's assessment
- iii. Intelligence test
- iv. Achievement test

i. Academic achievement: In order to screen the slow learners the academic achievement of the students was considered. Those who scored above 40 percentages of total marks consistently for the previous two years in the final examination were deleted. Accordingly 12 students from government school and 22 students from private school who scored above 40 percentages of total marks were deleted. Remaining 66 students from Government school and 75 students from Private school were considered for further screening test.

ii. Teacher's assessment: In this method all 141 students identified as slow learners were further assessed by the class teacher. The class teacher considered the children's performance in curricular, recreational interest and overall performance in the classroom and found to be dull and below average were recommended for further identification test. Teacher endorsed all 141 students as below average and no one was deleted after the teacher's assessment.

iii. Intelligence test: In order to delete the above average students irrespective of percentage of marks and teacher's assessment the intelligence test was conducted. The standard progressive matrices (SPM) developed by Raven (1988) was used to assess the level of intelligence. The Raven's progressive matrices consisted of 60 problems divided in to five sets (A, B, C, D and E) of 12 each (Appendix-IV). The total score provides an index of the intellectual capacity of each child. The maximum score that the student could obtain was 60 and minimum zero. The students who scored more than 25th percentile were deleted and those who scored below 25th percentile (14 to 18 scores) were categorized as slow learners. Here three students from government and two students from private schools who scored above 25th percentile were deleted from the study. Remaining 63 students from Government school and 73 students from Private school were considered for further screening test.

iv. Achievement test: For further confirmation of slow learners, the achievement test in science developed by the investigator was used. The test covered the portion of II standard science syllabus already covered in the class. The test consisted of 40 simple problems of both objective and subjective type questions (Appendix-II). For each correct answer a score

of one was given. So, the maximum score a student could secure was 40 and minimum being zero. Here two students from Government school and ten students from Private school who secured above 20 marks were deleted.

Totally 124 students were selected and among these two students from Private schools were deleted from the study because of incomplete participation. Finally 122 students were selected. Among these 61 students from Government school and 61 students from Private schools identified as slow learners were considered for the study. Out of this total sample, 30 students were selected for control group and the remaining 92 students were considered as experimental group.

3.3 TOOLS USED FOR THE DATA COLLECTION

The following tools were used for the data collection.

1. Standard Progressive Matrices (SPM) developed by Raven (1988).
2. Socio Economic Status inventory developed by Venkataramaiah (1983).
3. Self structured Questionnaire: In order to collect the information keeping in view the objectives of the study, the following questionnaires were developed by the investigator as tools for data collection.
 - a. *Background information:* The required background information of the respondent was collected through self-structured questionnaire. The questionnaire included items to collect information like name, age, class, gender, ordinal position, caste, religion, family composition and per capita income of the family (Appendix-I).
 - b. *Questionnaire for conducting pretest and post test:* A questionnaire was developed to assess the science knowledge of the students before and after intervention. The questions included the portion of science subject prescribed for the third standard. The questionnaire had both objective and subjective type questions (Appendix-III). The preliminary draft of the questionnaire was evaluated by the third standard teachers of both the schools. Based on their suggestions some ambiguous questions were deleted to avoid confusion and some were modified for clarity. Finally the questionnaire had 40 questions / items each carrying one mark. Thus a student could score maximum of 40 marks and minimum being zero.
 - c. *Questionnaire to collect opinion of teachers:* In order to collect the opinion of teachers towards the instructional strategies used for teaching a questionnaire was developed and was given to four subject experts. Based on their suggestions some of the statements were deleted and some were modified. Finally the questionnaire had ten statements, which were to be checked on a three-point scale. Each statement had three alternative responses namely 'good', 'satisfactory' and 'poor' with the numerical value '3', '2' and '1' respectively. Thus a maximum of 30 and minimum of 10 could be scored for each instructional method (Appendix-V).

3.4 PILOT STUDY

After framing the complete questionnaire it was pre tested on 15 slow learners who were not included for the final data collection. The suggestions given by them were considered and slight modification in the questionnaire was made. The reliability was found to be 0.78.

3.5 CLASSIFICATION AND QUANTIFICATION OF INDEPENDENT VARIABLES

- (a) *Ordinal position:* On the basis of the birth order of the children, they were grouped as first-born, middle born and last born.
- (b) *Gender:* According to the gender respondents were classified as boys and girls.

- (c) *Type of family:* The respondent's families were categorized as nuclear and joint family. Nuclear family consisted of a single married couple living with their unmarried children. Joint family consisted of more than one married couple of either same generation or of two generations living together with or without their children.
- (d) *Size of the family:* On the basis of the number of members residing in the family, the families were categorized as shown below.

Category	Members
Small	< 4
Medium	5 to 7
Large	> 8

- (e) *Education of parents:* Depending on the number of years of formal education received by the parents (both father and mother) they were categorized as below.

Category	Years of education
Very low	< 7
Low	8 to 10
Medium	11 to 15
High	< 16

- (f) *Occupation of parents:* Classification of occupation of parents (both father and mother) was done on the basis of the method prescribed by Venkataramaiah (1983) scale as follows.

Category	Score
No occupation	0
Unskilled	1
Semiskilled	2
Skilled	3
Farming / Business	4
Professionals	5

- (g) *Per capita income:* Per capita income of the respondents was calculated dividing the total income with the total members of that family. Per capita income in the present study ranged between Rs. 550/- to 2050/- per month.

3.6 DEVELOPMENT OF INSTRUCTIONAL STRATEGIES

The three instructional strategies namely picture book, charts and models were developed by the investigator by considering the science syllabus to be covered in the studies for the III standard students.

3.6.1 Picture book: The lessons were illustrated with different pictures, photographs and designs in the picture book related to third standard science syllabus. The book was prepared with the help of a drawing teacher and an artist. Ten III standard teachers were approached for suggestions and guidance to improve the clarity of picture book. Based on the comments and suggestions of the teachers, colours and clarity of the pictures were changed and modified. A number of pictures like living and non-living things, parts of plant, plants during seasons, domestic and wild animals, birds, structure of teeth, sources of water, air and its properties were included in the picture book. The pictures that were not clear and confusing to the students were replaced. Care was taken to give clarity to the pictures and designs (Appendix-VI).

3.6.2 Charts: Charts were prepared using the enlarged pictures of the picture book already developed. A number of charts were prepared with the help of the artist and a drawing teacher. In each chart related pictures were drawn separately for clarity. Charts had appropriate and large size pictures.

3.6.3 Models: To give proper knowledge of the subject matter some models were developed on chapters like parts of plant, plants during seasons and structure of teeth. These models were made out of wood, thermocol and plaster of paris with the help of an artist and a carpenter. Some models of animals, birds, which had natural appearance, were purchased to increase the concept about things.

All the pictures, charts and models were shown to the teachers and subject experts for the final approval.

3.6.4 Individualized instruction: In this type of instructional method the investigator devised the remedial instruction according to the needs of each slow learner. In individualized instruction the methods of instruction are adjusted to the needs and abilities of individual learner. The portion of III standard syllabus was taught orally and repeatedly till the students understood.

3.6.5 Peer tutoring: Another instructional method used was peer tutoring. The student's who received the instruction is called tutee and who taught the subject is tutor. The tutors who had teaching skill were selected by the teacher and they were asked to teach the other students. This method is peer dominated and textbook centered teaching.

3.7 COLLECTION OF DATA

The identified slow learners from both the schools were divided into six groups. Five groups were experimental and one was the control group. Two experimental groups had 16 students each and three experimental groups had 20 students each. The control group consisted of 30 students (Table-3.1). The data collection was carried out in four phases.

In the first phase pretest was conducted for the students of the experimental and control groups to assess the science knowledge using the developed questionnaire. The scores of the students in the pre test ranged between 6 and 25.

In the second phase the students were taught by the investigator using five different instructional strategies. First semester science syllabus was taught to each group for one hour every alternative day using the respective instructional method during science class. The intervention programme was carried out for a period of four months separately in both the schools.

For the first experimental group individual instruction method was used. In this method the course content was taught orally and repetition was made in teaching difficult portion as per the requirement of the individual child. Giving individual attention was the main goal of this method of teaching. Students of second experimental group were taught using picture book. In this method the investigator taught the course content for 50-60 minutes showing pictures in-between the oral explanation. Some of the information, which was beyond the student's comprehension, was picturised. Students handled the picture book and closely observed each picture related to the portion. Similarly the students of third experimental group were taught using charts. These charts were displayed on walls. Students could see and

Table 3.1 Distribution of students according to different instructional strategies

Group	Instructional strategies	Government school (N)	Private school (N)	Total (N)
Experiment	Individual Instruction	8	8	16
	Picture book	10	10	20
	Chart	10	10	20
	Model	10	10	20
	Peer tutoring	8	8	16
Control	Normal teaching	15	15	30
Total		61	61	122

N – Number of students

observe the charts during the class hours while explaining the portion. The fourth experimental group students were taught the portion with the help of models. Models were used to clarify the difficult concepts along with oral explanations. All the students personally handled the models by manually touching and seeing and learned the concepts taught.

Further, students of fifth experimental group were learnt through peer tutoring. In this method of teaching the role of the teacher was minimum. First the investigator taught the science portion orally to fifth group. Later two students who had aptitude and skill for teaching were selected. Student leaders were given a clear knowledge of the subject matter before teaching the other students. Some of the questions asked by the students were clarified by the student leader (peer tutor).

Control group students attended the regular class of the school and learnt through class teacher without using any picture book, charts and models developed by the investigator.

In the third phase with a gap of one week after completing the intervention programme posttest was conducted for all the students of experimental and control groups with the help of questionnaire used for the pre test. The posttest scores of the students ranged between 12 and 35. Further, teacher's opinion, quality, usability and influence of different instructional strategies used for teaching science was assessed through a developed questionnaire. Teachers of the selected schools who reviewed the picture book, charts and models were approached and asked about usefulness of these instructional strategies in learning science.

In the fourth phase the subject matter retention capacity of the students was assessed to know the impact of different instructional strategies using the questionnaire developed for the posttest. The test was conducted for all students in the end of academic year after a gap of three months. The retention score of the students of both experimental and control groups ranged between 5 and 26.

The score of the students ranged for each instructional strategy was given below

Group	Instructional strategy	Score range		
		Pre test	Post test	Retention test
Experiment	Individual instruction	2-15	10-22	8-20
	Picture book	9-19	18-29	18-22
	Charts	2-26	18-30	16-26
	Models	8-24	10-34	8-30
	Peer tutoring	3-28	6-32	5-22
Control	Normal teaching	4-20	8-30	5-20

3.8 STATISTICAL ANALYSIS

The data of the present study was analyzed using the following statistical tests.

- (a) Karl Pearson's product moment correlation coefficient analysis was used to measure the relationship between dependent and independent variables, using the formula

$$r = \frac{n \sum xy - \sum x \sum y}{\sqrt{\{n \sum x^2 - (\sum x)^2\} \{n \sum y^2 - (\sum y)^2\}}}$$

Where, r = Simple correlation coefficient

x = Independent variable

y = Dependent variable

$\sum x$ = Sum of x values

$\sum y$ = Sum of y values

$\sum x^2$ = Sum of squares of x values

$\sum y^2$ = Sum of squares of y values

$\sum xy$ = Sum of xy

n = Number of pairs of observations

To test the significance of correlation, 't' value was calculated using formula:

$$t = \frac{r \sqrt{n-2}}{\sqrt{1-r^2}}$$

$$t \approx n-2$$

- (b) To know the difference between two groups experimental group and control group students 't' test was applied using the formula:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{S^2 \left[\frac{1}{n_1} + \frac{1}{n_2} \right]}}$$

$$S^2 = \frac{(n_1-1) S_1^2 + (n_2-1) S_2^2}{(n_1 + n_2) - 2}$$

Where,

\bar{X}_1 = mean of the first group

\bar{X}_2 = mean of the second group

n_1 = number of observations in the first group

n_2 = number of observations in the second group

S_1^2 = variance of the first group

S_2^2 = variance of the second group

S^2 = pooled variance

To know the intervention effect of different instructional methods of pretest and posttest of experimental and control group students, paired "t" test was calculated by using the formula:

$$t = \frac{d-o}{\sqrt{Sd^2/n}}$$

- (c) To find out the association between the teachers opinion and method of instruction, the Chi-square test was applied using the formula,

$$\chi^2 = \frac{\sum (o_i - e_i)^2}{e_i}$$

Where, o_i = observed value

e_i = expected frequency

The chi-square value was compared with the table values for (r-1) (c-1) degrees of freedom (d.f.), 'r' denoting the number of rows, 'c' denoting number of columns in the contingency table.

3.9 OPERATIONAL DEFINITIONS

Operational definitions of certain terms fairly and frequently used in the study are explained below in alphabetical order.

Conventional method: The method of teaching science, which is widely being used by school teacher at present, is referred to as the conventional method. This method is textbook centered, teacher dominant, chalk-to-chalk based and examination oriented.

Instructional strategy: Instructional strategy is made up of the things of learning devices and materials, which are used as an additional aid in the process of learning and teaching.

Learning: The process by which experience results in a relatively permanent change in behavior or potential behavior

Science achievement: In the present study the word science achievement is used to denote the performance of the students on academic tests or examinations of science subject expressed in marks.

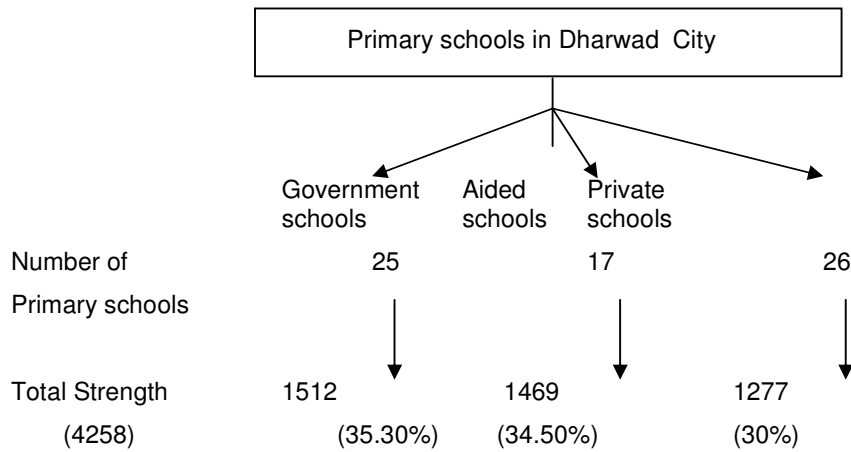
Slow learner: Slow learner is a child whose intellectual and achievement scores lie below the average children (Soundaraja Rao and Rajaguru, 1995). In the present study slow learner are those who scored 40 or less percentage of total marks consistently for the previous two final examinations, fell below the 25th percentile in the intelligence test, scored less than 20 marks in achievement test and assessed by teachers as slow learner.

3.10 HYPOTHESIS FOR THE STUDY

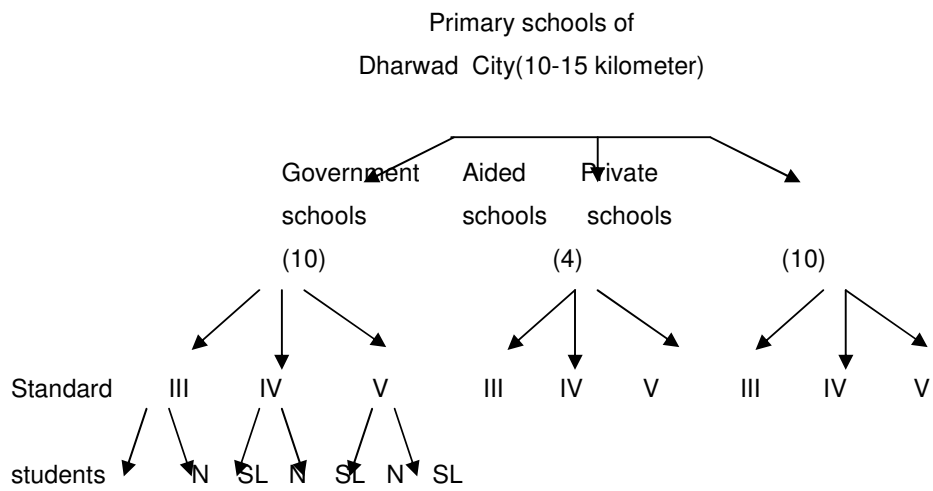
The following hypotheses were framed keeping in view of the objectives of the study.

1. Independent variables (gender, type of family, ordinal position, size of the family, parent's education, parent's occupation and per capita income) would not significantly influence the rate of learning among slow learners.
2. There would be no significant difference between the experimental group and control group slow learners in learning science.
3. Using individualized instruction / picture book / charts / models / peer tutoring in teaching would not significantly influence the learning of science among slow learners.
4. Subject matter retention capacity of the slow learner would not vary according to the different instructional strategies used in learning.
5. Teacher's opinion towards the usefulness of different instructional strategies would not significantly improve the rate of learning science.

3.2 Selection of the sample



3.2.1 Sample for prevalence study



RESULTS

4.1 Prevalence of low achievers

The data regarding prevalence of low achievers according to the type of school, gender and standard wise distribution was presented in table 4.1 (a, b and c) respectively (Appendix-I-VII).

Table 4.1 a. Distribution of low achievers according to type of school

Table 4.1 b. Gender wise distribution of low achievers

Table 4.1 c. Standard wise distribution of low achievers

Appendix I. General information

Appendix II. Achievement test

Appendix III. Science knowledge test

Appendix IV. Intelligence test

Appendix V. Schedule to elicit the information regarding teachers opinion

Appendix VI. Picture book

Appendix VII. List of primary schools of III, IV and V standard students in Dharwad city

The table 4.1a (Fig.1) shows the distribution of low achievers according to the government, aided and private schools. All the three types of schools, the percent of low achievers was higher in government schools (35.20%) than private (23.42%) and aided schools (17.38 %).

The table 4.1b (Fig.2) depicts the gender wise distribution of low achievers. More number of students were girls (76.92%) and 68.60 per cent were boys. However, the percentage of low achievers was more in boys (31.40) than girls (23.08).

Distribution of low achievers studying in III, IV and V standards is shown in table-3 (Fig.3). It is evident from the table that the percent of low achievers in all the classes was only one third (30%), whereas normal student's strength was ranged from 70-75 per cent. Among all the three standards the percent of low achievers was higher in III standard (30%), followed by IV standard (27.30%) and V standard (24.70%) respectively.

Figure 1. Distribution of low achievers according to type of school

Figure 2. Gender wise distribution of low achievers

Figure 3. Standard wise distribution of low achievers

Figure 4. Mean scores of students in science before and after the intervention

4.2 Background information of the respondents

Information regarding the background characteristics of the respondents is presented in table-4.2. The sample of the study was primary school students from III standard co-educational government and private schools, with their age ranging between 8-10years.

It is seen from the table that, more number of respondents were of boys (55%) and 45 per cent were girls. When categorized according to the ordinal position 48.5 per cent were second born, 27 per cent were first born and 24.5 per cent were last born. Majority of the children were from nuclear family (79%) and only 26 per cent of them were from joint family. With regard to the family size, more than half of the respondents had medium size family (60%), 33 per cent were from small family and least number of respondents were from large size family (7%).

With regard to the parent's education, about 32 per cent of fathers had high school level education (8-10 years), 16.5 per cent of them had primary education (1-4 years), 16.5

Table 4.1 Prevalence of slow learners in schools

4.1.a. Distribution of low achievers according to type of school

N=5291

Type of school	Strength of students (N)		
	Normal	Slow learner	Total
Government	1643 (64.80)	893 (35.20)	2536 (100.00)
Aided	1032 (82.62)	217 (17.38)	1249 (100.00)
Private	1158 (77.00)	348 (23.00)	1506 (100.00)

Figures in the parenthesis indicate percentages
N - Number of students

4.1. b. Gender wise distribution of low achievers

N=5291

Gender	Strength of students (N)		
	Normal	Slow learner	Total
Boys	1953 (68.60)	895 (31.40)	2848 (100.00)
Girls	1879 (76.92)	564 (23.08)	2443 (100.00)

Figures in the parenthesis indicate percentages
N - Number of students

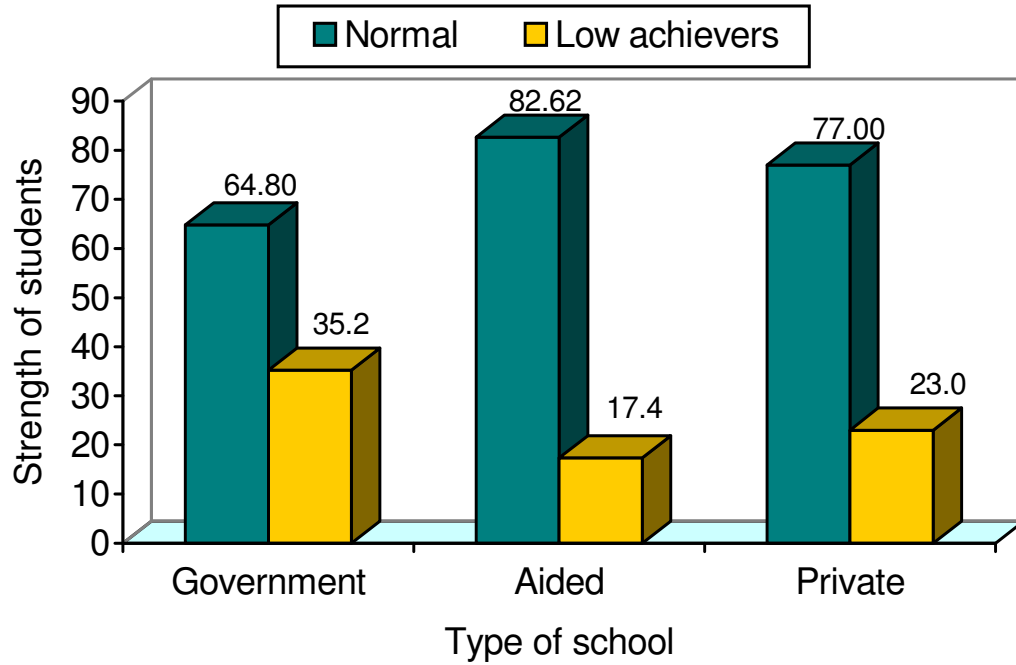


Fig. 1. Distribution of low achievers according to type of school

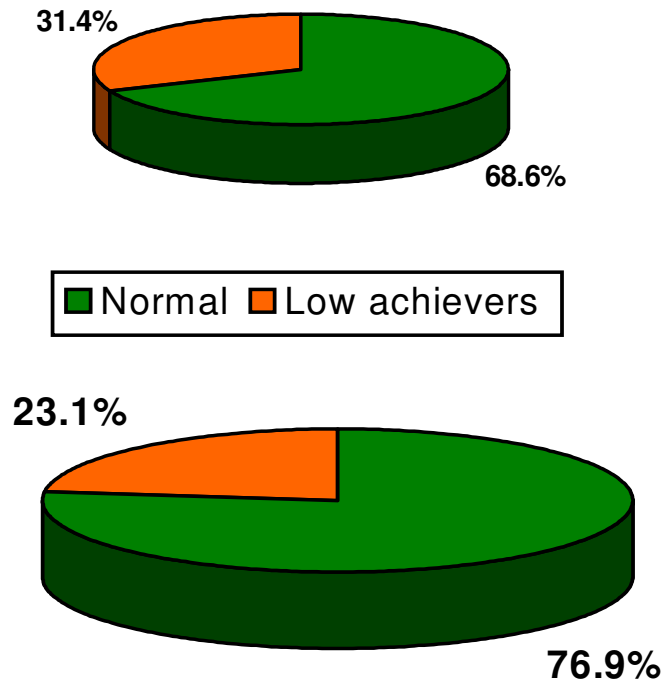


Fig.2. Gender wise distribution of low achievers

4.1. c. Standard wise distribution of low achievers

N=5291

Standard	Strength of students (N)		
	Normal	Slow learner	Total
III	1470 (70.00)	625 (30.00)	2095 (100.00)
IV	1260 (72.70)	473 (27.30)	1733 (100.00)
V	1102 (75.30)	361 (24.70)	1463 (100.00)

Figures in the parenthesis indicate percentages
N - Number of students

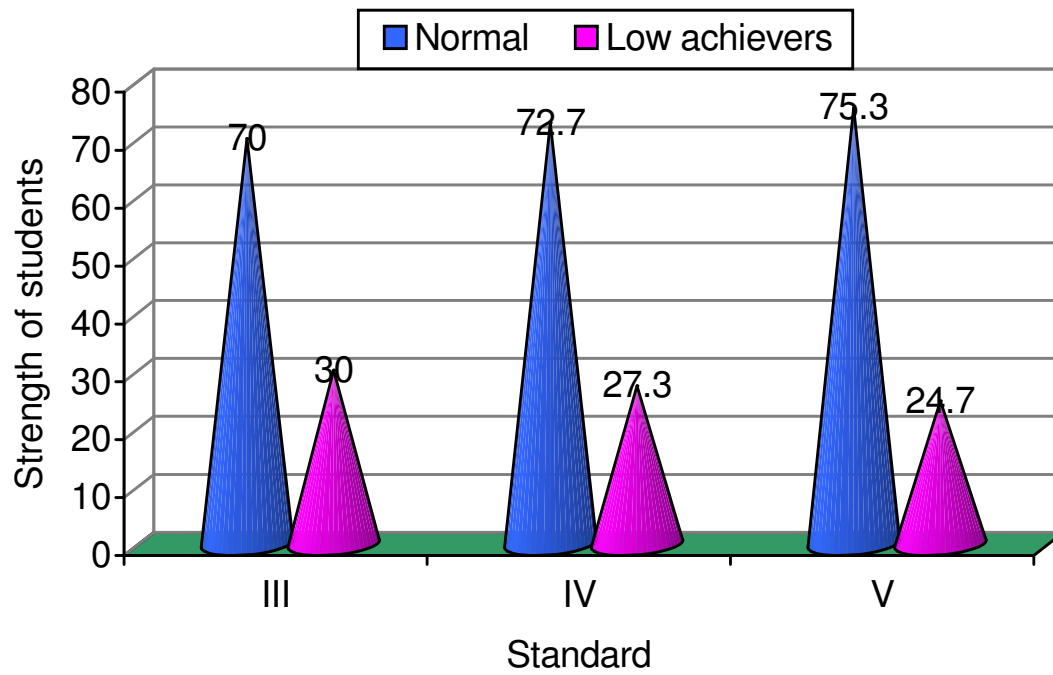


Fig.3. Standard wise distribution of low achievers

per cent had college level education (PUC and above) and only 2.5 per cent of them were illiterate. In case of mothers nearly 32 per cent of them completed middle school education (5-7 years), followed by high school education (27%), primary (22%) and college education (10%).

With regard to occupation relatively a larger proportion of father's (32%) were fell in the category of unskilled occupation followed by farmers / business (24.4%), semiskilled work (20.50%), skilled category (15%) and very few (6%) of them were professionals. In case of mothers' occupational position, majority (59%) of them were housewives, followed by unskilled (35%), semiskilled (4%) and skilled (3%). None of the mothers were in the category of business and professionals. In the present study majority of the students were from poor families. Housing and Urban Development Corporation (1994) demarcates that families with less than Rs 2,460/- per month belong to low-income group. Thus in the present study almost all of them belonged to low per capita income group and only ten percent of them were in the high income group of Rs 4000/-per month (Tables 4.2 – 4.11).

Table 4.2. Background information of the respondents

Table 4.3. Influence of gender and type of family in learning science among slow learners of experimental group

Table 4.4. Influence of ordinal position, size of the family, parent's education and occupation and per capita income in learning science among slow learners of experimental group

Table 4.5. Mean scores of students in science before and after the intervention

Table 4.6. Effect of various instructional strategies to improve the science learning among slow learners after intervention

Table 4.7. Comparison of pre test and posttest mean scores of control and experimental group students in science

Table 4.8. Comparison of mean scores in science of different experimental groups after the intervention

Table 4.9. Retention capacity of students in learning according to different instructional strategies

Table 4.10. Comparison of mean retention scores in science of different experimental groups

Table 4.11. Teacher's opinion towards different instructional strategies

4.3 Influence of gender and type of family in learning science among slow learners of experimental group

An appraisal of the Table-4.3 showed the influence of gender and type of family in relation to science learning of slow learners. It is evident from the table that the mean score of boys (23.18) was more compared to the mean scores of girls (21.62). However the difference was found statistically not significant.

Further, results from the same table revealed that the mean score was higher in students belonging to nuclear family (22.60) than joint family (21.80). However, the difference between the mean scores of students belonging to nuclear and joint family in learning science was found statistically not significant.

Thus, the hypothesis stating that there would be no significant difference between gender and type of family with the science learning of slow learners was accepted.

4.4 Influence of ordinal position, size of the family, parent's education, occupation and per capita income in learning science among slow learners of experimental group

The results presented in table-4.4 revealed the influence of ordinal position, size of the family, parent's education, parent's occupation and per capita income in learning science among slow learners of experimental group.

Table 4.2 Background information of the respondents

Particulars	Category	Frequency	Percentage
Gender	Boys	67	55.00
	Girls	55	45.00
Ordinal Position	First born	33	27.00
	Second born	59	48.50
	Third born	30	24.50
Type of family	Nuclear	96	79.00
	Joint	26	21.00
Size of the family	Small (1- 4 members)	40	33.00
	Medium (5-7 members)	73	60.00
	Large (8 and above)	09	07.00
Education of father	Illiterate	06	05.00
	Primary (1-4 years)	20	16.50
	Middle school (5-7 years)	37	30.00
	High school (8-10 years)	39	32.00
	College (PUC and <)	20	16.50
Education of mother	Illiterate	13	11.00
	Primary (1-4 years)	27	22.00
	Middle school (5-7 years)	39	32.00
	High school (8-10 years)	33	27.00
	College (PUC and <)	10	08.00
Occupation of father	No occupation	04	03.20
	Unskilled	38	31.00
	Semiskilled	25	20.40
	Skilled	18	15.00
	Farming / business	31	25.40
	Professionals	06	05.00
Occupation of mother	No occupation	78	59.00
	Unskilled	35	29.00
	Semiskilled	06	09.50
	Skilled	03	02.50
	Farming / business	-	-
	Professionals	-	-



Plate 1. Teaching through individual instruction

Table 4.3. Influence of gender and type of family in learning science among slow learners of experimental group

Variable	Category	Mean	S. D	't' value
Gender	Boys	23.18	4.58	1.28 NS
	Girls	21.62	6.98	
Type of family	Nuclear	22.60	5.90	0.45 NS
	Joint	21.80	5.59	

NS - Non significant

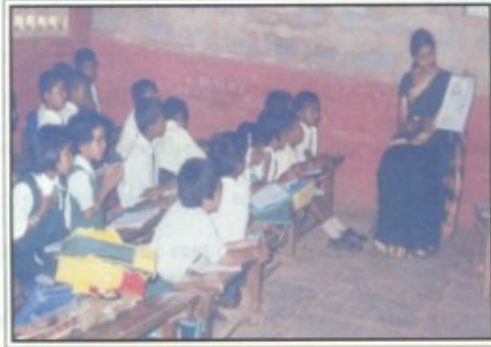


Plate 2. Teaching through picture book

The positive relationship was observed between father's education ($r=0.39$), mother's education ($r=0.30$), father's occupation ($r=0.25$), mother's occupation ($r=0.22$), per capita income ($r=0.24$) and science learning ability of slow learners. The 'r' value was found significant at 5 per cent level probability.

Further, it was observed that a positive relation ship between ordinal position, size of the family with regard to science learning ability among slow learners. However, 'r' value was found non-significant.

So, the hypothesis stating that ordinal position, size of the family would not significantly influence the rate of learning among slow learners was accepted. Only with reference to parent's education, parent's occupation and per capita income rest of the hypothesis was rejected.

4.5 Mean score of students in science before and after the intervention

Table-4.5 (Fig.4) revealed the mean score of students in science of both the experimental and control groups before and after the intervention.

The table reveals that there was significant difference between pretest and posttest scores of control group and experimental group students taught through the individualized instruction, picture book, charts, models and peer tutoring. Further, the mean scores indicated that each experimental group performance was significantly better in the posttest scores than the pretest.

It is observed from the same table that gain score was more for the students who received instruction through model (12.80) followed by chart (11.60), picture book (11.35), individual instruction (9.90) and peer tutoring (9.37). The least gain score was observed in control group with normal teaching (8.25).

Hence, the hypothesis that there would be no significant difference between the control group and experimental group students in science after intervention was rejected.

4.6 Effect of various instructional strategies to improve the science learning among slow learners after intervention

Contents of the Table-4.6 depicts the comparison of posttest mean scores of the experimental group who received instruction through various instructional strategies and the control group taught through normal conventional teaching.

It is clear from table that students from the experimental group performed better in science learning than the students from the control group after the intervention programme. The 't' values revealed that the different instructional methods used viz model, chart, picture book, individual instruction and peer tutoring were significantly effective in improving the science ability of slow learners. While difference was statistically significant at 1% level for model, chart and picture book instruction, it was significant at 5% level in individual instruction and peer tutoring.

It is also observed from the same table that difference was more for the students who received instruction through model (4.4), followed by chart (3.65), picture book (3.30) and individual instruction (1.9). The least difference was observed in peer tutoring (0.59).

Hence, hypothesis three that different instructional strategies viz- individual instruction, picture book, chart, model and peer tutoring would not significantly improve the science learning among slow learners was rejected.

Table 4.4 Influence of ordinal position, size of the family, parent's education and occupation and per capita income in learning science among slow learners of experimental group

Independent Variables	r' value
Ordinal Position	0.16 NS
Size of the family	0.09 NS
Parent's Education	
Father's education	0.39*
Mother's education	0.30*
Parent's Occupation	
Father's occupation	0.25*
Mother's occupation	0.22*
Per capita Income	0.24*

* Significant at 0.05 per cent level
 NS - Non-significant

Table 4.5. Mean scores of students in science before and after the intervention

N=122

Group compared	Type of instruction	Mean scores of		Gain score	't' value
		Pretest	Posttest		
Control	Normal Teaching	11.35 (6.21)	19.60 (1.68)	8.25	5.02**
Experimental	Individual Instruction	11.60 (6.43)	21.50 (2.63)	9.90	5.70**
	Picture Book	11.55 (6.83)	22.90 (3.66)	11.35	6.55**
	Chart	11.65 (6.69)	23.25 (1.88)	11.60	7.47**
	Models	11.20 (6.12)	24.00 (2.75)	12.80	8.53**
	Peer Tutoring	11.20 (6.12)	20.19 (2.24)	8.99	5.52**

Figures in the parenthesis indicate standard deviation

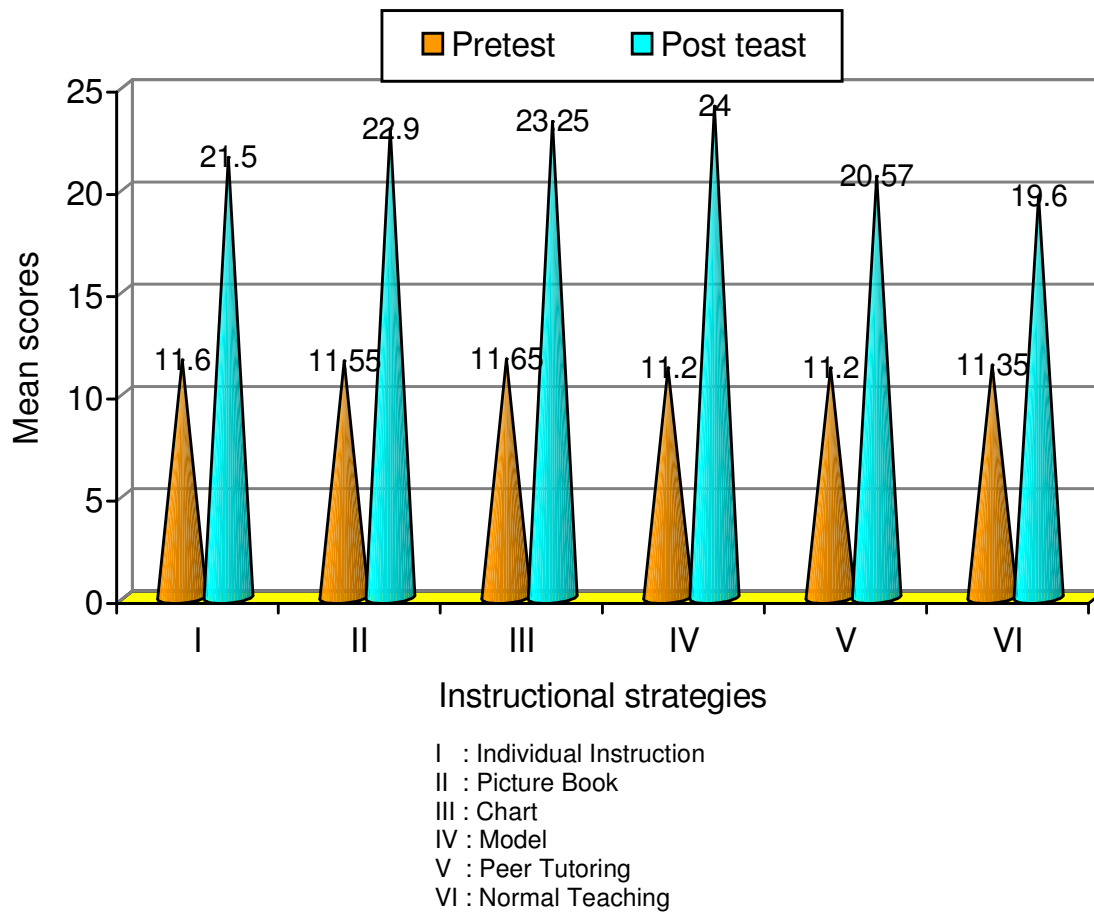


Fig. 4. Mean scores of students in science learning before and after the intervention

Table 4.6. Effect of various instructional strategies to improve the science learning among slow learners after intervention

N=122

Instructional Strategies	Mean scores of post test		Difference	't' value
	Experiment (n=92)	Control (n=30)		
Individual Instruction	21.50 (2.63)	19.60 (1.68)	1.90	2.68*
Picture Book	22.90 (3.66)	19.60 (1.68)	3.30	3.45**
Chart	23.25 (1.88)	19.60 (1.68)	3.65	5.40**
Model	24.00 (2.75)	19.60 (1.68)	4.40	6.38**
Peer Tutoring	20.19 (2.25)	19.60 (1.68)	0.59	2.18*

Figures in the parenthesis indicate standard deviation

** Significant at 0.01 per cent level

* Significant at 0.05 per cent level



Plate 3. Teaching through charts

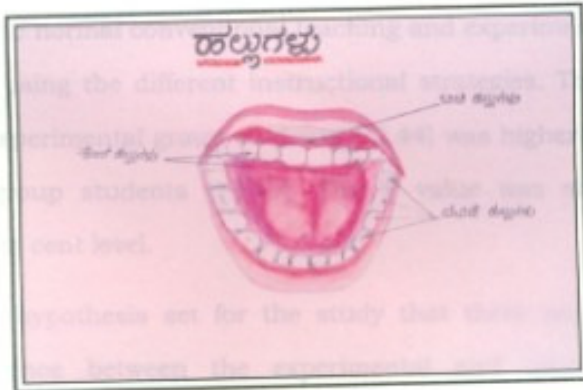


Plate 4. Teaching through charts

4.7 Comparison of pre test and posttest mean scores of control and experimental group slow learners in science

An appraisal of Table-4.7 showed the comparison between the pre-test and post-test mean scores of control and experimental group students in science. Non-significant difference was found between the pre test scores in science learning of control and experimental group students.

It is clear from the table that significant difference was found between the post test scores in science learning of control group students taught through the normal conventional teaching and experimental group students taught using the different instructional strategies. The science achievement of experimental group students (22.44) was higher than that of the control group students (19.60). The 't' value was statistically significant at 1 per cent level.

Thus, the hypothesis set for the study that there would be no significant difference between the experimental and control group students in learning science at pre test was accepted and rejected at posttest.

4.8 Comparison of mean scores in science of different experimental groups after the intervention

Results presented in the Table 4.8 revealed that post test performance of students of experimental group taught through individual instruction differed significantly from students taught through charts and models methods. Similarly students taught through picture book differed significantly from students taught through peer tutoring. 't' value found to be significant at 0.05 level. Further, the performance of students in science taught through charts differed significantly from the students taught through peer tutoring, model with peer tutoring and 't' value was found significant at 0.01 levels.

Non-significant difference was found for the students of other combinations taught through individual instruction and picture book, individual instruction and peer tutoring, picture book and charts, picture book and models, charts and models in their posttest performance.

Thus, the hypothesis that teaching through different instructional strategies for slow learners would not improve the science ability was partly accepted.

4.9 Retention capacity of students in learning science according to different instructional strategies

The results of Table-4.9 revealed the comparison of mean difference between posttest and retention test scores of students in science learning as influenced by different instructional strategies after the intervention programme.

It is observed from the table that the experimental group slow learners improved their science learning in the retention test than the posttest with a positive gain score who received instruction through picture book (0.90) and model (0.16). Where as the experimental group slow learners improved their science learning in the posttest than the retention test with a difference, who received instruction through chart (-0.46), individual instruction (-0.70), peer tutoring (-1.11) and normal teaching (-1.25). However, the 't' values were found to be non-significant indicating that there is no significant difference in the mean score of posttest and retention test of control and experimental group students.

Thus the hypothesis that, the subject matter retention capacity of the slow learner would not vary according to the different instructional strategies used in learning science among slow learners was accepted.

Table-4.7 Comparison of pre test and posttest mean scores of control and experimental group slow learners in science

N=122

	Pre test		Post test	
	Control (n=30)	Experiment (n=92)	Control (n=30)	Experiment (n=92)
Mean	11.35	11.43	19.60	22.44
S. D	3.58	3.88	1.68	5.24
't' Value	0.78 NS		4.78**	

** Significant at 0.01 per cent level

NS - Non significant



Parts of the plant



Teeth



Living and non living thing



Plants and seasons

Plate 5. Teaching through models

Table 4.8 Comparison of mean scores in science of different experimental groups after the intervention

Group comparison		Mean score		Standard deviation		't' value
I	II	I	II	I	II	
Individual instruction	Picture book	21.50	22.90	2.63	3.66	1.33 NS
	Charts	21.50	23.25	2.63	1.88	2.24*
	Models	21.50	24.00	2.63	2.75	2.78*
	Peer tutoring	21.50	20.19	2.63	2.24	1.07NS
Picture book	Charts	22.90	23.25	3.66	1.88	0.38NS
	Models	22.90	24.00	3.66	2.75	1.07NS
	Peer tutoring	22.19	20.19	3.66	2.24	2.35*
Charts	Models	23.25	24.00	1.88	2.75	1.01NS
	Peer tutoring	23.25	20.19	1.88	2.24	3.82**
Models	Peer tutoring	24.00	20.19	2.75	2.24	4.12**

* Significant at 0.05 per cent level

** Significant at 0.01 per cent level

NS Non-significant



Seasonal changes in a tree model - made out of thermocoal



Teeth model made out of plaster of paris



Parts of Plants model – made out of wood



Fruits model made out of wood



Animals model made out of wood and plastic

Table4.9. Retention capacity of students in learning according to different instructional strategies

N=122

Instructional Strategies	Mean score of		Difference (B-A)	't' value
	Post test (A)	Retention test (B)		
Normal Teaching	19.60 (1.68)	18.35 (2.54)	-1.25	0.13 NS
Individual instruction	21.50 (2.63)	20.80 (3.88)	-0.70	0.16 NS
Picture Book	22.90 (3.66)	23.80 (4.70)	0.90	0.21NS
Chart	23.25 (1.88)	22.79 (2.40)	-0.46	0.22NS
Models	24.00 (2.75)	24.16 (2.23)	0.16	0.18NS
Peer Tutoring	20.19 (2.24)	19.08 (3.02)	-1.11	0.25 NS

Figures in the parenthesis indicate standard deviation

NS - Non significant

Table 4.10. Comparison of mean retention scores in science of different experimental groups

Group comparison		Mean score		Standard deviation		't' value
I	II	I	II	I	II	
Individual instruction	Picture book	20.80	23.80	3.88	4.70	2.10*
	Charts	20.80	22.79	3.88	2.40	1.80NS
	Models	20.80	24.16	3.88	2.23	2.08*
	Peer tutoring	20.80	19.08	3.88	3.02	1.40NS
Picture book	Charts	23.80	22.79	4.70	2.40	0.86NS
	Models	23.80	24.16	4.70	2.23	0.31NS
	Peer tutoring	23.80	19.08	4.70	3.02	3.65**
Charts	Models	22.79	24.16	2.40	2.23	1.87NS
	Peer tutoring	22.79	19.08	2.40	3.02	2.01*
Models	Peer tutoring	24.16	19.08	2.23	3.02	2.61*

* Significant at 0.05 per cent level

** Significant at 0.01 per cent level

NS Non-significant



Plate 8. Teaching through peer tutoring

4.10 Comparison of mean retention scores in science of different experimental groups

A close scrutiny of the Table 4.10 revealed that significant difference was found in the performance of the students in retention test for the experimental group taught through individual instruction and picture book, individual instruction and models, picture book and peer tutoring, charts and peer tutoring, models and peer tutoring respectively. 't' value was found to be significant at 0.05 level. Non-significant difference was found for the students taught through other combinations viz. individual instruction and charts, individual instruction and peer tutoring, picture book and charts as well as models, charts and models in their retention test performance.

Hence the hypothesis that slow learners performance in retention test for different experimental groups did not differ significantly was partly accepted.

4.11 Teacher's opinion towards different instructional strategies

Table 4.11 revealed the opinion of teachers towards usefulness of different instructional strategies. It is clear from the table that almost all teachers favored using different instructional strategies in teaching science to the students viz picture book with a total score of 424 followed by model (355), charts (345), individual instruction (327) and peer tutoring (303). Among these methods picture book was found to be the most effective instruction as compared to charts and models and peer tutoring was least effective method of instruction.

Further, from the same table it is observed that majority of the teachers opined picture book stands first in ranking as a good instructional strategy followed by model (II), charts (III), individual instruction (IV) and peer tutoring (V) respectively.

Thus, the hypothesis set for the study that teacher's opinion towards the usefulness of different instructional strategies would not significantly improve the rate of learning science was rejected.

Table 4.11. Teacher's opinion towards different instructional strategies

N=16

Instructional Strategies	Teacher's opinion			Total score	Ranking
	Poor	Satisfactory	Good		
Individual Instruction	8 (50.00)	5 (31.25)	3 (18.75)	327	IV
Picture Book	1 (6.25)	5 (31.25)	10 (62.50)	424	I
Chart	3 (18.75)	7 (43.75)	6 (37.50)	345	III
Models	1 (6.25)	8 (50.00)	7 (43.75)	355	II
Peer Tutoring	9 (56.25)	5 (31.25)	2 (12.50)	303	V

Figures in the parenthesis indicate percentages

DISCUSSION

It is a well-known fact that all students in a class do not learn at the same pace. Some children learn in a fast manner and complete their academic tasks easily; on the other hand children who have limited intellectual endowment by nature are termed as slow learners. The slow learning child is not considered mentally retarded because he/she is capable of achieving a moderate degree of academic success at a slower rate than the average child.

The students showing poor performance should be identified and necessary remedial measures have to be taken for improvement in their performance. Moreover, science is a compulsory subject in every system of education right from the primary level in India. So, slow learners are equipped with basic science knowledge in the beginning itself in order to enable them to cope up with the subject. Primary education should help children to develop understanding of science key concepts at each level through appropriate experience. It is essential for every child to acquire minimal level of learning of primary level science. Hence, an alternative strategy for improving science learning among slow learners seems to be most appropriate and the present study confirmed its effectiveness in improving the rate of learning science among slow learners. The salient results of the study are discussed under the following headings:

1.1 Prevalence of low achievers

Over the years many different terms have been used to describe children with slow learners such as backward, disturbed, under achievers, low achievers and so on. Bharati Devi (1982) states that, low achievers are those students who scored on an average less than 40 per cent marks consecutives over two years in their previous examinations. They are limited in their capabilities, which impede their school progress. In the present study the percentage of low achievers was higher in Government schools followed by private and Aided schools (Table 4.1 a,b and c). This may be because children from lower socio economic status attend Government schools and home environment of these children was also not congenial for their scholastic achievement. Similarly, Sangawan and Rana (2000) found that prevalence rate of low achievers was 28.85 per cent from Government school and 25 per cent from private schools in the age range of 8 to 12 years children.

In all three types of schools higher percent of low achievers were from the third standard compared to fourth and fifth standards. However, the difference in the percentage of low achievers between the classes is not sharp. Similar results were obtained by Bharghava *et. al.*, (1998) which revealed that, the overall prevalence of low achievers among 9 to 12 years urban children was 36 percent from 30 primary schools. Further, Reddy and Ramar (2003) observed that in rural children of age group 5 to 8 years were slow to catch up in their academic achievement. They also revealed that the prevalence of low achievers was 30 - 35 percent based on teacher's reports and 27.2 percent based on parent's reports.

5.2 Influence of familial factors in learning science among slow learners

The results of the present study (Table-4.4) showed that, education of parents (father and mother) was positively and significantly related with science achievement of slow learners. This may be due to educated parents always encouraging the child's achievement, educational experiences and tuition facilities, which support and guide in the education of their children. Studies carried out by various scholars (Singhal, 1983; Sarma, 1984; Bhatnagar and Sharma, 1992; Poonam and Balda, 2001) to know the effect of education of parents on the academic achievement of children revealed that, achievement of children is directly related with the educational level of parents. Similarly, Samanth and Pandey (2001) proved that students of highly educated parents had high achievement motivation towards their children and provided conducive home environment than those students whose parents were less educated.

Similarly, parent's occupation was positively and significantly related to learning science among slow learners. This may be because higher occupation level of the parents

provided better economic condition, which resulted in material support and other facilities for the intellectual development of their children. Gill and Sidhu (1988), Cherian and Cherian (1995), Budhev (1999) revealed that occupation and cognitive development of the children are interrelated. Similarly, Wango and Khan (1991) observed the influence of parental involvement and socio economic status on academic achievement of children and found that, parent's occupational status was positively related to the academic achievement of children. Further, as the income of the family increased the performance of slow learners in science also increased. This may be because parents are able to afford better educational materials, books and other facilities, which support the education of children. Thus, children's mind is slowly conditioned and trained to increase their learning rate over the periods. Supporting to this result, many of the studies (Chadha *et. al*, 1988; Khan and Jernberu, 2002; Saritadevi 2003) revealed a positive relationship between academic achievement and percapita income of parents.

The results of the Table-4.3 showed that rate of learning science was slightly higher in boys than that of the girls. The difference in performance between two genders could be due to the difference in treatment by the parents. Particularly in Indian situation that too in rural background parents have low aspirations for girls education compared to boys. However, this difference was not significant. This may be because of disproportionate sample size of boys (55%) as compared to girls (45%). Several studies (Thomas and Marrison 1999; Jones *et. al.*, 2000; Rathore, 2000) revealed that boys performed better than girls in science ability. Mohapatre and Mishra (2000), Haggerty (2003) reported that classroom achievement of boys on a standardized science test was superior as compared to girls.

Ghetiya (2000) conducted a study on "effectiveness of sex and method of teaching on academic achievement of children". The results revealed that sex does not have any effect on academic achievement of children. Nair (2001) reported that female and male students perceived similar classroom environment. However, Telli *et. al.*, (2002) found that, there was a significant difference in the perception of biology learning environment among the gender. Girls had positive perception and attitudes towards biology than boys.

Further, the results of the same table revealed that, mean score of learning science among slow learners of nuclear family was higher than that of joint family. However, the difference was not statistically significant. This may be because of disproportionate sample size. In the present study it was found that majority of the students were from nuclear family (79%) and only 21 percent belonged to joint family. As the size of the family was small, parents give more attention to their children to perform better in academic achievement. Shanmukappa (1978) in his study on influence of type of family and socio economic status on academic achievement of children found that, there was no significant relation between type of family and academic achievement of children.

The findings of the present study (Table-4.4) revealed that ordinal position and size of the family has no significant influence on the rate of learning among slow learners. Generally first born received more attention and care than the later born, as parents can devote more time and involve better in the overall development of first child. However, later born many times receive help and guidance from their elder siblings. Moreover, in the present study though there was no much variation in the ordinal position of children, majority of the children were first and second born (74.5%). Similar inferences were drawn from the studies carried out by Narayani (1993) and Miner (1998), who revealed that child's ordinal position had positive influence on academic achievement of children.

Further, the results also revealed that size of the family had no significant influence on the rate of learning among slow learners. May be because of the reason that majority of the children were belonged to medium size (60%) and small size family (33%). Sundar Raj and Krishnan (1980) and Cherian (1990) conducted a study to determine the relationship between academic achievement and family size, and found a positive but non-significant relationship between family size and academic achievement of children.

5.3 Instructional strategies in learning science

Instruction is a process and series of events that leads to some learning outcome. An instructional strategy tells a teacher what materials to use, what learning activities students

should be engaged in and what sequence these activities should take place. Instructional strategies determine the approach that a teacher may take to achieve learning objectives. Instructional methods used by teachers create learning environment and specify the nature of the activity in which the teacher and learner will be involved during the lesson.

The effect of different instructional strategies used in teaching science for slow learners revealed that all the instructional strategies used were found effective in teaching science for slow learners in the classroom (Table-4.5, 4.6, 4.7 & 4.8). As expected instructional strategies have provided opportunities for effective learning and the use of picture book, models and charts make students alert, active and increase interest to learn, which in turn improves the speed of learning. Several previous studies (Rawat, 1977; Sindelar, 1991; Reddy and Ramar, 1995; Pandey *et. al.*, 2000 ; Mohan Sundaram and Dharmasekhar 2001; Philip and Marcia, 2002) have also revealed that intervention through different stimulating and enriching instructional methods were more effective in learning science than traditional method of teaching primary school children.

The instruction through models was found to be an excellent strategy compared to other ones, may be because that using models along with verbal instruction help children to make all the sensory organs involved and enhances the power of understanding the concepts and ability for self activity as almost all the sensory organs are involved in the learning process. Similarly Mehra *et. al.*, 2002 and Ponnusamy and Natarajan 2002 came out with the findings that teaching through models was more effective in learning science than traditional method of teaching. They also found that low intelligence students benefited more than the high intelligence students.

Montessori, Maslow and many other educationists mentioned that children could perceive things better through handling models and objects. The attention can be directed methodically in to an activity through various sensory stimuli, as children have very strong desire to touch every thing that they see. Laura (2002) conducted a study on usefulness of teaching methods and academic achievement of children in science and revealed that filmed and wooden models were as effective as live models, which helped in the proper use of sensory organs.

According to teacher's teaching through models and charts ranked II and III (Table-4.11) respectively. Teachers expressed that through models different concepts like parts of animals, plants, teeth and other body organs are clearly seen. Models will have the clarity compared to charts and one can see the models in all angles, they always resemble the original things as children get the opportunity to handle the models. Through models it is possible to enlarge small objects for group study or reduce large objects for easy manipulation and also help in simplifying the complex working parts. Some teachers expressed that there is less number of models available to teach science subjects to children of standard I to V and also opined that Government should take keen interest in preparing and commercializing models so as to supply at least one / two sets in each schools. There should be sufficient facilities to teach difficult subjects like science and math's through models. However, some of the teachers expressed that it is difficult to prepare and keep the model because of limited resources like money and skill.

A chart is a pictorial way of representing relationship between several ideas / things. The main purpose of showing a chart is to show the concept in a concise and attractive form, so that it has a visual impact and helps in retaining it in memory. Further, using charts while learning was also found an effective strategy to improve the rate of learning. The repeated observation of the informative pictures from charts helped in imprinting the subject matter for a long time in the student's mind. Arnold *et. al.*, (1994) found that picturisation of the subject matter provided an excellent content for learning. He further mentioned that chart clarifies the meaning of the spoken words as these activities involved more than one senses.

Auliffe and Dembo (1994) also observed that the charts created interest among children and increased concentration and curiosity, which enabled them to grasp the subject matter and provided the feed back. Similar observations are made by Deloache and Demendoza (1987) and Small *et. al.*, (1993), who proved the importance of charts in the teaching learning situation. In the present study (Table-4.11) teachers also expressed that charts which contain a series of ideas with enlarged pictures should create interest and

curiosity among children to grasp the subject matter. Some teachers felt that though it is easy to prepare and display, students interest remain for a short period which create monotony as children would like to see new things.

Similarly, pictures having different colours helped to imprint the subject matter in the mind of the students. Usually children enjoy pictures and moreover visual aids are better than verbal explanation. Teaching by using picture book was found an effective method. The lessons were illustrated with different pictures, photographs and designs in the picture book helped the slow learners to become alert and provided excellent source of information in learning. Of the five senses eye is the most efficient avenue of learning. Though in most of the cases good learning would be impossible without words but they alone are not enough for quick grasping. Thus the present finding support the axiom "one picture worth a thousand words" and "seeing is believing". Similar finding were found by Chintamanikar (1992) and Alam and Rath (1998), that the picturization of the subject matter developed interest among the children and enabled them to grasp the subject matter easily and helped to take active role in learning proces.

Further, many other studies (Cornell *et. al.*, 1992; Arnold *et. al.*, 1994 and Epstein, 1994) reported that using pictures while teaching facilitated children's recall of information and helped to extend the understanding of concepts clearly.

As teachers expressed that, picture book was the best method of instruction in teaching as compared to other methods. The attractive colours in the pictures sustain the interest of students. Assignments given in the picture book helped students to revise what has been already learnt in that particular chapter. Some teachers suggested that textbook related to the prescribed syllabus should be fully picturized with attractive colours for better understanding. The diagrammatic representation gives a clear idea, which can be easily comprehended by the children.

Individualized instruction was another important strategy found to be effective in improving learning process. The method of teaching followed was according to the needs of the individual learner. In individualized instruction one can draw and sustain their attention relatively little longer time and promote concentration as the teacher concentrates on the individual. In individualized instruction different ways and modes of instructions (materials, games, puzzles and audio visual aids) can be used for the development of difficult concepts and the teacher keep pace with the speed of learning of the individual child. Some children learn science quickly and easily, but for those whom it is difficult, no timetable should be set. Children should always be given the time they need to explore to understand and remember. Such positive findings were also observed by Lidho and Khan (1990) found that individual counseling helped underachievers to improve their scholastic achievement.

The results are in conformity with the findings of Slavin *et. al* (1984), Rajan (1996) and Lokanadha *et. al.* (1997), who revealed that individualization deals with individuality and all the students were supposed to learn the same content in the same sequence presented in the same way but at their own speed of learning. Further, teacher's expressed that the individual instruction though is a good strategy cannot be easily practiced, as this requires 1:1 proportion to provide personal attention and guidance according to the needs of the child. As suggested by the teacher's, if the ratio of teachers to student's ratio is 1:20 to 1:30 maximum some how the individual attention can be given. The intake of students in each school should be less or there should be provision for more number of divisions in each class.

Further, the findings also revealed that peer-tutoring method in teaching was found to be a good method. In peer tutoring, the tutor briefed by explaining what the learner should learn and provided the necessary information and the learner is generally learnt in a relaxed condition. Thus, the relaxed and stress free atmosphere helped slow learners to concentrate in learning. Several studies (Dale, 1979 and Dill *et. al.*, 2000) supported this fact that, peer tutoring or cross age tutoring is effective environment for learning. Similar findings were found by Fantuzzo *et. al.*, (1995) and Maheady *et. al.*, (1998) reported that peer tutoring was an effective method of learning. Peer group of their own age has powerful influence and that stimulated children to learn many things from them.

Further, a higher percentage of teachers said that it is difficult to select the peers who have good teaching and leadership capacity and moreover the peer tutoring is not possible when children are young. They also expressed that peer tutor needs maturity of mind and knowledge. Here, the teacher's supervision plays an important role, because teacher cannot completely rely on peer tutor. Sometime wrong concepts may be passed by the peer tutor.

According to Gerber and Kauffman (1981) peer tutoring instruction is directed at providing remedial and compensatory education to low income and minority students. Recently it is proposed as a means of providing time and cost efficient individualized instruction for slow learning children. Investigation of class wide peer tutoring programme have demonstrated that the principles of effective instruction are critical variables in student's achievement (Delquadri *et. al.*, 1986). This result is also supported by Larsen and Ehly (1980), Peterson and Janicki (1999), reported that in peer tutoring repetition of the skill within each task, attainment of task mastery before proceeding to the next task, error correction procedures, positive reinforcement and feedback are easily possible. It helped children of similar age who had certain common experience, interests and way of understanding.

5.4 Retention capacity of slow learners with time gap

The ability to recall is a great asset in learning although remembering cannot be equated with learning. The knowledge gained just after the exposure to the new method is no doubt important, but what is more important is the amount of knowledge retained with lapse of time after the exposure. The retention can be attributed to the variation in the number of senses being stimulated by the use of visual aids in learning science. This must have enhanced retention power, which may be attributed to the quality of stimulation boosted by the effective use of instructional strategies. The personal experience and practical knowledge received while learning might have helped to retain the subject for a longer period.

The results presented in the Table-4.9 indicated that there is positive influence of instructional strategies specifically model and picture book on the retention capacity of science subjects among slow learners after a lapse of three months. The retaining concept is also supported by the Saloman theory, which states that young children's comprehension and retention can be enhanced by audio-visual instruction as compared to oral presentation. Further, theory of Gagne's (1970) indicated that, in class room situation the effective use of teaching aids help children to recall all the relevant information he/she had previously learnt as and when required. Children must be able to relate these units of knowledge to one another and apply them to the new principles to understand in a better way. The teacher must ensure that the children's past experience is known and utilized.

A recent study by Nayak and Rao (2004) found that, short periods of instruction are more valuable than one long period, because for slow learners the use of different instructional methods attract the attention and create interest in their studies. Models and picture books make learning more attractive, interesting and appealing to students. These instructional strategies can further enrich learning and make it more effective and add colour to education at all stages and forms, as children learn by the combination of seeing, hearing and touching the things (Table-4.10). These results are in line with Penders (1986), found that more the number of senses being stimulated in children, more the message will be communicated and learning will take place. Similarly, the results of Philip and Marcia (2002) support the present finding that stimulating two senses simultaneously result in easier and quicker mental impressions as well as longer retention. However, information gathered from numerous recent studies (Thompson and Cunningham, 2000; Owing *et. al.*, 2002 and Denton, 2002) showed that good retention scores in children is associated with better academic achievement.

4.1 Prevalence of low achievers

The data regarding prevalence of low achievers according to the type of school, gender and standard wise distribution was presented in table 4.1 (a, b and c) respectively (Appendix-VI).

The table 4.1a (Fig.1) shows the distribution of low achievers according to the government, aided and private schools. All the three types of schools, the percent of low

achievers was higher in government schools (35.20%) than private (23.42%) and aided schools (17.38 %).

The table 4.1b (Fig.2) depicts the gender wise distribution of low achievers. More number of students were girls (76.92%) and 68.60 per cent were boys. However, the percentage of low achievers was more in boys (31.40) than girls (23.08).

Distribution of low achievers studying in III, IV and V standards is shown in table-3 (Fig.3). It is evident from the table that the percent of low achievers in all the classes was only one third (30%), whereas normal student's strength was ranged from 70-75 per cent. Among all the three standards the percent of low achievers was higher in III standard (30%), followed by IV standard (27.30%) and V standard (24.70%) respectively.

4.2 Background information of the respondents

Information regarding the background characteristics of the respondents is presented in table-4.2. The sample of the study was primary school students from III standard co-educational government and private schools, with their age ranging between 8-10years.

It is seen from the table that, more number of respondents were of boys (55%) and 45 per cent were girls. When categorized according to the ordinal position 48.5 per cent were second born, 27 per cent were first born and 24.5 per cent were last born. Majority of the children were from nuclear family (79%) and only 26 per cent of them were from joint family. With regard to the family size, more than half of the respondents had medium size family (60%), 33 per cent were from small family and least number of respondents were from large size family (7%).

With regard to the parent's education, about 32 per cent of fathers had high school level education (8-10 years), 16.5 per cent of them had primary education (1-4 years), 16.5 per cent had college level education (PUC and above) and only 2.5 per cent of them were illiterate. In case of mothers nearly 32 per cent of them completed middle school education (5-7 years), followed by high school education (27%), primary (22%) and college education (10%).

With regard to occupation relatively a larger proportion of father's (32%) were fell in the category of unskilled occupation followed by farmers / business (24.4%), semiskilled work (20.50%), skilled category (15%) and very few (6%) of them were professionals. In case of mothers' occupational position, majority (59%) of them were housewives, followed by unskilled (35%), semiskilled (4%) and skilled (3%). None of the mothers were in the category of business and professionals. In the present study majority of the students were from poor families. Housing and Urban Development Corporation (1994) demarcates that families with less than Rs 2,460/- per month belong to low-income group. Thus in the present study almost all of them belonged to low per capita income group and only ten percent of them were in the high income group of Rs 4000/-per month.

4.3 Influence of gender and type of family in learning science among slow learners of experimental group

An appraisal of the Table-4.3 showed the influence of gender and type of family in relation to science learning of slow learners. It is evident from the table that the mean score of boys (23.18) was more compared to the mean scores of girls (21.62). However the difference was found statistically not significant.

Further, results from the same table revealed that the mean score was higher in students belonging to nuclear family (22.60) than joint family (21.80). However, the difference between the mean scores of students belonging to nuclear and joint family in learning science was found statistically not significant.

Thus, the hypothesis stating that there would be no significant difference between gender and type of family with the science learning of slow learners was accepted.

4.4 Influence of ordinal position, size of the family, parent's education, occupation and per capita income in learning science among slow learners of experimental group

The results presented in table-4.4 revealed the influence of ordinal position, size of the family, parent's education, parent's occupation and per capita income in learning science among slow learners of experimental group.

The positive relationship was observed between father's education ($r=0.39$), mother's education ($r=0.30$), father's occupation ($r=0.25$), mother's occupation ($r=0.22$), per capita income ($r=0.24$) and science learning ability of slow learners. The 'r' value was found significant at 5 per cent level probability.

Further, it was observed that a positive relation ship between ordinal position, size of the family with regard to science learning ability among slow learners. However, 'r' value was found non-significant.

So, the hypothesis stating that ordinal position, size of the family would not significantly influence the rate of learning among slow learners was accepted. Only with reference to parent's education, parent's occupation and per capita income rest of the hypothesis was rejected.

4.5 Mean score of students in science before and after the intervention

Table-4.5 (Fig.4) revealed the mean score of students in science of both the experimental and control groups before and after the intervention.

The table reveals that there was significant difference between pretest and posttest scores of control group and experimental group students taught through the individualized instruction, picture book, charts, models and peer tutoring. Further, the mean scores indicated that each experimental group performance was significantly better in the posttest scores than the pretest.

It is observed from the same table that gain score was more for the students who received instruction through model (12.80) followed by chart (11.60), picture book (11.35), individual instruction (9.90) and peer tutoring (9.37). The least gain score was observed in control group with normal teaching (8.25).

Hence, the hypothesis that there would be no significant difference between the control group and experimental group students in science after intervention was rejected.

4.6 Effect of various instructional strategies to improve the science learning among slow learners after intervention

Contents of the Table-4.6 depicts the comparison of posttest mean scores of the experimental group who received instruction through various instructional strategies and the control group taught through normal conventional teaching.

It is clear from table that students from the experimental group performed better in science learning than the students from the control group after the intervention programme. The 't' values revealed that the different instructional methods used viz model, chart, picture book, individual instruction and peer tutoring were significantly effective in improving the science ability of slow learners. While difference was statistically significant at 1% level for model, chart and picture book instruction, it was significant at 5% level in individual instruction and peer tutoring.

It is also observed from the same table that difference was more for the students who received instruction through model (4.4), followed by chart (3.65), picture book (3.30) and individual instruction (1.9). The least difference was observed in peer tutoring (0.59).

Hence, hypothesis three that different instructional strategies viz- individual instruction, picture book, chart, model and peer tutoring would not significantly improve the science learning among slow learners was rejected.

4.7 Comparison of pre test and posttest mean scores of control and experimental group slow learners in science

An appraisal of Table-4.7 showed the comparison between the pre-test and post-test mean scores of control and experimental group students in science. Non-significant difference was found between the pre test scores in science learning of control and experimental group students.

It is clear from the table that significant difference was found between the post test scores in science learning of control group students taught through the normal conventional teaching and experimental group students taught using the different instructional strategies. The science achievement of experimental group students (22.44) was higher than that of the control group students (19.60). The 't' value was statistically significant at 1 per cent level.

Thus, the hypothesis set for the study that there would be no significant difference between the experimental and control group students in learning science at pre test was accepted and rejected at posttest.

4.8 Comparison of mean scores in science of different experimental groups after the intervention

Results presented in the Table 4.8 revealed that post test performance of students of experimental group taught through individual instruction differed significantly from students taught through charts and models methods. Similarly students taught through picture book differed significantly from students taught through peer tutoring. 't' value found to be significant at 0.05 level. Further, the performance of students in science taught through charts differed significantly from the students taught through peer tutoring, model with peer tutoring and 't' value was found significant at 0.01 levels.

Non-significant difference was found for the students of other combinations taught through individual instruction and picture book, individual instruction and peer tutoring, picture book and charts, picture book and models, charts and models in their posttest performance.

Thus, the hypothesis that teaching through different instructional strategies for slow learners would not improve the science ability was partly accepted.

4.9 Retention capacity of students in learning science according to different instructional strategies

The results of Table-4.9 revealed the comparison of mean difference between posttest and retention test scores of students in science learning as influenced by different instructional strategies after the intervention programme.

It is observed from the table that the experimental group slow learners improved their science learning in the retention test than the posttest with a positive gain score who received instruction through picture book (0.90) and model (0.16). Where as the experimental group slow learners improved their science learning in the posttest than the retention test with a difference, who received instruction through chart (-0.46), individual instruction (-0.70), peer tutoring (-1.11) and normal teaching (-1.25). However, the 't' values were found to be non-significant indicating that there is no significant difference in the mean score of posttest and retention test of control and experimental group students.

Thus the hypothesis that, the subject matter retention capacity of the slow learner would not vary according to the different instructional strategies used in learning science among slow learners was accepted.

4.10 Comparison of mean retention scores in science of different experimental groups

A close scrutiny of the Table 4.10 revealed that significant difference was found in the performance of the students in retention test for the experimental group taught through individual instruction and picture book, individual instruction and models, picture book and peer tutoring, charts and peer tutoring, models and peer tutoring respectively. 't' value was found to be significant at 0.05 level. Non-significant difference was found for the students taught through other combinations Viz. individual instruction and charts, individual instruction and peer tutoring, picture book and charts as well as models, charts and models in their retention test performance.

Hence the hypothesis that slow learners performance in retention test for different experimental groups did not differ significantly was partly accepted.

4.11 Teacher's opinion towards different instructional strategies

Table 4.11 revealed the opinion of teachers towards usefulness of different instructional strategies. It is clear from the table that almost all teachers favored using different instructional strategies in teaching science to the students viz picture book with a total score of 424 followed by model (355), charts (345), individual instruction (327) and peer tutoring (303). Among these methods picture book was found to be the most effective instruction as compared to charts and models and peer tutoring was least effective method of instruction.

Further, from the same table it is observed that majority of the teachers opined picture book stands first in ranking as a good instructional strategy followed by model (II), charts (III), individual instruction (IV) and peer tutoring (V) respectively.

Thus, the hypothesis set for the study that teacher's opinion towards the usefulness of different instructional strategies would not significantly improve the rate of learning science was rejected.

SUMMARY

A study on “Instructional strategies to accelerate science learning among slow learners” was undertaken during the academic year 2003-04 with the following objectives.

Firstly to study the prevalence of slow learners in schools, secondly, to develop instructional strategies based on the prescribed syllabus for the science subject, thirdly to know the influence of independent variables (gender, type of family, ordinal position, size of the family, parent’s education, parent’s occupation, and per capita income) on the rate of learning science among slow learners fourthly to study the impact of various instructional strategies in learning science among slow learners, and finally to know the teacher’s opinion towards the usefulness of different instructional strategies.

The prevalence study for low achievers was carried out for students studying in III, IV and V standards selected from ten schools from Government, ten schools from Private and four aided schools of Kannada medium. They were situated within 10 –15 kilometer distance from the Dharwad city. The low achievers from these schools were identified based on teacher’s assessment and academic achievement who scored below 40 per cent marks in the previous year examination. Further, slow learners from these schools were identified by screening methods.

The population for the study comprised of third standard children studying in co-educational Kannada medium primary schools situated in Dharwad taluka of Karnataka State. A preliminary survey was carried out to collect information regarding the total number of primary schools in Dharwad city. The survey revealed that there were 68 primary schools (25 government, 17 aided and 26 private) in Dharwad city. The total population of third standard students studying in all the government, aided and private schools from both Kannada and English medium were 4258 during the academic year 2003-04. It was decided to take schools situated within 10-kilometer distance from the Dharwad city. There were four Government and two Private primary schools within that distance. However, the principal of two schools (one Government and one Private school) gave permission to carryout the research work after getting the written permission from the Block Education Officer. Further, 78 students from government school and 97 students from private school selected for the study. Among these students slow learners were identified by using the following four screening methods

- i. Academic achievement
- ii. Teacher’s assessment
- iii. Intelligence test
- iv. Achievement test

Finally 122 students who fulfilled all the criteria’s of slow learners were selected for the study. They were randomly divided into six groups. Among the six groups, five groups were treated as experimental group and one as control group.

The research was carried out in four phases. In the first phase pretest was carried out for students of all the experimental and control group to assess the science knowledge using the developed questionnaire. In the second phase the students were taught using five instructional strategies namely individualized instruction, picture book, charts, models and peer tutoring. The third standard science syllabus / portion was taught by the investigator to each group for one hour on every alternative day using the respective instructional methods. For the first experimental group individual instruction method was used. Giving individual attention was the main goal of this method of teaching. Students of second experimental group were taught using picture book. Students handled the picture book and closely observed each picture related to the portion. Similarly the students of third experimental group were taught using charts. These charts were displayed on walls. Students could see and observe the charts during the class hours while explaining the portion. The fourth experimental group students were taught the portion with the help of models. All the students personally handled the models by manually touching and seeing and learned the concepts taught. Further, students of fifth experimental group were learnt through peer tutoring. In this

method of teaching the role of the teacher was minimum. The intervention was carried out for a period of four months. Control group students were allowed to sit in the classroom and learn through the conventional method (normal teaching) by the class teacher without using any instructional strategies.

In the third phase after completing the intervention, a posttest was administered for all the students of experimental and control group to assess the impact of various instructional strategies in learning science. In the fourth phase the subject matter retention capacity of the students was assessed among the same students, after a lapse of three months. A developed questionnaire was used as a tool to assess the teacher's opinion towards usefulness of different instructional methods. The scores secured by these groups in the different tests formed the vital data for the analysis. The statistical analysis applied to analyze the data were "t" test, correlation coefficient and chi-square tests.

The salient findings of the study are summarized as follows:

1. Prevalence of low achievers was higher in government schools compared to private and aided schools.
2. Prevalence of low achievers was higher in III standard compared to IV and V standard students.
3. Prevalence of low achievers boys was more compared to low achieving girls.
4. There was no significant difference between the control and experimental groups in science learning before the intervention programme.
5. The slow learners in the experimental groups showed significant improvement than control group in science learning after the intervention programme.
6. Statistically significant difference was found between pretest and posttest scores of both control and experimental group students taught through different instructional strategies.
7. Using different instructional strategies in teaching science was found better than conventional method. Model method was found to be the most effective instructional strategy followed by charts, picture book, individual instruction and peer tutoring.
8. Statistically significant difference was observed between the students in science learning taught through picture book and peer tutoring, individualized instruction and picture book, individualized instruction and model, chart and picture book, model and peer tutoring.
9. Statistically non-significant difference was found between the posttest and retention test mean scores of both experimental and control group students.
10. Statistically significant difference was observed between the students in science learning taught through chart and peer tutoring, model and peer tutoring, individualized instruction and model, individualized instruction and chart, picture book and peer tutoring.
11. No significant influence between the type of family and rate of learning science among slow learners.
12. Boys performed better than girls in science. However, the difference was statistically non significant.
13. Ordinal position and size of the family had positive relation but did not influence the rate of learning among slow learners.
14. Parent's educational and occupational levels positively and significantly influenced the rate of learning science among slow learners.

15. Per capita income of the family had positive and significant influence on the rate of learning science among slow learners.
16. Majority of the teachers had favorable opinion about using different instructional strategies in teaching. According to teacher's opinion, picture book was first best method followed by models, charts, individual instruction and peer tutoring.

Implications and Recommendations

Very often in schools children are not admitted according to their intellectual capacity or aptitude. Regardless of their learning abilities all children are put in the same class and common instruction is provided. Following such procedure of admission there exists number of slow learners in all schools. As observed by the investigator in most of the schools the learning environment is rarely designed for the below average children. The problem is that it is difficult to identify the slow learners in the beginning. Such slow learners are about 20 percent of the student population. This calls for early identification of their learning difficulties and proper instructional provisions for them.

Both parents and teachers expect children to be active, alert and achieve well in academic activities. If children are not up to the expectations, they think that children are not interested and not concentrating in studies, without realizing the actual capacities and abilities of slow learners. So, teacher, parents and guardians have to identify and accept children as slow learners for their own good otherwise these children as well as parents of these children would face serious problems.

It is a well-known fact that all students in a class do not learn at the same rate of speed. But, each child is unique in its abilities, interests and potentialities, which demands individualized attention and instruction to come up to their maximum level. The development of brain and nervous system is relatively high during early years of life; the knowledge children gain during early formative period lays the foundation for the lifelong learning. During early years the instructional strategies used must encourage brain storming, listening, gathering information, observing, experimenting, thinking, analyzing, interacting, manipulating, understanding, modifying and adapting.

Moreover, right from the beginning when formal education starts much emphasis has to be given for difficult subjects like mathematics and science. Even the students who are good at other subjects have to compulsorily study the science subject irrespective of their interest or talent till 10th standard. So, they are to be equipped with sufficient basic science knowledge in the beginning itself in order to enable them to cope with the subject. Hence, innovative teaching methods are needed to maximize and promote interest in science learning. The science teaching should be supplemented with audiovisual aids along with oral instructions to make the subject easy to the students. This sort of enriched programme provides variety and enhances interest to sustain student's attention.

Research results proved that all the instructional strategies used were considerably effective in improving the learning among slow learners. This supports the axiom 'one picture worth a thousand words' and 'seeing is believing'. So, it is necessary to make use of available audiovisual aids like models, picture books and charts in classrooms. Educational department in the state government should make efforts to provide the essential teaching aids / kits for each class or school. The teachers should develop the skills in preparing teaching aids and models by using indigenous low cost materials. Somehow the teachers should create rich learning environment and encourage students active participation in the process of teaching learning programme.

Appointing effective and well-trained teachers is one of the most important duties of the concerned. Teacher's interest, ability of teaching and area of specialization should be considered while selecting teachers. No doubt a skilful teacher with right aptitude for teaching can contribute more in the field of education. Added to it the teacher should know the developmental characteristics and individual differences of children. Also, training colleges should organize in service programmes for teachers interested in understanding remedial work in both primary and secondary schools.

In most of the primary schools surveyed, the researcher observed the high teacher student ratio that ranged between 1:60 to 1: 100. In Indian situation, the strength of students in each section is very high. The education department should think in this line and should increase the number of teachers particularly in primary sections of the school. Another factor noticed by the investigator is that, in private schools the salary paid to the teachers was considerably low. Hence it is felt that salary protection act for teachers should be implemented in private/ aided/ unaided schools.

Another important factor observed was inadequate space and teaching materials in the classroom. As already mentioned the materials and visual aids required for effective teaching should be made available in the education programme during foundational period. Educational guidance centers must be established in each taluka level to guide teachers as well as parents of young children to tackle the special or unique problems of children. The educational guidance centers should work as model units. Educators can create new paths to learning standards by providing more learning options for students.

Suggestions for future study

There is scope for conducting similar studies on the following aspects.

1. Studies must be conducted on factors like school environment, home environment and parental encouragement in school and its influence on science learning.
2. Longitudinal studies are required in the area of learning environment among slow learners.
3. The present study was restricted to III standard students only. This may be extended to the other educational levels in primary schools for all the subjects.
4. Experimental studies can be under taken to assess the effectiveness of peer tutoring, parent tutoring and adult tutoring in rate of learning science and other subjects among slow learners.
5. To assess the impact of different instructional strategies on academic achievement of slow learners in rural, urban and slum areas.

REFERENCE

- AGARWAL, K., 1989, Parents role in educational development. *Asian Journal of Psychology and Education*, **22**(7-8): 38-41.
- ALAM, P. O. AND RATH, K.F., 1998, Artificial neural networks for modeling knowing and learning in science. *Journal of Research in Science Teaching*, **37**(1): 63-80.
- ANNAPURNA, T., 1998, Slow learners : Instructional strategies to accelerate mathematic learning. *Ph. D. Thesis, University of Agricultural Sciences, Dharwad.*
- ARAS,S.M. E.AND ARAS SAKTHI, 1990, *Kinder Science*. Mahesh Arts Publishers, Sivakasi, Pune, pp. 4-8.
- ANDERSON, P. F., 2000, Computers in a developmentally appropriate curriculum. *Young Children*,**55**(2):90-93
- ARNOLD, D. H., LONIGAN, C. J., WHITEHURST, G. J. AND EPSTEIN, J. N., 1994, Accelerating language development through picture book reading – replication and extension to a video tape training format. *Journal of Educational Psychology*, **86**(2): 235-243.
- AULIFFE, P. M. AND DEMBO, M. L.,1994, Families engagement with young children's science and technology learning at home. *Science Education*, **85**(4): 454-481.
- AUSUBEL DAVID, 1978, *School Learning: An introduction to Educational Psychology*. New York, Holt.
- BAKER, J. A., 1999, Teacher student interaction in urban at risk classrooms: Differential behaviour, relationship quality and student satisfaction with school. *Psychological Abstracts*, **86**(11):415-421.

- BEWICK, L AND KOSTELINK,D.S.,2004, Educating primary school teachers about computers. *Young Children*,**59**(3):35-42
- BHADWAL,C.S. AND SOOD, M. C., 1991, Use of teaching skills and the achievement of rural underachievers at primary stage in arithmetic. *Journal of Educational Research and Extension*, **27**(3):155-168.
- BHARATHIDEVI, 1982, Certain psychological factors of adjustment influencing achievement among school children. *Indian Journal of Psychology*, **57**: 141-153.
- BHARGAVA, S., GARD, D.P., SINGHI. S., SINGHI, P. AND LALL K. B., 1998, Prevalence of behaviour problems among low and high achievers in Lokhanda District. *Indian Journal of Pediatrics*, **55**: 408-415.
- BHATNAGAR, J. K. AND SHARMA, M., 1992, A study of the relationship between parental education and academic achievement in a semi-rural setting. *Psychological Studies*, **37**(2& 3): 126-129.
- BHUDEN, P. V., 1999, Impact of mastery learning strategy (MIS) on secondary school students attitude towards science and their self concept. *Journal of Educational Research and Extension*, **28**(2): 91-98
- BRUNER, J. S., 1965, *A Study of Thinking*. Science Editions, London.
- BUDHEV, P. V., 1999, Academic achievement among children of working and non-working mothers of Sourashtra region. *Journal of Educational Psychology*, **32**(4): 25-28.

- BURT, S. C., 1966, *The Causes and Treatment of Backwardness*. 5th Edition, University of London, V. L. P. Press Ltd., London, pp. 382-384.
- CALOMAN, G., 1979, *Interaction of Media, Cognition and Learning*. San Francisco, Jossey, Boss.
- CHADHA, M.P., 1998, *Primary Science in Indian education*. Vikas Publication, New Delhi, pp. 88-132.
- CHAEFER, F. S. AND ARONSON, M., 1972, Infant education research project : implementation and implications of the home tutoring programme. In: R. K. Parker (Ed.), *The Preschool in Action*, Boston, Allyn and Bacon, pp. 410-436.
- CHATTERJEA, R. G. AND PAUL, B., 1984, A study of field independence in relation to science achievement, Urban rural habitat and intelligence. *Indian Journal of Psychology*, **59**(3-4) : 1-13.
- CHAUDHARI, U. S., VAIDYA, S., NAVALKHA, N. G. AND MAHAPATRA, B. C., 1998, Effect of teaching strategic and socio-economic status on self concept of the learner. *Indian Psychological Review*, **50**(4): 216-223.
- CHERIAN, V. I. AND CHERIAN, L., 1995, Relationship between parental occupation and academic achievement of Xhora children from polygamous and monogamous families. *The Journal of Family Welfare*, **42**(3): 50-52.
- CHERIAN, V. I., 1990, Family size and academic achievement of children. *Journal of Family Welfare*, **36**: 56-59.
- CHINTAMANIKAR, 1992, *Exceptional Children : their Psychology and Education*. Sterling Publishers Private Ltd., New Delhi, pp. 65-78.

- CHITRADEVI, A., 2000, *Science*. Sura Books Ltd., Chennai, pp. 3-9.
- CHOWDHARY, S. AND GHOSH, S.K., 1996, A study on creative ability and its impact on achievement in science. *Indian Psychological Review*, **47**: (Spl. Issue): 241-246.
- CLOVER, M. E., 1972, Study of the feasibility of computer assisted pupil progress reporting in 4th grade. *Dissertation Abstract International*, **33**(4): 1312.
- COLE, K. N., DELE, P. S., MILLS, P. E. AND JENKINS, J. R., 1993, Interaction between early intervention curricula and student characteristics. *Exceptional Children*, **60**(1): 17-28.
- CORNELL, K. H. AND FRENCH, L. M., 1992, Science in the preschool classroom. *Teaching and Learning About Science*, pp. 49-58.
- DALE, P., 1979, Self ideal discrepancy among peers and school achievement. *Psychological Studies*, **65**: 64-66.
- DASH, M. AND DASH DEENA, 2003, *Fundamentals of Educational Psychology*. Atlantic Publishers and Distributors, New Delhi, pp. 213-239.
- DEVARIES, R. AND ZAN, B., 1995, Creating a constructivist classroom atmosphere. *Young Children*, **51**(1):4-13
- DUTTA SUNIL, 1988, Relationship of creativity with achievement in science and socio economic status of X grade students. *Journal of Educational Research and Extension*, **25**(2): 106-111.
- DAVID, F., LARNINE, D. AND MARGARIDA, F., 1976, Improvement in science performance as consequence of self assessment in Portuguese primary school pupils. *British Journal of Educational Psychology*, **64**: 407-417.

- DELOACHE, J. S. AND DEMEANDOZA, A. P, 1987, Joint picture book interactions of mothers of 7 years old children. *British Journal of Development Psychology*, **5**: 111-123.
- DELOACHE, V. AND DEMENDOZA, L., 1987, Identification of under achievers in academic performance. *Educational Studies*, **27**(2): 187-200.
- DELQUADRI, J., GREENWOOD, C.R., WHORTON, D., CARTA, J. AND HALL, P. V., 1986, Class wide peer tutoring. *Exceptional Children*, **52**: 535- 542.
- DENTON, A. N., 2002, Effect of teaching strategies and achievement of under achievers at primary stage. [www.aoa / BOHDLEARN](http://www.aoa.org/BOHDLEARN)
- DILL, E. M. AND BOYKIN, A. W. AND RATH, M., 2000, The comparative influence of individual peer tutoring and communal learning contexts on the text recall of African. *American Journal of Educational Psychology*, **41**(4): 113-135.
- DURE, P. S. AND THORESON, L. C., 1992, Do early talkers become early readers linguistic precocity. *Preschool Language Emergent Literacy*, **28**: 421-429.
- DUTTA, S., 1998, Study on relationship of creativity with achievement in science and socio-economic status of X grade students. *Journal of Educational Research Extension*, **25**(2): 106-111.
- EPSTEIN, A. J., 1994, Effective schools and accomplished teachers: Lessons about primary grade reaction in schools. *Elementary School Journal*, **101**(2): 121-165.

- ERIKSON, G. L. AND ERIKSON, L. J. AND JOHNSON, 1994, Females and science achievement, evidence, explanations and implications. *Science Education*, **68**: 63-69.
- FANTUZ ZO, J. W., DAVIS, G. Y. AND GINBURG, M. D., 1995, Effects of parent involvement in isolation or in combination with peer tutoring on student self concept. *Journal of Educational Psychology*, **87**(2):272-281.
- FEAGANS, L. AND KINNEY, J. D., 1981, The pattern of exceptionality across domains in learning disabled children. *Journal of Applied Developmental Psychology*, **1**: 313-328.
- FISHER, R.A., 1959, *Statistical Methods and Scientific Inference*. 1st Edition, Oliver and Boyd, Edinburgh.
- GAGNE, R. M., 1970, *The Conditions of Learning*. 3rd Edition, Hold, Rinchart and Winston Publications, New York, pp. 18-48.
- GAGNE, R. M. AND BRIGGS, L. J., 1974, *Principles of Instructional Design*. Richart and Wintston, Holt, New York.
- GOANKAR, V. AND PATIL, P., 2003, *Charter for the Welfare of Slow Learner*. Impressions Publications, Belgaum, pp.8-17.
- GOANKAR, V. AND PATIL, P., 2005, *Helping Young Children Grow*. Impressions Publications, Belgaum, pp.20-37.
- GEETA, S. AND SRIVASTAVAS, K. N., 1983, Teaching and lasting about science. *Young Children*, **48**(6): 10-11.
- GEORGE WILL, J.W., 1987, Nigerian parental influence on the academic performance of children. *Children Deyti*, **58**(5): 1244-1257.

- GERBER, F. R. AND KACIFFMAN, M., 1981, Effect of classroom climate, peers leadership behaviour and students scholastic achievement. *Psycholinguia*, **28**(1): 66-69.
- GHADEKAR, R. AND PATWARDHAN, A., 1994, Effect of selected variables on the effectiveness of teaching aid oriented technique. *Maharashtra Journal of Extension Education*, **13**: 9-12.
- GHETIYA, S.M., 2000, A study of effectiveness of sex and methods of teaching on academic achievement for science teaching. *Indian Psychological Review*, **54**(1-2): 40-42.
- GHOSH, S., 1994, A study on training strategies of Jurisprudential enquiry model of teaching. *Journal of Educational Psychology*, **42**(3 -4): 30-39.
- GILL, J. K. AND SINDHU, M. S., 1988, Intelligence and academic achievement in the children belonging to different socio-economic groups in rural Punjab. *Indian Psychological Review*, **33**(4): 50-54.
- GOEL, S. P., 2003, Effect of gender and home environment on educational aspirations. *Journal of Community Guidance and Research*, **21**(10): 77-81.
- GREENBERG, F. R., 1972, Achievement gains in a first aid courses taught by individualized and conventional group methods. *Dissertation Abstracts International*, **33**(4): 1319.
- GREWAL, A., 1985, An interactional study of cognitive and socio economic correlates of school achievement. *Journal of Psychological Research*, **29**(1): 41-45.
- HAGGERTY, S. 2000, Gender and science achievement: A case study. *International Journal of Science Education*, **9**(3): 271-279.

- HAUGLAND, S., 1999, What role should models play in young children's learning. *Young Children*, **54**(6):26-31
- HEMAKUMARI, T. A., 1997, Role of mother and educational achievement of the child. *Education Quarterly*, **29**(3): 16-21.
- HOISINGTON, C., 2002, Using photographs to support children's science inquiry. *Young Children*, **57**(5):26-32
- HOLLAND, M., 2005, Using picture books to help children cope with a family. *Young Children*, **60** (3),105-107.
- JAGANNADHAN, K., 1986, Socio-economic status and academic achievement. *Journal of Educational Research and Extension*, **22**(3): 141-149.
- JANAKAVALLI, C. AND GOPALKRISHNAN, S., 1998, Impact of multimedia approach in teaching environmental education at the secondary level. *Journal of Educational Research and Extension*, **35**(4): 22-27.
- JANICKI, M. M., 2002, Gender and science learning in high schools : subject matter and laboratory experience by students. *American Educational Research Journal*, **34**: 297-331.
- JEAN BAKER, 1999, Teacher student interaction in urban at risk classrooms : Different behaviour, relationship quality and student satisfaction with school. *Elementary School Journal*, **100**: 57-70.
- JENSON, A. R., 1980, *Bias in Mental Testing*. Methuen and Co. Ltd., London.
- JEYAMANI, P. AND CHANDRAMANI, M., 1992, Effectiveness of stimulation model of teaching through computer assisted instruction. *Research Highlights. JADU*, **2**: 232-236.

- JOHNSON, O.,1993, *Education for the Slow Learners*. Prentice-Hall Inc., London.
- JONES, M. G., HOWE AND MELISSA, R., 2000, Gender differences in students experiences, interests and attitudes towards science and scientists. *Science and Education*, **84**(2): 180-192.
- JOSHI, B. N. AND VASTAVA, M. N., 1995, Higher mental abilities in science through different instructional strategies. *Journal of Educational Research Extension*, **28**(1): 23-33.
- JOVANOIC JASNA AND STEINBACH, S., 1998, Boys and girls in the performance based science classroom who's doing the performing. *American Educational Research Journal*, **35**(30): 477-496.
- KALYANI, K.S. AND RADHAKRISHAN, O.R., 2002, Impact of classroom learning environment on the intelligence of Ashram school (tribal) children. *Indian Psychology Research*, **58**(3): 130-136.
- KAUR, R. AND GILL, T. K., 1993, Sex differences in academic achievement in different subjects of rural and urban students. *Indian Psychological Review*, **40**(1-2): 20-24.
- KEEL, M. C.AND GAST, P. L., 1992, Small group instruction.
- KERCKHOFF, A. C. AND JUDITH, L. H., 1974, Parental influence on educational goals. *Journal of Sociometry*, **37**: 307.
- KHAN, A. AND JERNBERU, S. M., 2002, Influence of family socio economic status on educational and occupational aspirations of high and low achieving adolescents. *Journal of Community Guidance and Research*, **19**(1): 113-118.

- KING, A., 2001, Effects of training in strategic questioning on children's problem solving performance. *Journal of Educational Psychology*, **83**(4): 8307-810.
- KIRK, S. A. AND EIKINS, J., 1975, Characteristics of children enrolled in child service demonstration centers. *Journal of Learning Disabilities*, **8**: 630-637.
- KIRK, S. A., 1970, *Educating Exceptional Children*. Oxford and IBH Publishing Co., New Delhi, pp. 85-86.
- KRISHNAN, A. D., 1977, Non intellectual factors and their influence on academic achievement. *Psychological Studies*, **22**: 1-7.
- LARSEN, D. B. AND EHLI, G. U., 1980, The relationship among variety of instruction. *Student Achievement Dissertation Abstract International*, **37**(4): 2120-A.
- LAURA, J., 2002, Teaching and learning about science. *Young Children*, **28**: 11.
- LAUR, R. AND GILL, T. K., 1993, Sex differences in academic achievement in different subjects of rural and urban students. *Indian Psychological Journal*, **40**(1-2): 20-24.
- LAYTON, M. G., 1987, *Innovations in Science and Technology*. Pramod Publications, New Delhi, pp.42-48.
- LEEPER, D. AND SKIPPER, W., 1974, *Good Schools for Young Children*. Macmillan Publishing Company, New York, pp.12-22.
- LIDHO, M. L. AND KHAN, M. A., 1990, Bright under achievers among the socially backward counseling and medical measures. *Indian Journal of Clinical Psychology*, **17**: 33-36.

- LOKANADHA REDDY, SHARMA, M. AND JANAK KUMAR, 1997, Effectiveness of remedial package in learning spoken English by low achiever at the secondary level. *Perspectives in Education*, **13**(1): 43-52.
- MADISON, J. P., 1991, The slow learner: A winner at last?. *Elementary English*, **48**(7): 896-901.
- MAHEADY, L., KOTHERINE SACCA, M. AND HARPER, G. F., 1998, Classwide peer tutoring with middle handicapped high school students. *Exceptional Children*, **55**(1): 52-59.
- MARRISON, T., 1999, Classroom structure, work involvement and social climate in elementary school classrooms. *Psychological Abstracts*, **86**(1): 471-477.
- MATHUR, S. S. AND HUNDAL, B. S., 1972, School achievement and intelligence in relation to some socio-economic background factors. *Journal of Educational Psychology*, **30**(1): 42-48.
- MEHRA, V., MISHRA, M. AND KHARE, S. B., 2002, Effect of teaching strategies on study habits and attitude towards educational technology of B.Ed. students. *Indian Psychological Review*, **58**(3): 119-129.
- MELLAD VICENTE, 1998, The class room practice of pre service teachers and their conceptions of teaching and learning science. *Science Education*, **82**(2): 197-214.
- MICHAEL, R., 2000, Artificial neural networks for miscalling knowing is learning in science. *Journal of Research in Science Teaching*, **37**(1): 63-80.

- MINER, B., 1998, Sociological background variables affecting school achievement. *Journal of Education Research*, **62**(8): 373-379.
- MISHRA, M., 2002, Perception of classroom environment of middle school children. *Indian Psychological Review*, **58**(2): 79-84
- MOHANASUNDARAM AND DHARMASEKAR, 2001, The effectiveness of remedial teaching in improving the map drawing ability of standard X students in social science. *Indian Psychology Research*, **56**(1): 12-17.
- MOHAPATRA, M. AND MISHRA, L., 2000, Gender effect on achievement in science with a special reference to mechanics from primary to secondary school years – A study under Indian conditions. *Journal of Educational Research and Extension*, **37**(3): 1-7.
- MONTESSORI, M., 1973, *The Absorbent Mind*. Kalkshethra Publications, Thiruvan Minyur, Madras, India, pp. 165-169.
- MONTESSORI, M., 1965, *Montessori Own Hand Book*, New York.
- MUNROE, H. R. AND MUNROE, L. R., 1984, Birth order and intellectual performance in three east African societies. *Journal of Social Psychology*, **23**: 123-128.
- NAIR, A. S., 1978, An experimental study of the overlap of intelligence and science aptitude with educational outcome in biology measured using Host's Taxonomy, Department of Education, University of Kerala, Kerala.
- NARAYANI, S. S., 1993, Effective use of teaching aid in class room environment. www.rediff.com
- NAYAK, A. K. AND RAO, V. K., 2004, *Educational Psychology*. APH Publishing Corporation, New Delhi, pp. 48-60.

- OWING, M. C., STANLEY, K. F., STIFFAN, G. F., ARNOLD, M. M., 2002,
[Http://www. Goa/BODHLEARN](http://www.Goa/BODHLEARN)
- PANCHALINGAPPA, S. N., 1994, An investigation in to the causes of
under achievement in secondary school mathematics and science.
Ph. D. Thesis, Karnatak University, Dharwad.
- PANDEY, K. P., 1998, *Advanced Educational Psychology*. Rashtravani
Printers, New Delhi, pp. 220-232.
- PANDEY, L. N., GUTA, V. P. AND GUPTA, S. K., 2000, Efficiency on
remedial teaching strategies for development of competencies in
EUS in children studying at NFE centres in Rewa district at
Madhya Pradesh. *The Progress of Education*, **74**: 170-173.
- PASSI, W. C., 1992, Training strategies for attaining training transfer of
problem solving skills : A cognitive load approach. *Journal of
Educational Psychology*, **84**: 429-433.
- PATHAK, A.N. AND VERMA, 1995, Adjustment pattern of high and low
creative tribal. *Indian Psychology Research*, **35**(1-2): 11-14.
- PECAUT, L. S., 1991, Why can't Johnny learn ?. *Principal*, **70**(4): 29-30.
- PENDERS, J. M. A., 1986, Methods and programme planning in rural
extension. *International Agricultural Study Centre, Wageningn*.
- PETERSON, P.L. AND JANICKI, J.C., 1999, Individual characteristics and
children's learning in large group and small group approaches.
Journal of Educational Psychology, **71**(5): 677-687.
- PHILIP, B. AND MARCIA, L., 2002, Beliefs about science. How does
science intervention contribute ?. Replication and extension to a
videotape training format. *Journal of Educational Psychology*,
86(2): 235-243.

- PIAGET, J., 1978, *Success and Understanding*. Cambridge, H.U. Publications, London.
- PIAGET, J. AND INHELDER, B., 1969, *The Psychology of the Child*. Basic Books, New York.
- PILLAI, K.S., 1990, Interactive effect of science aptitude and attitude towards science on Biology achievement. *Journal of educational Research and Extension*, **26**(4): 206-211.
- PONNUSAMY, P. AND NATARAJAN, S., 2002, Utilization of various instructional materials by primary school teaches. A study in Coimbatore district. *Journal of Educational Research and Extension*, **39**(3): 32-35.
- POONAM AND BALDA, 2001, Effect of familial factors on children's intelligence. *Indian Psychological Review*, **56**(1): 8-11.
- PRASAD, J., 2004, Practical aspects in teaching of science. *Kanishka Publishers Distributors*, New Delhi-2, pp. 126-133.
- RAJAN, P. A., 1996, Comparative study of the three models of presenting analogies in chemistry. *Indian Psychological Review*, **42**(11-12): 7-18.
- RAMAR, R., 1994, Effectiveness of multimedia based modular approach with special reference to low achievers. *Unpublished M. Phil. Thesis*, Alagappa University, Karaikudi.
- RANDHAWA, B. S. AND MICHAYLUX, O. J., 1975, Learning environment in rural and urban classrooms. *American Educational Research Journal*, **12**(3): 265-285.
- RAO, G. D., 1970, A study of some factors related to scholastic achievement. *Indian Journal of Psychology*, **45**(2): 99-120.

- RATHORE, J., 2000, A study of the scholastic achievement of children studying at primary level in environment studies (science) with special reference to MLL and Development of remedial teaching strategies. *Journal of Educational research and Extension*, **34(4)**: 9-13.
- RAVEN, 1988, Standard manual coloured progressive metrics. pp. 1-14.
- RAWAT, 1977, Construction and standardization of diagnostic test in chemistry. *Second Survey of Research in Education*, pp 740 -748.
- REDDY, G. L. AND RAMAR, R., 1995, Effectiveness of multimedia based modular approach in teaching Mathematics and Science to low achievers. *U.G.C. Journal of Education*, **18(2)**: 148-150.
- REDDY, G. L. AND RAMAR, R., 1996, Effectiveness of multimedia based modular approach in teaching English to slow learners. *Journal of Educational Research and Extension*, pp. 106-112.
- REDDY, G. L. AND RAMAR, R., 2003, *Slow Learners Their Psychology and Instruction*. Discovery Publishing House, New Delhi, India.
- RICE, DIANA, C., RYAN, J. AND SARA, M., 1998, Using maps to assess student learning in the science classroom. *Journal of Research in Science Teaching*, **35(10)**: 1103- 1127.
- RIEBER LYOD, 1991, Using computer animated graphics in science and instruction with children. *Indian Psychological Review*, **82(1)**: 135-140.
- RUGU MAYO, E.B., 2004, Science education and needs of developing countries. [Http://www. Goa/BODHLEARN](http://www.Goa/BODHLEARN)
- RUMBERGER, R., 1998, High school dropouts: A review of issues and evidence. *Review of Educational Research*, **57(2)**, 101-121.

- SAINI, B.K., 1977, Academic achievement as a function of economic status and educational standard of parents. *Psychological Studies*, **22**(2): 24-26.
- SARITADEVI, SAIRO, B. K., MAYURI, K. AND PURUSHOTHAMAN, S., 2003, Effectiveness of different instructional methods with special reference to under achievers. *Media and Technology for Human Resource Development*, **5**(3): 206-214.
- SALOMAN, G., 1979, *Interaction of Media, Cognition and Learning*. Boss Publication, San Francisco.
- SAMANTH, R. K., AND PANDEY, R. C., 2001, Manual on instructional aids for teaching excellence. Mittal Publications, New Delhi, pp. 4, 17-19.
- SANGAWAN, S. AND RANA, P., 2000, Assessment of science and achievement of slow and average learner children. *Indian Psychological Review*, **54**(3): 139-146.
- SARMA, M.K., 1984, Academic achievement of school students vis-a-vis their parents education. *Indian Journal of Psychology*, **59**(1-2): 33-40.
- SATHYANARAYANA MURTHY AND GOPALKRISHNA, 1989, Study on scientific attitude and attitude towards science of X class students. *Journal of Educational Research and Extension*, **26**(1): 58-63.
- SATYANARAYANA MURTHY AND GOPALKRISHNA, 1989, Study on scientific attitudes and attitude science x-class students. *Journal of Educational Research and Extension*, **26**(1): 58-63.

- SAVGE, J. P. AND HOONEY, J.F., 1979, *Teaching thro' different methods to children with special needs*, Publisher Boston : Allyn Bacon, pp. 207-241.
- SAVAGE, M AND HOLCOMB, D., 1999, Children, photography and challenging projects. *Young Children*, **54**(2): 26-29.
- SCHAEFER AND ARONSON, 1977, *Early Intervention and its Advantages*. Pointer Publisher, Jaipur, p. 43-58.
- SCHONELL, F. J., 1966, *Backwardness in the Basic Subjects*. Oliver and Boyd., London Publications, London.
- SHAN, M. A. AND KULSHRESHTA, A., 1997, A study of caste differences in the methods of discipline, child rearing practices and management. *Indian Psychological Review*, **15**(2): 5-9.
- SHANMUKAPPA, G., 1978, An investigation in to the causes of under achievement of high school students. *M. Phil. Dissertation Thesis*, Karnatak University, Dharwad.
- SINDELAR, 1991, Impact of guided learning on the cognitive performance of low and high achievers. *Psychological Studies*, **46**(1-2): 14-20.
- SINGH, S. AND SAXENA, R. A., 1987, Achievement difference and school effects. *Indian Educational Review*, **30**(1): 20-24.
- SINGH, V. P., 2004, *Problems of Educational Backwardness*. Sarup and Sons, New Delhi, pp. 227-250.
- SINGHAL, M. P., 1983, A study of relationship between anxiety, academic achievement with familial factors. *Journal of Psychological Studies*, **36**: 350-355.

- SINGHAL, A. B., 1983, A study on relationship between parents educational levels academic achievement of primary school children. *Journal of Research in Science and Teaching*, **48**(2): 1048.
- SIROMANI, S., 2002, *Science Ahead* (Primary 2 and 3). Orient Logman Private Limited, New Delhi, pp. 32-44.
- SLAVIN, R.E., MADDEN, N.A. AND LEAVY, M., 1984, Effect of term assisted individualization on the science achievement of academically handicapped and non handicapped students. *Journal of Educational Psychology*, **76**(5): 813-819.
- SMALL, Y. M., LOVETT, S. B. AND SCHER, M.S ., 1993, Pictures facilities children recall of unillustrated. Expository Proc. *Journal of Educational Psychology*, **83**(3): 520-528.
- SONTAKEY, V. V., 1998, Personality factors of high achievers and low achievers in biological sciences. *Journal of Educational Research Extension*, **25**(1): 50-55.
- SOUDAR RAJ, T. R. AND RAJ GURU, S., 1995, Effectiveness of video assisted instruction in the achievement of slow learners. *Journal of Educational Research and Extension*, **32**(1): 106-112.
- SRIVASTAVA, A., 1978, On bringing up weak and slow learning children. Learning Laboratory Publishers, New Delhi, pp. 43-52.
- SUNDAR RAJ AND KRISHNAN, 1980, Academic performance in relation to select personality and familiar factors. *Journal of Educational Research and Extension*, **25**(4): 198-208.
- SWATANTRA DEVI, 1996, Video assisted instruction is more effective than conventional method in teaching chemistry. *Journal of Educational Psychology*, **22**(2): 44-46.

- TELLI, S., RAKIKI, N. AND CAKIROGLU, J., 2002, Learning environment and students attitude towards biology. www.google.com
- TERESA, P. AND MICHAL, P., 2002, Motivation to learn science; differences related to gender, type and ability. *Journal of Educational Research*, **93**(4): 245-254.
- TERMAN, L.M. AND MERRIL, M.A., 1960, Stanford Binet Intelligence scale .
- THOMPSON, J.W. AND CUNNINGHAM, J.C., 2000, An evaluation of the general aptitude test among school children. *Unpublished Masters Thesis*, University of Florida.
- THOMAS, L. AND MARRISON, L., 1999, Classroom structure, work involvement and social climate in elementary school classrooms. *Psychological Abstracts*, **86**(1): 471-477.
- TORRANCE, C.J., 1979, Individual characteristics and children's learning in large group and small group approaches. *Journal of Educational Psychology*, **71**(5): 677-687.
- VEENA, S. P., 1994, Family factors affecting the scholastic achievement of school age children. *M. H. Sc. Thesis*, University of Agricultural Sciences, Dharwad.
- VENKATA RAMAIAH, P., 1983, Development of socio economic status scale for farm families of North Karnataka *Ph. D thesis*, department of agricultural Extension Education, University of Agricultural Sciences, Bangalore, College of Agriculture, Dharwad.
- VERMA, B. P. AND GUPTA, C. K., 1990, Effect of home environment on cognitive abilities of children. *Indian Psychological Review*, **35**: 1-7.

VERMA, B.P., PATEER, S.C AND QADIR, S.G., 1993, Students approaches to studying. An investigation in to the influence of genders academic courses. *Indian Psychology Research*, **40** (9-10): 14-22.

VIJAY PRATAP SINGH, 2004, Problems of educational backwardness. Sarup and Sons, New Delhi, pp. 227-231.

VIJAYLAXMI, O. AND NATESAN, H., 1992, Factors influencing academic achievement. *Research Highlights*, **2**: 62.

WANGOO, MAHMOOD AND KHAN, S., 1991, Socio economic status and academic achievement. A comparative study of government and private school students. *Indian Psychology Research*, **36**(1-2):1-10.

WILSON, G., 2000, The effects of birth, sex of cognitive abilities on he assessment of special methods. *Educational Psychology*, **20**(2): 153-166.

ZIMMERMAN, B. J. AND BLOLNER, R., 1979, Effects of model persistence and success on childrens problems solving. *Journal of Educational Psychology*, **71**(4): 508-513.

APPENDIX - I

GENERAL INFORMATION

Name of the school :

Name of the respondent :

Gender : M / F

Age :

Class :

Ordinal position : F / M / L

Caste :

Type of family : Nuclear / Joint

Family composition :

Sl. No.	Name of the family members	Relation with the respondent	Age	Gender	Education	Occupation	Income (Rs)
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							

Any other source of income other than salary.

If yes, Income per month Rs.-----.

APPENDIX - II

ವಿದ್ಯಾರ್ಥಿಯ ಹೆಸರು :

ಶಾಲೆ ಹೆಸರು :

.....

ಪ್ರಶ್ನೆ-1 : ಜಿಜ್ಞಾಸುಗಳ ತುಂಬಿ.

1. ಬೇಯಿಸಿದ ಎರಡು ಆಹಾರ ವಸ್ತುಗಳು -----, -----
2. ಹಸಿಯಾಗಿ ತಿನ್ನುವ ಎರಡು ತರಕಾರಿಗಳು -----, -----
3. ಒಂದೇ ಕಾಲಿನಿಂದ ಆಡುವ ಆಟ -----
4. ಭೂಮಿಯನ್ನು ಊಳಲು ----- ಪ್ರಾಣಿ ಸಹಾಯಕ
5. ಅಗಸನ ಬಟ್ಟೆ ಹೊರಲು ----- ಪ್ರಾಣಿ ಸಹಾಯಕ
6. ಕುದುರೆಯ ಆಹಾರ -----, -----
7. ಎರಡು ಕೀಟಗಳ ಹೆಸರು -----, -----

ಪ್ರಶ್ನೆ-2 : ಈ ಕೆಳಗಿನ ಹೇಳಿಕೆಗಳನ್ನು 'ಸರಿ' (\sqrt) ಅಥವಾ 'ತಪ್ಪು' (X) ಎಂದು ಗುರುತಿಸಿ.

1. ಸಸ್ಯಗಳು ಗಾಳಿ ಇಲ್ಲದೇ ಬದುಕುವುದಿಲ್ಲ. ()
2. ಉಸಿರಾಡಲು ನೀರು ಬೇಕು. ()
3. ಕೆರೆಯ ನೀರು ಶುದ್ಧವಾಗಿರುತ್ತದೆ. ()
4. ಬರೆಯುವ ಕಾಗದವನ್ನು ಮುದುಡಬಾರದು. ()
5. ಗಾಜಿನ ಸಾಮಾನನ್ನು ಗಟ್ಟಿಯಾಗಿ ಹಿಡಿಯಬೇಕು. ()

ಪ್ರಶ್ನೆ-3 : ಹೊಂದಿಸಿ ಬರೆಯಿರಿ.

<u>ಅ</u>		<u>ಬ</u>
1. ಪಕ್ಷಿ	ಬೇಸಿಗೆ ಕಾಲ	()
2. ಮೀನು	ಸ್ಟೇಟರ್	()
3. ಹೆಚ್ಚು ಸೆಕೆ	ನೀರು	()
4. ಹಾವು	ಗೂಡು	()
5. ಚಳಿಗಾಲ	ಹುತ್ತ	()

ಪ್ರಶ್ನೆ-4 : ಪ್ರಶ್ನೆಗಳಿಗೆ ಉತ್ತರ ಬರೆಯಿರಿ.

1. ನಮಗೆ ಗಾಳಿ ಏಕೆ ಬೇಕು?

2. ಆರೋಗ್ಯವಾಗಿರಲು ಎಂತಹ ನೀರು ಕುಡಿಯಬೇಕು?
3. ಶಾಲೆಯಿಂದ ಬಂದ ಕೂಡಲೇ ಕೈಕಾಲು ತೊಳೆಯಬೇಕು. ಏಕೆ?
4. ನಮಗೆ ಶಕ್ತಿ ಏಕೆ ಬೇಕು?
5. ಸಸ್ಯಗಳಿಂದ ನಮಗೆ ಏನು ಪ್ರಯೋಜನ?
6. ಗೂಬೆ ಎಲ್ಲಿ ವಾಸಿಸುತ್ತದೆ?
7. ಪ್ರತಿ ದಿನ ಹಲ್ಲು ಉಜ್ಜಬೇಕು ಏಕೆ?
8. ಎರಡು ದೊಡ್ಡ ಗಾತ್ರದ ಪ್ರಾಣಿಗಳನ್ನು ಹೆಸರಿಸಿರಿ.
9. ಕೈಗಳ ಸಹಾಯದಿಂದ ಮಾಡುವ ಎರಡು ಕೆಲಸಗಳನ್ನು ಹೆಸರಿಸಿರಿ.
10. ಕಾಲುಗಳ ಸಹಾಯದಿಂದ ಮಾಡುವ ಎರಡು ಕೆಲಸಗಳನ್ನು ಹೆಸರಿಸಿರಿ.

APPENDIX - III

ವಿದ್ಯಾರ್ಥಿಯ ಹೆಸರು :

ಶಾಲೆ ಹೆಸರು :

ಪ್ರಶ್ನೆ-1 : ಬಿಟ್ಟ ಸ್ಥಳ ತುಂಬಿರಿ.

1. ಎರಡು ಸಜೀವ ವಸ್ತುಗಳು -----, -----
2. ಎರಡು ನಿರ್ಜೀವ ವಸ್ತುಗಳು -----, -----
3. ಎರಡು ಮೃದು ಕಾಂಡದ ಸಸ್ಯಗಳು -----, -----
4. ಐದು ದಳಗಳಿರುವ ಹೂವು -----, -----
5. ಗಟ್ಟಿಯಾದ ಕಾಂಡವಿರುವ ಸಸ್ಯ -----, -----
6. ದೊಡ್ಡ ಗಾತ್ರದ ಪ್ರಾಣಿಗಳು -----, -----
7. ಚಿಕ್ಕ ಗಾತ್ರದ ಪ್ರಾಣಿಗಳು -----, -----
8. ಮಳೆಗಾಲದಲ್ಲಿ ಎಲೆಯ ಬಣ್ಣ ----- ಆಗಿರುತ್ತದೆ.
9. ----- ಹಲ್ಲುಗಳು ಆಹಾರವನ್ನು ಅರೆಯುತ್ತವೆ.
10. ಜೀವಿಗಳು ಹುಟ್ಟುತ್ತವೆ ಹಾಗೂ -----
11. ಮಕ್ಕಳಲ್ಲಿ ಮೊದಲು ಹುಟ್ಟುವ ಹಲ್ಲುಗಳು -----
12. ಬಾಯಿಯ ಮುಂಭಾಗದಲ್ಲಿರುವ ಹಲ್ಲುಗಳು -----
13. ಮರಿ ಹಾಕುವ ಪ್ರಾಣಿಗಳು -----

ಪ್ರಶ್ನೆ-2 : ಇವುಗಳಿಗೆ ಒಂದೊಂದು ಉದಾಹರಣೆ ಬರೆಯಿರಿ.

1. ಪೊದರು --
2. ಹೂ ಬಿಡುವ ಗಿಡ --
3. ರೆಕ್ಕೆಗಳಿಲ್ಲದ ಕೀಟ --
4. ಆರು ಕಾಲಿನ ಕೀಟ --
5. ಜಲವಾಸಿ ಪ್ರಾಣಿ --
6. ಶಕ್ತಿ ಕೊಡುವ ಆಹಾರ --
7. ಜೀವಸತ್ವ 'ಅ' ಇರುವ ಆಹಾರ --
8. ಹಸಿಯಾಗಿ ತಿನ್ನುವ ಆಹಾರ --
9. ಚಿಕ್ಕ ಗಾತ್ರದ ಪ್ರಾಣಿ --
10. ದೊಡ್ಡ ಗಾತ್ರದ ಪ್ರಾಣಿ --

ಪ್ರಶ್ನೆ-3 : ಪ್ರಶ್ನೆಗಳಿಗೆ ಉತ್ತರ ಬರೆಯಿರಿ.

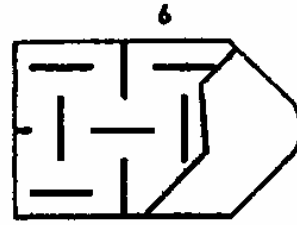
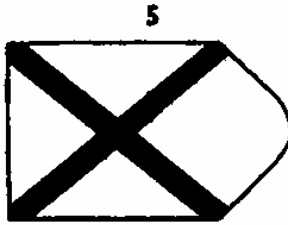
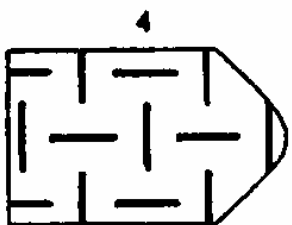
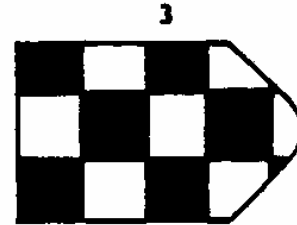
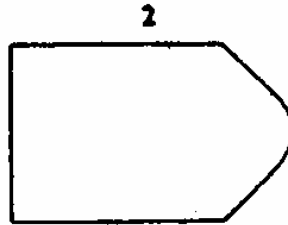
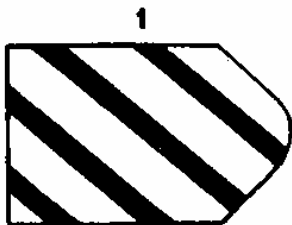
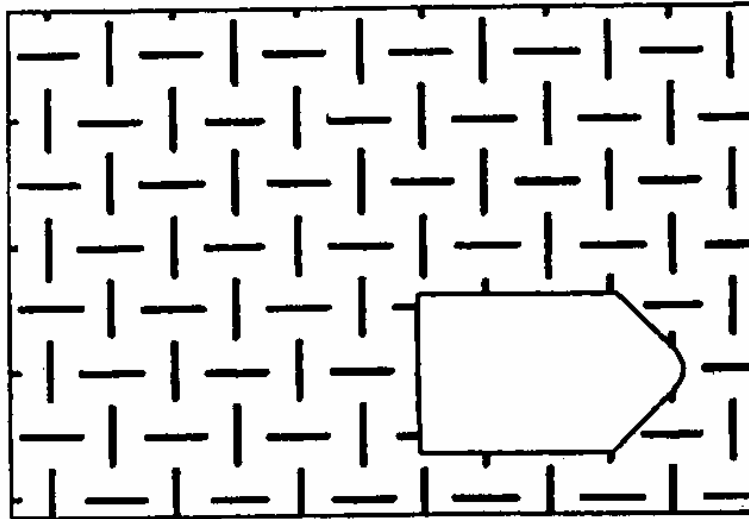
1. ಜೀವಿಗಳ ಮುಖ್ಯ ಗುಣಲಕ್ಷಣಗಳು ಯಾವುವು?
2. ಸಸ್ಯದ ಭಾಗಗಳನ್ನು ಹೆಸರಿಸಿರಿ.
3. ವರ್ಷದಲ್ಲಿ ಎಷ್ಟು ಕಾಲಗಳು?
4. ದೇಹಕ್ಕೆ ಶಕ್ತಿ ಕೊಡುವ ಆಹಾರಗಳು ಯಾವುವು?

ನಮಗೆ ಆಹಾರ ಏಕೆ ಬೇಕು?

APPENDIX - IV
INTELLIGENCE TEST

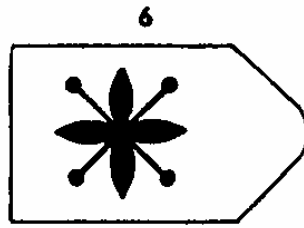
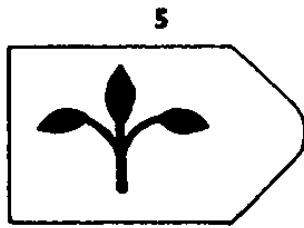
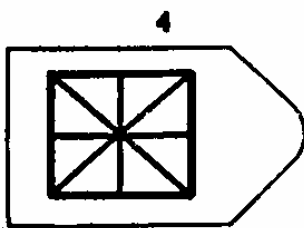
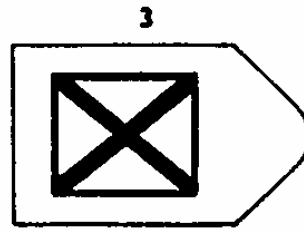
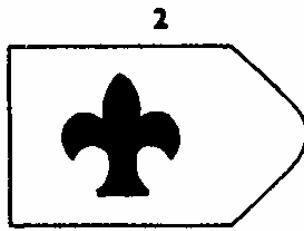
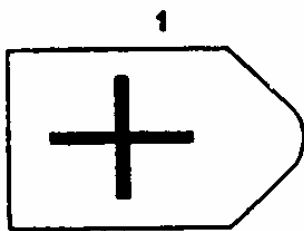
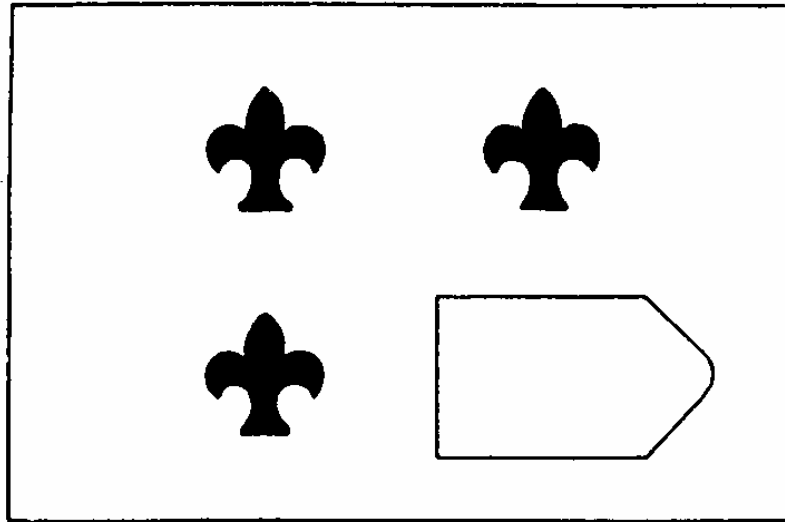
SET A

A I



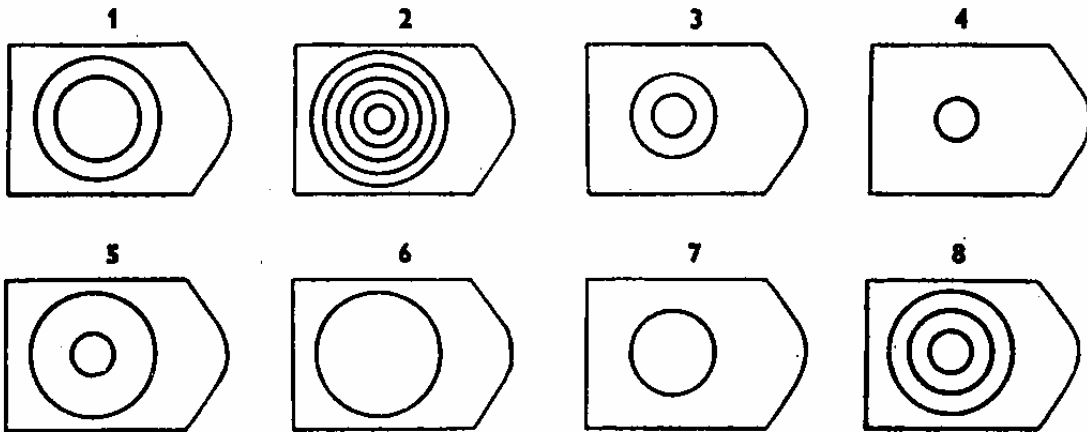
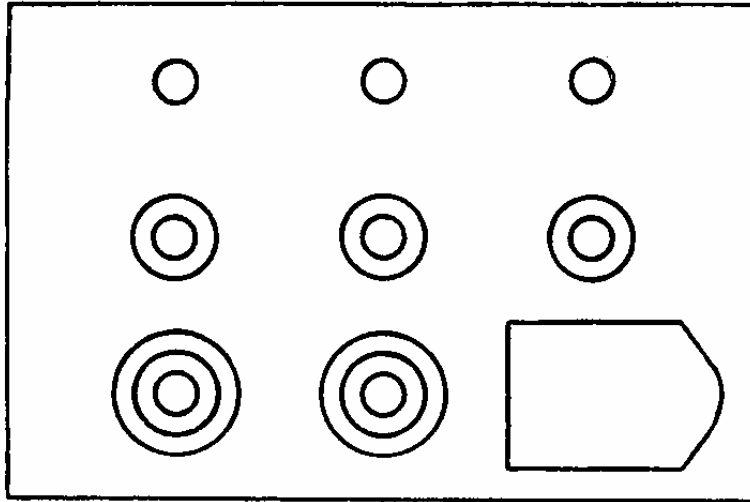
SET B

B1



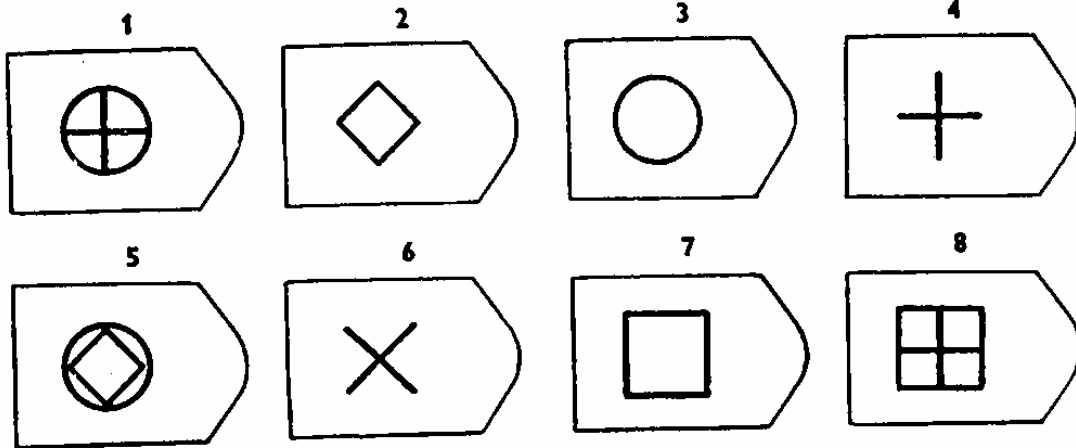
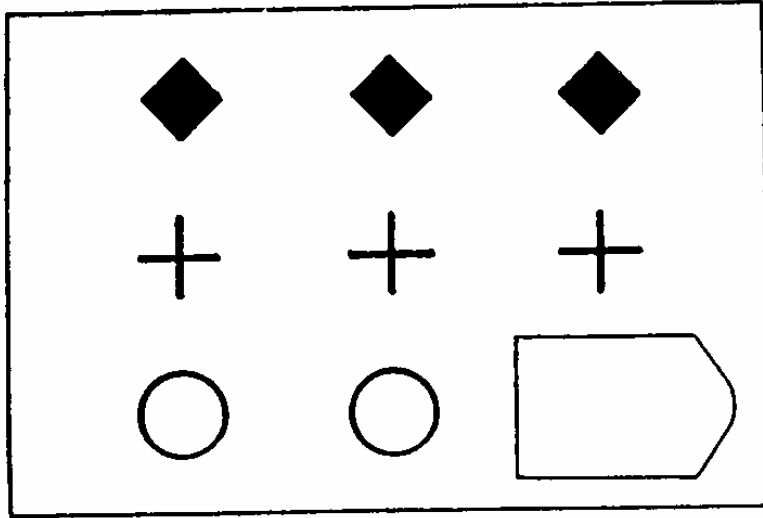
SET C

C1



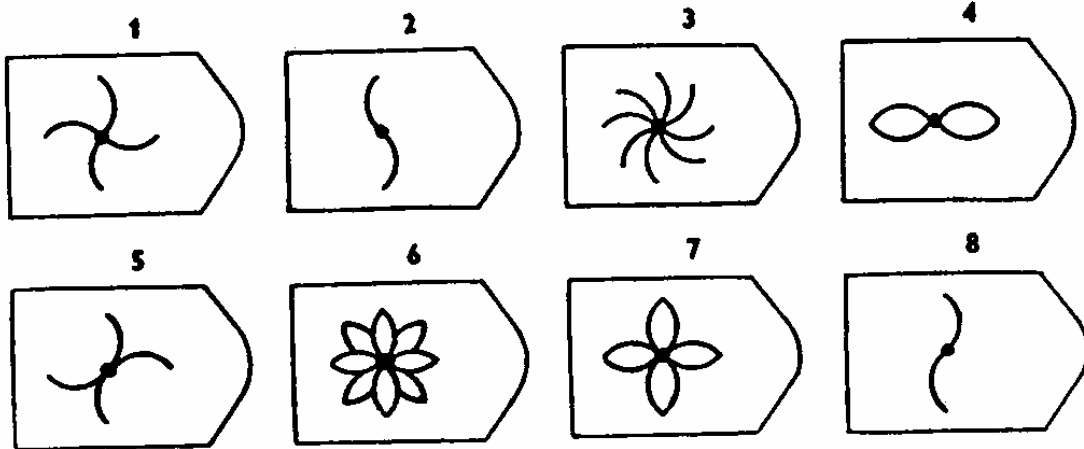
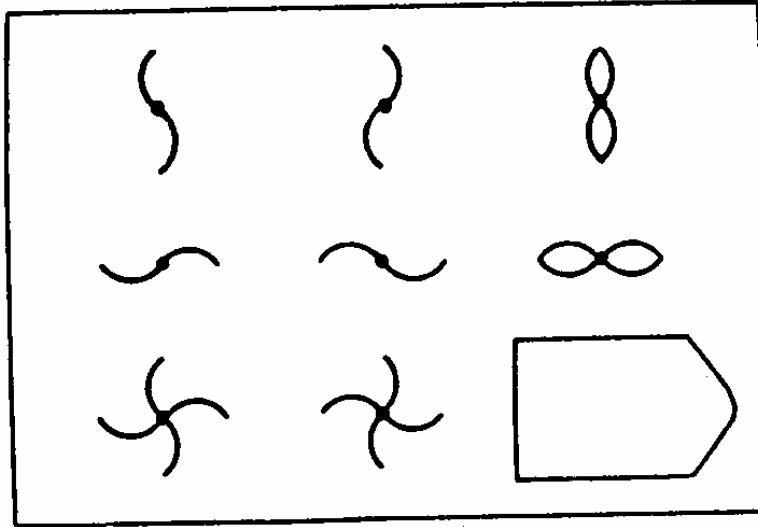
SET D

D 1



SET E

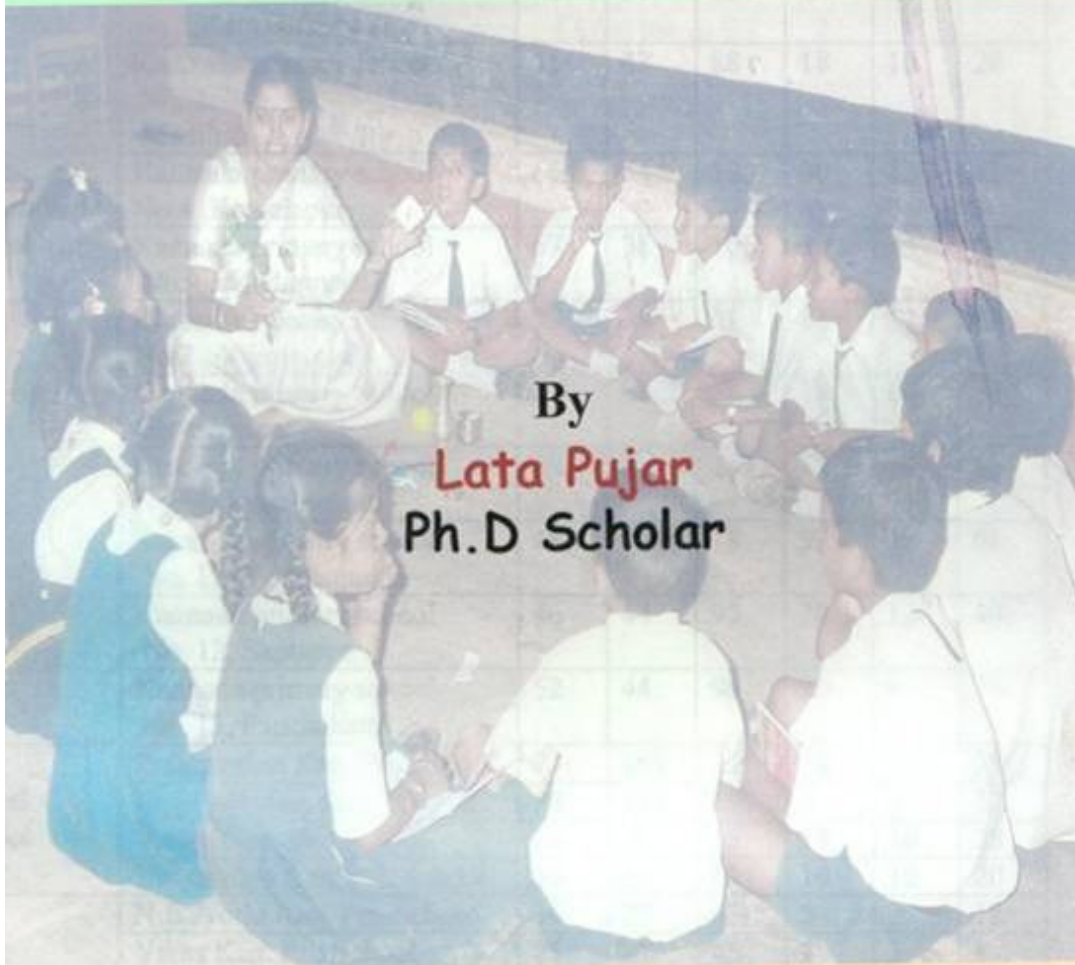
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APPENDIX - VI

PICTURE BOOK

- An Instructional strategy



By
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APPENDIX - VII

List of primary schools of III, IV and V standard students in Dharwad city within 10-15 kilometer distance.

III Standard

Type of school	Name & place of the school	Strength of students			Strength of low achievers		
		boys	girls	total	boys	girls	total
Government school	Kannada primary school No.2,Kamanakatti	70	51	121	14	12	26
	Kannada primary school No. 3, Madihal	45	43	88	18	10	28
	Kannada primary school No.4 ,Kamalapur	66	54	120	30	12	42
	Kannada primary school No. 6, Madarmaddi	67	38	105	30	34	64
	Kannada primary school No.7 , Vijaya road	53	38	91	11	11	22
	Kannada primary school Ganeshnagar	25	33	58	18	14	32
	Kannada primary school No.10, Kamanakatti	89	48	137	32	14	46
	Kannada primary school No. 11, Yettinagudda	48	30	78	32	29	61
	Kannada primary school No. 12, Saptapur	46	44	90	28	12	40
	Kannada primary school No. 13, Panchakatti	52	44	96	29	6	35
Aided school	Prasentation Kan. Pri. School	73	169	242	18	11	29
	Basel Mission Kan. Pri.Sch.	88	111	199	6	6	12
	Vanita Kan. Pri. School	21	34	55	18	10	28
	Vidyaranya Kan. Pri. School	30	33	63	10	10	20
Private school	N.B.Jyothi Kan. Pri. School	34	29	63	5	2	12
	Vikas Kan. Pri. School	25	21	46	3	3	8
	Aluruvenkatarao Kan. Pri. Sh	33	28	61	21	2	5
	K.P.E.S Kan. Pri. School	82	20	102	3	9	30
	Shanthisadana Pri School	23	26	49	7	3	6
	Mallikarjuna Pri School	20	12	32	4	3	7
	Chetan Pri School	20	18	38	3	0	3
	Basava Sadan Pri School	10	20	30	5	0	5
	Krishinagar Kan. Pri. School	50	47	97	42	19	61
Gangambika Pri. School	18	16	34	0	3	3	
Total		1088	1007	2095	390	235	625

IV Standard

Type of school	Name & place of the school	Strength of students			Strength of low achievers		
		boys	girls	total	boys	girls	total
Government school	Kannada primary school No.2, Kamanakatti	34	18	52	10	6	16
	Kannada primary school No. 3, Madihal	42	28	70	22	3	25
	Kannada primary school No.4 , Kamalapur	71	40	111	30	22	52
	Kannada primary school No. 6, Madarmaddi	44	53	97	12	6	18
	Kannada primary school No.7, Vijaya road	41	52	93	18	12	30
	Kannada primary school Ganeshnagar	36	22	58	11	11	22
	Kannada primary school No.10, Kamanakatti	47	24	71	15	15	30
	Kannada primary school No. 11, Yettinagudda	40	34	74	20	10	30
	Kannada primary school No. 12, Saptapur	35	40	75	12	8	20
	Kannada primary school No. 13, Panchakatti	53	49	102	30	15	45
Aided school	Prasentation Kan. Pri. School	46	88	134	24	8	32
	Basel Mission Kan. Pri.Sch.	72	60	132	20	7	27
	Vanita Kan. Pri. School	27	31	58	5	5	10
	Vidyaranya Kan. Pri. School	48	44	92	9	5	14
Private school	N.B.Jyothi Kan. Pri. School	32	22	54	8	4	12
	Vikas Kan. Pri. School	36	38	74	3	9	12
	Aluruvenkatarao Kan. Pri. Sh	46	22	68	7	5	12
	K.P.E.S Kan. Pri. School	50	32	82	9	5	14
	Shanthisadana Pri School	40	20	60	12	3	15
	Mallikarjuna Pri School	20	16	36	4	2	6
	Chetan Pri School	15	10	25	4	0	4
	Basava Sadan Pri School	15	8	23	10	5	15
	Krishinagar Kan. Pri. School	38	20	58	3	5	8
	Gangambika Pri. School	24	8	32	4	0	4
	Total	952	781	1733	302	171	473

V Standard

Type of school	Name & place of the school	Strength of students			Strength of low achievers		
		boys	girls	total	boys	girls	total
Government school	Kannada primary school No.2 No.2, Kamanakatti	44	32	76	16	10	26
	Kannada primary school No. 3, Madihal	61	52	113	20	12	32
	Kannada primary school No.4 Kamalapur	27	18	45	12	8	20
	Kannada primary school No. 6, Madarmaddi	43	58	101	16	20	36
	Kannada primary school No.7 Vijaya road	51	29	80	10	6	16
	Kannada primary school Ganeshnagar	34	16	50	5	5	10
	Kannada primary school No.10,Kamanakatti	44	53	97	12	10	22
	Kannada primary school No. 11, Yettinagudda	36	34	70	10	12	22
	Kannada primary school No. 12, Saptapur	47	31	78	8	8	16
	Kannada primary school No. 13, Panchakatti	22	18	40	7	3	10
Aided school	Prasentation Kan. Pri. School	51	34	85	8	8	16
	Basel Mission Kan. Pri.Sch.	36	22	58	2	6	8
	Vanita Kan. Pri. School	32	24	56	3	6	9
	Vidyaranya Kan. Pri. School	46	28	74	8	4	12
Private school	N.B.Jyothi Kan. Pri. School	23	13	36	4	4	8
	Vikas Kan. Pri. School	42	24	66	6	0	6
	Aluruvenkatarao Kan. Pri. Sh	22	25	47	8	2	10
	K.P.E.S Kan. Pri. School	25	25	50	7	2	9
	Shanthisadana Pri School	30	32	62	5	5	10
	Mallikarjuna Pri School	15	12	27	6	6	12
	Chetan Pri School	17	10	27	6	2	8
	Basava Sadan Pri School	26	30	56	10	12	22
	Krishinagar Kan. Pri. School	24	26	50	6	6	12
	Gangambika Pri. School	10	9	19	8	1	9
	Total	808	655	1463	203	158	361

Teacher's opinion towards different instructional strategies

N=16

Instructional Strategies	Teacher's opinion			Total score	Ranking	χ^2
	Poor	Satisfactory	Good			
Individual Instruction	8 (50.00)	5 (31.25)	3 (18.75)	327	IV	13.48**
Picture Book	1 (6.25)	5 (31.25)	10 (62.50)	424	I	
Chart	3 (18.75)	7 (43.75)	6 (37.50)	345	III	
Models	1 (6.25)	8 (50.00)	7 (43.75)	355	II	
Peer Tutoring	9 (56.25)	5 (31.25)	2 (12.50)	303	V	

Figures in the parenthesis indicate percentages

INSTRUCTIONAL STRATEGIES TO ACCELERATE SCIENCE LEARNING AMONG SLOW LEARNERS

LATA L. PUJAR

2006

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Major Advisor

ABSTRACT

A study on 'Instructional strategies to accelerate science learning among slow learners' was carried out in Dharwad during 2004 –05. The objectives of the study were to know the prevalence of low achievers in schools, to develop instructional strategies based on the prescribed syllabus to teach science subject, to know the influence of gender, ordinal position, type and size of the family, parent's education, occupation and per capita income of the family on the rate of learning science among slow learners, to study the impact of various instructional strategies developed in learning science among slow learners and to know the teacher's opinion towards the different instructional strategies. The slow learners were identified from both Government and Private Kannada medium primary schools using four screening methods *viz.*, academic achievement, teacher's assessment, intelligence test and achievement test. The sample for the study comprised of 122 slow learners both from. Correlation coefficient, t- test and chi square tests were used to analyze the data.

The results revealed that, the prevalence of low achievers was higher in Government school studying in third standard compared to Private and Aided schools. Gender, ordinal position, type and size of the family did not influence the rate of learning among slow learners. Whereas, parent's education, occupation and per capita income of the family had positive and significant influence on the rate of learning science among slow learners. Teaching using the different instructional strategies was found better than conventional method. Teaching through model was found to be the most effective instructional strategy followed by charts, picture book, individual instruction and peer tutoring. However, statistically non-significant difference was found between the posttest and retention test mean scores of both experimental and control group students. Teacher's assessment revealed that all most all of them had very good opinion towards using the picture book in teaching followed by models, charts, individualized instruction and peer tutoring.