CHAPTER 1

THEORETICAL FRAMEWORK OF THE STUDY
CHAPTER 1
THEORETICAL FRAMEWORK OF THE STUDY

1.1. Introduction
1.2. Educational Technology
1.2.1. Definition of Technology
1.3. Application of Educational Technology
1.4. Advantages of Using Educational Technology
1.5. Mathematics
1.6. Importance of Teaching Mathematics
1.7. General Objectives of Teaching Mathematics
1.8. The Objectives of Teaching Mathematics at Secondary Level
1.9. Educational Technology in Teaching Mathematics
  1.9.a. Black Board
  1.9.b. Models
  1.9.c. Filmstrips
  1.9.d. Flash cards
  1.9.e. Radio
  1.9.f. Computer
  1.9.g. Bulletin Board
1.10.a. Statement of the Problem
1.10.b. Operational Definition of Key Terms
1.11. Need for the Study
1.12. Scope and Contribution of the Study
I.13. Variables Selected for the Study
I.13.a. Institutional variables selected for the study
I.13.b. Teacher variables selected for the study
I.13.c. Variables with reference to the application of Educational Technology
I.14. Objectives of the Study
I.15. Hypotheses of the Study
I.16. Methodology
I.16.a. Sample
I.16.b. Methodology in Brief
I.16.c. Tools Used
I.17. Limitation
I.18. Arrangement of the Thesis
I.19. Conclusion
CHAPTER - I

THEORETICAL FRAME WORK OF THE STUDY

I.1. Introduction

In the modern age, revolutionary changes are taking place in the fields of Science and Technology. So students should be filled with the knowledge about communication media such as Television, Over Head Projector, Educational Video Film, Transparencies and Computer. So the teachers also have to ahead with their knowledge. We have to change our old methodology by using new modern methods of teaching technology in teaching.

The importance of education is to help the child to adjust to this changing world. The best type of education is that which guides the immature child to live his/her life richly and abundantly at the same time to contribute to social betterment.

Visual aids are very effective and important in enhancing the teaching learning process. They should be widely used in the teaching of different levels being very helpful giving as well as retaining more knowledge. The results of teaching learning process can be known or judged with the use of different visual aids. There is variety of visual aids available for imparting knowledge to the students. The use of visual aids in teaching-learning process has created a new dimension in the educational situation which gives rise to new types of behaviour on the part of teachers and students. Keeping in view the importance of visual
aids as discussed above the study was taken to find out the availability and utilization of visual aids.

1.2. Educational Technology

1.2.1. Definition of Technology

The word 'Technology' is derived from the Greek word 'Technique' meaning 'art of skill'. Educational Technology concerned with the development, application and evaluation of systems, techniques and aids to improve the process of human learning.

From the report of the meeting of Chief Technical Admission, National Director and UNESCO specialists in Paris, December 1969, "Educational Technology is the development, application and evaluation of systems, techniques and aids in the field of human learning." Educational Technology has to be seen as a part of persistent and complex endeavour of bringing pupils, teachers and technical means together in an effective way."

1.3. Application of Educational Technology

Learning is not only selling of information. The behaviourist says, "Learning is relatively permanent change in the behaviour through reinforced practice. The demands of education are increasing day by day. Our traditional teaching methods have failed miserably to cope with the increasing demand for education because teachers and classroom increases arithmetically while the demand for education increases
geometrically. The stereo-type teaching impede effective learning process between child and teachers.

The present age of science and technology provides to education a vast amount of instruction molecular equipments and techniques. The modern audio-visual aids are actually roots for the improvement of the teaching learning process. In fact teaching has become a science because of the impact of innovation in educational technology in teaching. It is necessary, therefore, to employ new media especially visual aids in secondary school levels. Visual aids are best compellers, potentialisation and motivation. They add zert interal and vitality to learning situation. As a result they enable student to learn faster, remember longer, gain more accurate information, receive and understand delicate concepts and meaning. They help to reduce verbalism. In science teaching mere book knowledge and narration would not help the student to give a good science background. If mathematics is poorly taught and badly learnt, it is little more than burdening the mind with dead information. Visual aids and means can be employed to teach pupils what words mean. It provides multi-sensory experience. Since visual aids can be used to gain and extend. First hand experience, they are most effective in comprehending ideas.

The most profound justification for the use of visual aids in teaching is related to the need for bringing vivid reality, variety of classroom techniques etc., in the classroom. Mere talking and chalking will not help this. It also allows freedom from the formal constrains. To be
brief, the visual aids are supplementary devices. The utilization of visual channels helps to clarify, establish and correlates accuracy of concepts and to interpret and appreciate them. In this way visual aids have immense potentialities of motivation, clarification and stimulation.

I.4. Advantages of Using Educational Technology

1. To stimulate speedy technological development of the country.
2. To promote the efficiency of education.
3. To improve the effectiveness of instruction.
4. For providing equal educational opportunities.
5. For transmission of knowledge.
6. For imparting quality education.
7. For solving problems of Indian education.
8. It uses of maximum of sense.
9. It is based on maxim of teaching.
10. It is helpful in development of science.
11. It gives direct contact to the students with social and physical environment.
12. It gives experience varying from abstract to concrete.
13. It can be used to teach for any age or ability groups.

I.5. Mathematics

According to various definitions, mathematics is the science of measurement, quality and magnitude. It has also been defined as the
science of number and space. In Hindi or in Punjabi the name is ‘Ganitha’ which means the ‘science of calculation’. There is no doubt in any civilized mind that mathematics is the foundation of the present explosion in scientific knowledge. This knowledge has brought about a tremendous civilized and technological revolution which has not only affected the mode of living of man but also his thinking and culture. Further mathematics has not remained a mere subject of study, today it has become a language for communication and thought process, only through this language man comprehends nature “As are the crests on the heads of peacocks, as are the jewels on the hoods of snakes so is Ganitha” (Mathematies at the top of all Vedanta Science).

According to Roger Bacon, “Mathematics is the gate and key to all sciences” and J.W.A Young has very rightly remarked that “where the backbone of Mathematics removed our material civilization would inevitably collapse.”

Mathematics is the queen of all science. Ever since the history of man on the globe, this science, in its varied forms, has helped man in the growth of his knowledge and mankind. In the modern world, it forms an important basis for scientific and technological development. So, Napolcan the great says, “without development of mathematics no nation can develop continue to ring in our cases invariably.”

I.6. Importance of Teaching Mathematics

Mathematics has been considered to be a fascinating branch of human knowledge. Since the dawn of civilization it has contributed in a
great measure to the advancement of human civilization. The art of measuring and the art of counting are very important in the fields of engineering science and technology. It is an exact science in itself. It is generally felt that mathematics is one of the most difficult subjects. “The Cock Croft Report in 1982, the result of a detailed inquiry in the United Kingdom, reported, “Mathematics is a difficult subject both to teach and to learn.”

Children begin to learn the fundamentals of Mathematics from their childhood. Proper interest must be created in the learning of Mathematics, otherwise, it becomes a kind of scare crow to many students. A dull student in Mathematics, if handled properly, can be made to differently improve wonderfully. Plato was of the view that “those person who are not able to study Mathematics and understand its problems, should not be allowed to enter any institution”. So, Mathematics is helpful in the study of the development of the nature and other developments that continually go on around us.

In certain States of India, Mathematics is a compulsory subject upto secondary level. After high school education in these states, Mathematics students go in for technical education or education in industrial training institutes and polytechnics. In the higher secondary it is an optional subject.

Hence, Mathematics is necessary for human being at every step. Mathematics should find a respectable place in school curriculum.
I.7. General Objectives of Teaching Mathematics

1. To train the students in Scientific thinking and reasoning.

2. To help the students to attain the power of accurate and effective expression.

3. To build the student qualities of self-confidence.

4. To bring about the development of the ability of the students to express their thoughts clearly, accurately and precisely.

5. To help the students to develop the power of original thinking and investigation.

6. To help the students to improve their classroom learning.

7. To improve their ability to perform calculation mentally.

8. To develop ability to estimate and check results.

9. To develop ability to use and interpret graphs, scripts, statistics and tabular presentation of qualitative data.

10. To enable them to use Mathematical tools.

11. To make them think critically to draw inferences and to generalize.

12. To develop ability to represent design and spatial relation by drawings.

13. To enable the students to systematically organize and interpret the data given.

14. To cultivate and develop the proper habits of study and power of concentration.

15. To enable the students to understand the implications of the technical terms and their connotations.
I.8. The Objectives of Teaching Mathematics at Secondary Level

1. To develop memorization and habit formation in students. This is developed by memorizing formulae.

2. To give oral exercise then only it will give swift working of the mind.

3. To train the students to write figures correctly, legibly and in good handwriting by doing sums in number system.

4. To train the students to do the sums within a limited time.

5. To develop the habit of understanding and analysing the problems before trying to solve them.

6. To train the students in speed and accuracy.

7. To develop number concept.

8. To develop originality in the students by drawing geometry and graphs.

9. To lay foundations for the studies understanding of higher Mathematics. So they were taught trigonometry at secondary level.

10. To enable to understand the language of Algebra.

11. To develop the concept of direction.

12. To understand Mathematical symbols and use them.

13. To develop the idea of jurisdiction and volume.

14. To understand the nature of fundamental operations and power to apply them in new situation.

15. To understand relationship between fraction, ratio and proportion and use them.

16. To have proper idea about the weights and measure by studying Mensuration.
1.9. Educational Technology in Teaching Mathematics

Communication is the backbone of education. It helps in exchanges of ideas between the teacher and students. The use of sensory aids in the teaching of Mathematics is of recent origin. In fact all teaching has always involved the communication of ideas through the reducing speech or visually by the use of written or printed material text books, writing Aids, geometrical instruments and the black board have long been regarded as indispensable equipment for mathematic classes. More over it is perceived by a vast majority of people that Mathematics is a dry and difficult subject and full of abstract things. The result is that students take very little interest in it. To create the necessary interest is a constant problem for the teacher. This subject demands the use of aids in every step.

1.9.a. Black Board

Black board is the integral part of the Mathematics classroom. It is on the black board that the sums are solved and the problems explained to the students. Black board may be called the second tongue of the Mathematics teacher. This adds a visual impression to the effect of hearing the words. Because of the addition of the sensory experience, these words are remembered longer than those which are only heard. It is used not only for writing words but also for drawing graphs, diagrams, tables, the monitory of speech and make teaching more interesting.
I.9.b. Models

When teacher teaches about some objects, it is best to show the real objects to the students, so that concepts about them can be developed. However, sometime it is not possible to show the real objects to the students either due to their sizes or their inaccessibility. In such case the teacher can show a model of the object. The model should be exactly proportional in all dimensions so that it conveys the exact shape of the objects although its size would be smaller or larger as a case may be once the ratio of the size of a real to that of the model known.

I.9.c. Filmstrips

Filmstrips can be projected on a large screen for a group or they can be viewed by individual student. A mini-viewer still pictures are projected and may not have writer captions. Some filmstrips come with audio tapes or records with pre-recorded Commentaries with the company the visuals. Filmstrips may be used for large groups or individualized instruction for introducing a unit or for teaching lesson.

I.9.d. Flash cards

Flash cards are useful as they allow factual information to be learned in an enjoyable fashion. Flash cards can be used by the teachers to provoke discussion or to assert students in feeling what is like to be put in a new or different situations.

The use of flash cards is an excellent technique, for individual because it provides the instant feed back through the self-checking device
on the back of the card. We can also use it for groups playing. Formulae are written in cards and show it to them for a minute then ask them to match the cards.

1.9.e. Radio

Radio is beneficial and inexpensive tool in the classroom for the following reason.

a) News programmes are broadcast many times a day.

b) There are varieties of programmes relating to Mathematics.

c) The radio provides many opportunities for students to develop thinking skills. It is also the most economical way of informing and changing attitude of the whole population. At the same time, the radio is cheap and is qualitative almost at every school, college, home, office and other places of work.

1.9.f. Computer

In advanced countries, computers are used as educational aids at all levels of education. Secondary school students enjoy problem solving activities in Mathematics and science and in history. It relieves the teacher of his daily routine redundancies, because the performance of learners during the course and the test is recorded automatically. It helps in feeding information back to evaluate the performance of the students promptly and thus be able to use the data in designing the best teaching strategy for the learner in future. Because of their growing popularity, the fear has often been expressed that they may replace the teacher in the classroom.
But this fear seems to be baseless because the computer cannot replace the teacher. It can only change his role in a big way. It is therefore, a very powerful tool in the hands of teachers in the instructional process. As and when it is introduced in a big way in the field of instruction, it will increase the scope and quality of the teachers’ contribution to the teaching-learning process.

I.9.g. Bulletin Board

Bulletin Board is equipment which makes class teaching interesting, meaningful and attractive. This equipment is very simple and is easily available, and easily portable. It is a rectangular piece of soft board (2 x 4) which is fixed on a wooden frame of the same size with screws or nails. The front side covered with cloth of some dark colour. To keep the cloth tight and even on the soft board, an aluminium frame is fixed on the edges of the soft board. For displaying notices, instruction, programmes etc., various Mathematical figures such as triangle, square, rectangle, similar triangular, congruent triangles are used in them for display. It may be for a week, month or a year. Formulae can be displayed on this board. The board should be cleared and the new formulae be fixed on the board. New ideas about Mathematics which was published in newspapers, magazines, booklets etc., may be displayed on the board.

I.10.a. Statement of the Problem

The dissertation is stated as “Application of Educational Technology in Teaching of Mathematics at Secondary School level in Bharathidasan University Jurisdiction”.

I.10.b. Operational Definition of Key Terms

Application

It is the process of applying theories and principles in concrete situations. This is regarded as one of the scholastic category. Apply, relate, employ, classify, develop etc. are the action verbs that would represent application. The word ‘application’ can be operationally defined as classifying and employing audio visual education for teaching Mathematics.

Educational Technology

Educational technology means the application of Scientific knowledge about learning and the conduction of learning to improve the effectiveness and efficiency of teaching and training. This word reserves to Audio-Visual aids in this study.

Teaching

Teaching, in its simple meaning, is referred to either as occupation or profession of community known as teacher or an activity or group of activities undertaken to help an individual to learn or acquire some knowledge, skills, attitudes or interest etc. Morrison says, “Teaching is an intimate contact between a more matured personality and less matured one which is designed to further the education of the latter.” According to B.O. Smith, “Teaching is a system of actions intended to produce learning”. But the fundamental definitions of teaching can be adapted as below.
"Teaching is a triadic relation, tri-polar process involving the sources of teaching student and set of activities designed and manipulated primarily to bring the changes in the behaviour of the student." Teaching in this study means teaching of Mathematics at secondary level.

Mathematics

According to various definitions “Mathematics” is the science of measurement, quality and magnitude. According to New English dictionary “Mathematics”, in a strict sense, is the abstract science, which investigates deductively the conclusion implicit in the elementary conceptions of spatial and numerical relations. In the modern world, it forms an important basis for scientific and technological development, which is also used in all branches of science and day-to-day life. This is one of the subjects taught at school level.

Secondary level

This pertains to the IX and X standard of school education. The age group is between 13 and 15. It is opt for the constructive thinking. They have to be motivated and guided in right way. Then, the objectives or educational goal can be reached.

Bharathidasan University Jurisdiction

There are 8 educational districts located in this University. They are (1) Thanjavur educational district, (2) Pattukkottai educational district, (3) Thiruvarur educational district, (4) Nagapattinam educational district, (5) Pudukkottai educational district, (6) Karur educational district
(7) Perambalur educational district and (8) Tiruchirapalli educational district.

1.11. Need for the Study

The present age is called the age of science and technology. Mathematics is one of the branches of Science. A wise teacher always uses aids to make his teaching effective, concrete and interesting. Teaching of Mathematics can be made interesting and effective with the help of the teaching aids.

The present generation has realized the importance and due to this the demand for education is increasing rapidly with a view to bringing innate potentialities of the child. Various attempts are also being made to provide the right type of experience for the all round and harmonious development of the child. In fact the teachers play a major role in bringing out the potentialities of the child. 1986 National Policy of Education emphases the child-centered education, experience based on teaching, learning as joyful experience, activity based teaching etc. To implement these strategies, they have followed the operational black board scheme and minimum level of learning approach, moreover to improve our more and more visual aids must be used in our classroom. Hence the teacher should know the importance of the utilization of visual aids to motivate learner to bring novelty in the classroom and to the student meaningful experience etc. Keeping all those facts in mind and the realization of immense potentialities of visual aids for successful and effective teaching in our schools has prompted, the investigator takes a close look at the
availability and utilization of the more important visual aids. The teacher has to employ these material aids with caution. He/She should keep in mind, the psychophysical requirements of the students. Material aids should be used sparingly of course keeping in view the requirements of the subject matter. The use of these material aids are necessary for teaching of Mathematics.

Mathematics occupies an important place. In most of the states of our country, Mathematics is taught as a compulsory subject upto high school level.

Every occupation in this world even a pottery, carpentry, sweet making is guided by Mathematics. When a farmer throws a stone to device away the birds eating his fruit, if one stone misses he can easily try another. But the throwing of Apollos in space to reach the moon could not be such a simple hit or miss. The multimillion dollar project is not as simple to loss as a stone. In this case right amount of thrust in rockets accurately in time an angle to launching shape to provide minimum friction etc. were required. How to get these values lies in the domain of higher mathematics.

In the present social setup Mathematics is very much important for the common men only a person with good Mathematical background can be reasonably sure to that he is getting his education.
In spite of the facts discussed so far, more number of failures at school level is in Mathematics. It is the next only to English in failure. One of the important reasons is that the subject has not been understood properly. It is mainly because of poor teaching methods and the lack of use of audio-visual aids.

Many studies have been undertaken to find out the effectiveness of Educational Technology on teaching in general and teaching of Mathematics in particular. But the study on the uses of Educational Technology has not been done, so deeply, so far, in the schools coming under Bharathidasan University Jurisdiction as far as the researcher is concerned. Thus is the need for this study.

I.12. Scope and Contribution of the Study

The scope of educational technology depends upon in what context the term educational technology is used as the Audio-Visual Aids, mechanical and electric gadgets, the scope is limited to improve the educational messages.

If the term Educational Technology is used as the process oriented technique then its scope is limited to production of teaching, learning material. The vigorous task analysis specification of direct behaviour, the determination of pre-requisites and the gradual development of the programme ensure that the teaching learning material developed on this style will be most useful to the learner. Thus basically the technique of developing software and organization of man-material resources are born
for specific objectives. This covers both planning as well as implementation phases and is the most accepted concept all over the world.

The result of this study will throw more light on the means to the problem of poor achievement in Mathematics at high school level which will help us to evolve suitable strategies for optimum utilization of available technology in schools.

I.13. Variables Selected for the Study

I.13.a. Institutional variables selected for the study

1. Type of Schools (Boys / Girls / Co-education)
2. Location of the institution (Rural / Urban)
3. Nature of the Institution (Govt. / Aided)
4. Language of Instruction (Tamil / Tamil and English)

I.13.b. Teacher variables selected for the study

1. Sex (Male / Female)
2. Age (Above 35 years / 35 and below 35 years)
3. Educational Qualification (Post Graduate / Under Graduate)
4. Years of Teaching experience (Above 15 years / 15 and below 15 years)

I.13.c. Variables with reference to the application of Educational Technology

1. Availability of Educational Technology
2. Utilization of Educational Technology
3. Working Knowledge in handling Educational Technological Aids
4. Teacher attitude towards utilization of Educational Technological Aids

I.14. Objectives of the Study

The following objectives were framed

1. To find out the availability of Educational Technology at Secondary School level in Bharathidasan University Jurisdiction for Teaching of Mathematics.
2. To find out the utilization of Educational Technology for teaching Mathematics at Secondary School level in Bharathidasan University Jurisdiction.
3. To find out the Working Knowledge of B.T. Assistants of Mathematics in handling Educational Technological Aids.
4. To know the attitude of B.T. Assistants of Mathematics towards the application of Educational Technology for teaching of Mathematics at Secondary School level in Bharathidasan University Jurisdiction.
5. To find out the relationship between the Availability of Educational Technology and the Institutional variables such as
   (i) Type of school
   (ii) Locality
   (iii) Nature of Institution
   (iv) Language of instruction followed in the school
6. To find out the relationship between the Utilization of Educational Technology and Institutional variables such as
(i) Type of school
(ii) Locality
(iii) Nature of Institution
(iv) Language of instruction followed in the school

7. To find out the relationship between the Utilization of Educational Technology and Teacher variables such as
   (i) Sex
   (ii) Age
   (iii) Educational qualification
   (iv) Teaching experience

8. To find out the relationship between the Working Knowledge of the teachers and the following teacher variables such as
   (i) Sex
   (ii) Age
   (iii) Educational qualification
   (iv) Teaching experience

9. To find out the relationship between Attitude of teachers towards the application of Educational Technology and the following teacher variables such as
   (i) Sex
   (ii) Age
   (iii) Educational qualification
   (iv) Teaching experience
I.15. Hypotheses of the Study

1. Educational Technology is not available at Secondary School level in the Educational Districts of Bharathidasan University Jurisdiction for teaching of Mathematics.

2. Educational Technology is not properly utilized for teaching of Mathematics at Secondary School level in the Educational Districts of Bharathidasan University Jurisdiction.

3. The B.T. Assistants of Mathematics in Bharathidasan University Jurisdiction are not having Working Knowledge in handling Educational Technological Aids for teaching of Mathematics.

4. The B.T. Assistants of Mathematics in Bharathidasan University Jurisdiction are not having positive attitude towards the application of Educational Technological Aids.

5. There is no significant relationship between the Availability of Educational Technology and Institutional variables such as
   (i) Type of school
   (ii) Locality
   (iii) Nature of Institution
   (iv) Language of instruction followed in the school

6. There is no significant relationship between the Utilization of Educational Technology and Institutional variables such as
   (i) Type of school
   (ii) Locality
   (iii) Nature of Institution
   (iv) Language of instruction followed in the school
7. There is no significant relationship between the Utilization of Educational Technology and Teacher variables such as
   (i) Sex
   (ii) Age
   (iii) Educational qualification
   (iv) Teaching experience

8. There is no significant relationship between the Working Knowledge of teachers in handling Educational Technological Aids and the following Teacher variables such as
   (i) Sex
   (ii) Age
   (iii) Educational qualification
   (iv) Teaching experience

9. There is no significant relationship between the Attitude of teachers towards the application of Educational Technological Aids and the following Teacher variables such as
   (i) Sex
   (ii) Age
   (iii) Educational qualification
   (iv) Teaching experience

I.16. Methodology

I.16.a. Sample

There are 8 educational districts in the Bharathidasan University jurisdiction. They are (1) Thanjavur educational district, (2) Pattukkottai educational district, (3) Thiruvarur educational district, (4) Nagapattinam
educational district, (5) Pudukkottai educational district, (6) Karur educational district (7) Perambalur educational district and (8) Tiruchirapalli educational district. There are 911 high and higher secondary schools in the Educational Districts of Bharathidasan University Jurisdiction. 372 schools were selected for the present study by using random sampling technique. One Mathematics B.T. Assistant from each school was requested to respond the questionnaire. Thus, stratified random sampling technique has been adopted in this study.

I.16.b. Methodology in Brief

All the high and higher secondary schools in the Bharathidasan University Jurisdiction have been selected for this study. One questionnaire was sent to each school. The teachers from 372 out of 911 schools have responded. The data thus collected were put into appropriate statistical analysis.

I.16.c. Tools Used

The questionnaire prepared and developed by the investigator and her guide was used to collect the data in this study.


To find out the relationship between the selected variables and the application of Educational Technology, Chi-Square test was applied and the data were analysed.
I.17. Limitation

1. The study was limited to 372 schools in Educational districts of Bharathidasan University Jurisdiction.

2. Availability, utilization, working knowledge and interest and attitude of the school teachers only were measured by using the tool developed by the investigator for the purpose.

3. Only one teacher from each school has been asked to respond the questionnaire.

4. The study was limited to the government and aided schools of Bharathidasan University jurisdiction, Educational districts of Tamil Nadu.

I.18. Arrangement of the Thesis

The chapters are organised in the following way:

Chapter I : Theoretical frame work of the study.

Chapter II : Review of related literature.

Chapter III : Plan and procedure.

Chapter IV : Analysis and Interpretation of Data

Chapter V : Findings, Conclusion and Suggestions,

Recommendations for further Research.

The bibliography at the end provides a list of books, journals and reports that have helped the investigator to conduct this research. The appendices provide complete information regarding the tools used.

I.19. Conclusion

Basic principles of this research was given in this first chapter. The review of related literature will be discussed in the next chapter.