CHAPTER-I

THE PROBLEM

1.0 Introduction

Education is a continuous process which the society establishes to assist its members to understand the heritage of the past and to participate productively in the future. It is the leading out of the in-born powers and potentialities of the individuals in the society and the acquisition of skills, aptitudes, and competencies necessary for self-realization and for coping with life’s problem. Education is considered as a tool to be used for the integration of the individual into the society to achieve self-realization, develop national consciousness, promote unity, and strive for social, economic, political, scientific, cultural and technological progress.

Education in science and mathematics therefore becomes bedrock and indispensable tools for scientific, technological and economic advancement in any nation. It gives the nation the capacity to apply technology for the exploitation of the resources of nature. Such exploitation will depend greatly on mathematics for laying the foundation for political, governmental, military, civil, scientific, technological advancement, economic development, socio-cultural and environmental peace. There is no denying that education is considered the most important ingredient of the human activity responsible for any social change all over the world. Education, both formal and informal, brings about a considerable change in the behavior of people by making them aware of the world through different means. No social transformation of major importance can be dreamt of by the society inhabited by ignorant people. Ignorance is often synonymous with stagnation and disruption. If we turn the pages of recorded history, we can easily discern that every civilization that has become extinct tended to discard progressive thinking in its decadent phase. Modern society always sets a great store by education as a means of enlightenment which has the potential to make its upwardly mobile. The more pronounced is the thrust, the speedier development becomes.¹

¹Right to education (RTE) act: Beginning To A Meaningful End, Competition Success Review, July 2012, p-1
Mathematics is the study of qualitative relations; put simply, it is the science of structure, order, numbers, space and relationships about counting, measuring and describing of shapes and objects. It qualifies in its own right as a science but it is often regarded as a language of and a link between all the sciences.

Mathematics is a body of knowledge that opens up the mind to logical reasoning, analytical thinking and the ability for creative thinking, deep focusing and clarity of thought and precision. It is the hub on which all scientific and technological studies find their bearings. In pure sciences it is the basis and language of study, in applied sciences and technology it is an indispensible tool of analysis, with the social sciences it is a scaffold and for the Arts the light that gives consistently and completeness to its study.

The learning of mathematics in schools represent first, a basic preparation for adult life and secondly a gateway to a vast array of career choices. And from the societal perspective, competence in mathematics is essential for the preparation of an informed citizenry and for continuous production of highly skilled personnel required for industry, technology and science. The progress of any nation depends upon her scientific and technological advancement which can only be built on a sound mathematical education capable of making the citizens effectively functional in the natural and applied sciences. The study of Mathematics therefore will go a long way to “equip students to live effectively in our modern age of science and technology”.

Mathematics Education must contribute towards the acquirement of these values: knowledge and skills, intellectual habits and power, desirable attitudes and ideals that are indispensable tools for a successful and balanced human existence.

Problem solving is the frame-work or pattern within which creative thinking and reasoning take place. It is the ability to think and reason on given levels of complexity. People who have learned effective problem solving techniques are able to solve problems at higher levels of complexity than more intelligent people who have not such training.
The following objectives for teaching mathematics in secondary schools:

i. To generate interest in mathematics and provide a solid foundation for everyday living

ii. To develop computational skills.

iii. To foster the desire and ability to be accurate to a degree relevant to the problem at hand.

iv. To develop and practice logical and abstract thinking.

v. To develop capacity to recognize problems and to solve them with related mathematics knowledge.

vi. To provide necessary mathematical background for further education.

vii. To stimulate and encourage creativity.

The individual has yet to blossom out to perfection to bring forth all that is best in him. All development, all personal advancement is in search of Truth, the realization of the spiritual essence that is in man. Thus education cannot be confined to childhood and youth – it has to take into account the whole life of a man. So education will not be complete till one realizes the Self, the perfection. Education is through life and for life. Education must take care of the whole child, the human personality in all its aspects - physical, intellectual and spiritual.\(^2\)

In the words of William H. Kilpatrick, “From the broad point of view all life thoughtfully lived is education.” It is said that a pupil gets one-fourth of his education from his teacher, another fourth by his own intellectual efforts, another fourth from his fellow students and the rest in the course of time through life and experiences.\(^3\)

Students in mathematics classes that do not emphasize problem solving are being deprived, as well, of the feelings of exhilaration and empowerment that come from mastering a difficult problem. They are not developing the tools and the confidence they will need to tackle the types of problems that will occur in their working and personal lives. They often fail to gain a deeper conceptual

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understanding that comes from constructing one’s own mathematical truths through deep thinking.

Therefore the investigator feels the need to show the students about good conceptual understanding of the mathematics in a problem when they choose appropriate representations, use relevant information, use mathematical terms precisely, and to help the students demonstrate their ability to use strategies and reasoning by investigating and selecting appropriate problem-solving strategies and conducting a logical, well-planned, and supported process that leads to a reasonable solution. This project will therefore take a survey of the factors responsible for these failures, the effects on the students and future of our society and proffer means of changing the trend of students’ poor performance in mathematics. In this effort, students’ performances in senior secondary schools will be used as tool for analysis and investigation, and the investigator would like to carry out the present study in Jowai, West Jaintia Hills District.

1.1 Theoretical Background

1.1.1 Importance of Mathematics in the School Curriculum

Mathematics is a compulsory subject for all students in school. Mathematics is a living subject which seeks to understand patterns that permeate both the world around us and the mind within us. Although the language of Mathematics is based on rules that must be learned, it is important for motivation that students move beyond rules to be able to express things in the language of mathematics. This transformation suggests changes both in curricular content and instructional style. It involves renewed effort to focus on: Seeking solutions, not just memorizing procedures; Exploring patterns, not just memorizing formulas; Formulating conjectures, not just doing exercises.

It is believed that the acquisition of mathematical knowledge and problem solving will develop students’ higher order thinking skills and decision making which they can apply in their future. Most students have difficulty with a math problem because they do not know how to start it. Mathematics makes sense to students and is easier to remember and apply when students understand the mathematics they are learning. Also, students who understand mathematical
concepts and skills more readily learn new mathematical concepts and skills. Students who learn mathematics with understanding feel a real sense of accomplishment and thus are motivated to learn more mathematics and to succeed in mathematics. Students who understand mathematics become autonomous learners of mathematics. Since mathematics is about reasoning rather than Rote memorization, so it is necessary for the students to have the concept and basic knowledge of mathematics. Doing mathematics requires lots of practice.

Mathematics is a process of enquiry and coming to know, adding to the sum of knowledge. Mathematics is not a finished product, for its results remain open to revision (the problem-solving view). There is a view of mathematics as a static but unified body of knowledge, a crystalline realm of interconnecting structures and truths, bound together by filaments of logic and meaning. Thus mathematics is a monolith, a static immutable product. Mathematics is discovered, not created (the Platonic view). There is the view that mathematics, like a bag of tools, is made up of an accumulation of facts, rules and skills to be used by the trained artisan skillfully in the pursuance of some external end. Thus mathematics is a set of unrelated but utilitarian rules and facts (the instrumentalist view). Certainly the subject, which is so useful from social, cultural, ethical and practical points of view, should be given an importance place in the school curriculum.

According to the Kothari Commission (1964-66), the most significant Commission of Indian Education, wisely remarked that “Science and Mathematics should be taught on a compulsory basis to all pupils as a part of general education during the first ten years of schooling. In addition, there should be provision of special courses in these subjects at the secondary stage, for students of more than average ability.”

Mathematics is more closely related to our daily life as compared to other subjects. Except our mother tongue there is no other subject which is more closely related to our daily life as mathematics. Mathematics is considered as father of science. In present days mathematics has been given an important place in school curriculum. In order to give an importance place in curriculum, a particular subject must possess the following views-

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1. Utility of particular subject in daily life.
2. Whether the subject is helpful in the development of mental discipline or not.
3. The social and cultural importance of particular subject.

Today, Mathematics holds an important place in schools. For giving a place in curriculum there is no special need of evaluation and testing of it. Mathematics also helps to develop the child as social and intellectual citizens, like other subjects. It has its own disciplinary values. In addition to these, mathematics also develops those qualities which can be developed by other subjects. Napoleon also remarked that, “The progress and improvement of Mathematics is linked to the prosperity of the state”.

Generally, the children are sending to schools for achieving different goals and it is assumed that the child will be able to achieve the following objectives:

1. Acquisition of knowledge and skills
2. Acquisition of intellectual of habits and various powers as discipline etc.
3. Acquisition of desirable attitude and ideals.

1.1.2. Importance of Academic Achievement at Matriculation Level

In India, board examinations refer to the pivotal examination that occur at the end of the 10th grade education and at the end of 12th grade education. The board examination is the most important examination in the life of a student. It is a stage which determines the future course of action of the student. Moreover, it is the terminal stage of school and hence his performance in the board exams is therefore an indication of how well he has fared as a student in the school. The scores achieved in these exams are considered very important for getting into university, getting into professional courses or training programs and even possibly in finding employment. It is also a time of intense pressure for the students, parents as well as teachers.

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In today’s highly competitive world, success in matriculation means much more than mere achievement. It has become a scale of measuring the future success of the student, the key to a good career, sound financial security and much more. Hence, the problem of predicting high school success has received more public attention than any other event in the field of education; it is also assuming greater importance from day to day.

The Indian system of education fundamentally consists of five years of primarily schooling, followed by five years of secondary schooling. The SSLC (Secondary School Leaving Certificate) must be obtained at the end of term of study at the secondary school. On obtaining this certificate, the student is deemed to have completed his basic schooling or basic education. After successful completion of SSLC, a student wishing to pursue his education further would join a course based on the specialization he chooses and which gives him knowledge sufficient for him to enter a university which is sometimes called a Pre-University course (PUC), for two years. After this twelve year period of study a student may enter a university for undergraduate studies. Alternatively, after obtaining the SSLC, a student may choose to attend an industrial training institute where one can be trained in skills necessary for technical occupations. The other options include joining polytechnic for a three year course of diploma in engineering and then further pursuing degree in engineering after the completion of diploma.

The SSLC is obtained by passing a public examination, i.e., an examination that has been formulated by the regional board of education that the school is affiliated with, and not by members of the faculty of the school. The performance of a student in the SSLC examination is one of the factors in admission to Pre University Courses in India. Therefore, the SSLC is often regarded as the first important examination that a student undertakes.

Therefore, academic achievement at the matriculation level is such a crucial event in the student’s life, so much so that apart from the students, parents too are anxious about their children attaining high scores as they know that high scores leads to a chance towards good jobs and financial security.
1.1.3. Importance of Problem Solving Ability.

Problem solving is that practice which improves students’ problem-solving abilities. Introducing new concepts and skills through problem-solving initiates understanding. Introducing concepts and skills in problem-solving contexts evokes thinking and reasoning about mathematical ideas. Students who think and reason about mathematical ideas learn to connect these new ideas to ideas previously learned, that is, they develop under. In the process of solving the problems, often students would re-organize their information, re-construct arguments and look for different contexts to verify their ideas. A problem solving ability refers as that a problem is not necessarily solved because the correct answer has been made. A problem is not truly solved unless the learner understands what he has done and knows why his actions were appropriate.

To help young people be better problem solvers is to prepare them not only to think mathematically but to approach life’s challenges with confidence in their problem-solving ability. The thinking and skills required for mathematical problem solving transfer to other areas of life. Things learned with understanding are the most useful things to know in a changing and unpredictable world,” explains Hiebert and colleagues. Yet, usefulness is not the only reason to learn with understanding. To learn with understanding is to also grapple intellectually with mathematics as a subject. “When we memorize rules for moving symbols around on paper we may be learning something, but we are not learning mathematics,” says Hiebert. “Knowing a subject means getting inside it and seeing how things work, how things are related to each other, and why they work like they do.”

The aim of teaching problem solving as art is to develop students’ abilities to become skillful and enthusiastic problem solvers; to be independent thinkers who are capable of dealing with open-ended, ill-defined problems. Problem solving has been used as justification for teaching mathematics. To persuade students of the value of mathematics, the content is related to real world problem-solving experiences. Problem solving also has been used to motivate students, sparking their interest in a specific mathematical topic or algorithm by providing a contextual (real-world) example of its use. Problem solving has been used as recreation, a fun activity often used as a reward or break from routine studies. Problem solving as practice, probably
the most widespread use, has been used to reinforce skills and concepts that have been taught directly.

Problem solving in mathematics can be described as "thinking and working mathematically" but the converse is not true. Problem solving in mathematics is a complex process which requires an individual who is engaged in a mathematical task to coordinate and manage domain-specific and domain-general pieces of knowledge. In order to begin the process of solving a math problem we need to understand the problem. By understanding the problem, we know what the problem is asking for, and then we will be able to identify the known and Unknown. All math problems give us information and ask us to find the unknown information. The first thing we need to write down is what we know in the problem. Then we need to write down what we do not know. This is the information we will be solving for. Now that we have identified the known and unknown in the problem, we can translate this information from English to Math. We can develop a relationship between the known information and unknown information by writing an equation with appropriate variables. Then the equation is already set up from the previous step. Now we can solve the equation by using the correct mathematical operations. We can check the validity of the answer by plugging it back into the original equation. If both sides are equal then we have solved the problem. Otherwise, we need to refer back to the previous steps to check for any errors in mathematical calculations, translation, and overall understanding of the problem.

1.2 Needs and Justification of the Study

Mathematics is needed in every human being in day to day life. Mathematics is essential in music, dancing, marketing, aesthetic etc. It is an important subject, it is considered as father of all sciences. Mathematics helps the students in achieving the educational goal and objectives. The importance of mathematics and be expressed in the form of values. It helps in attaining and developing various values among the child. There are certain values of teaching mathematics. The value gives meaning and strength to a person’s character by occupying a central place in his life. Education is the foundation for the success of any given society. Whether or not it is true that education is a basic human right and when that right is granted, growth and development in the society as a whole is more likely to improve in the society.
There is a serious drawback in the field of education especially the science education, most of the students after their class X exam they opted for arts subject. The reason for this may vary, but one of the reasons is that the students they don’t like math and they feel that it is very tough. Students holding such beliefs (that mathematics is a tough subject) may not even attempt to solve a problem that involves too much complexity.

Students in mathematics classes that do not emphasize problem solving are being deprived, as well, of the feelings of exhilaration and empowerment that come from mastering a difficult problem. They are not developing the tools and the confidence they will need to tackle the types of problems that will occur in their working and personal lives. They often fail to gain a deeper conceptual understanding that comes from constructing one’s own mathematical truths through deep thinking.

One of the most important aims of education is to impart knowledge to the students and this is done with the help of the schools. The school is one of the most important formal agencies of education. It plays a major role in molding the ideas, habits and attitudes of the children with a view to producing well balanced personalities, physically and emotionally strong, mentally alert, emotionally stable, culturally sound and socially efficient members of the society. The school is a social institute set up by the society to serve its many needs. It is a place where men and women of tomorrow are trained and disciplined in certain forms of activities. The future of man depends on their good performance in the examination. A student who prepares himself well in the examination can expect a good result which will ultimately be the key to his success and happiness in the future. Academic performance is hence very important to all students as it decides the future of the student according to his capacity and ability.

Jowai is one of the towns in Meghalaya, where there were number of schools managed by the state as well as the central government, various religious missions, non-governmental organizations, private bodies as well as individuals, are mushrooming at every nook and corner of the town. Many of these schools are well established and have excellence history of excellence in the board examination while at the same time; there are the odd schools which are incapable of good performances. The students from government and private schools differ significantly
so far as their socio-economic status and academic achievement was concerned and found that the government and private school students from highly advanced, advanced and normal schools differed significantly so far as their socio-economic status was concerned.

Every year, selection test for class X was held and the result was declared after one month. Student who cleared the selection test will be appearing for the board exam which held between the month of February and March. The results of these examinations are usually declared between the months of May and June and are a time of great anxiety for both the students as well as the parents.

Whether or not this is true can only be ascertained by conducting a research on the marks that are allotted from their half yearly marks and from the standardized test given by the investigator. By comparing the marks obtained from these two tests, the investigator can reached to the conclusion on the ability of the students to solve problems in Mathematics.

The system of formal education consists of three major components: objectives, curriculum and evaluation (Bloom, 1956). These three components are so intimately bonded together that it is difficult to conceive of one without the other two. Curriculum and examination are the two faces of the same coin and it is only when they operate together that the objectives of education can be adequate and sufficiently reached. In the process of education, the first question that one naturally has to face is: Where to go? The first task in the process, therefore, is to formulate in very précis terms, the objectives which are the outcome of learning. The second question is how to go? This necessitates that a set of learning experiences the curriculum- is carefully designed to realize the objectives formulated. The logical third question is has the destination been reached? The final step in the process is to check whether or not the learning experiences have produced the desired results in terms of the stated objectives. One of the most popular and widely used tools of the evaluation is therefore, examination. It is thus apparent that examination is closely linked with the educational objectives and teaching-learning process.

Successful and unsuccessful problem solvers in mathematics differ with regard to knowledge, control and beliefs and affect factors. The review of the

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research literature on factors that contribute to students' difficulty in mathematical problem solving suggests that, the mathematics content level of the problems which students at different year levels of schooling will be able to solve successfully, and the different strategies or heuristics which students at different year levels use to solve the same mathematical problems must govern the design of problem-solving curricula at the various year levels of schooling.

Thus, the investigator therefore feels the need to take an in-depth study into the above mentioned facts and this project will therefore take a survey of the factors responsible for these failures, the effects on the students and future of our society and proffer means of changing the trend of students’ poor performance in mathematics. Since no study in this particular area was found so far, the investigator has therefore decided to take up the present study.

1.3 Statement of the Problem.

The problem under consideration is stated as follows:

“A Study of the Academic Achievement in Mathematics in relation to the Problem Solving Ability of X class students in Jowai Town”.

1.4 Operational Definition of the key Terms Used

The present study involves three key terms, viz., ‘Academic Achievement’, ‘Mathematics’ and Problem solving Ability ‘. These are defining as follows:-

**Academic Achievement:** refers to the half yearly examination marks of X Grade students in Mathematics as obtained in their half yearly examination conducted by their respective schools.

**Mathematics:** is a science of numbers and their operations, interrelations, combinations, generalizations and abstractions of space configurations and their structure, measurement, transformation and generalization. Mathematics is a process of enquiry and coming to know, adding to the sum of knowledge. Mathematics is not a finished product, for its results remain open to revision.
Problem solving Ability:

Problem solving is the frame-work or pattern within which creative thinking and reasoning take place. It is the ability to think and reason on given levels of complexity. People who have learned effective problem solving techniques are able to solve problems at higher levels of complexity than more intelligent people who have not such training.

1.5 Objectives of the study:

The present study aims to fulfill the following objectives:

I. To find out the problem solving ability of class X students studying in Secondary Schools of Jowai Town.
II. To find out the mathematics marks obtained by class X students studying in Secondary Schools of Jowai Town.
III. To find out the difference between the mathematics marks obtained by boys and girls in X grade examination.
IV. To find out the difference between the problem solving ability obtained by X grade boys and girls.
V. To find out the difference between the problem solving ability of high and low achievers boys.
VI. To find out the difference between the problem solving ability of high and low achievers girls.

1.6 Hypothesis under the Study:

I. There is no significant difference between the mathematics marks obtained by boys and girls in X grade examination.
II. There is no significant difference between the problem solving ability obtained by X grade boys and girls.
III. There is no significant difference between the problem solving ability of high and low achievers boys.
IV. There is no significant difference between the problem solving ability of high and low achievers girls.
1.7 The Delimitations of the study:

The study will be delimited to the two Secondary Schools in Jowai Town.