



**ORIGINAL RESEARCH PAPER**

**Education**

**MATHEMATICS TEACHING AT VARIOUS LEVELS IN SCHOOL: PRACTICES AND PROBLEMS**

**KEY WORDS:** Mathematics education, Primary and Secondary level, NCF 2005

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**ABSTRACT**

Mathematics is a study of measurements, numbers, and space. It has Greek origin which means tendencies to learn. Everyday activities like driving, timekeeping, and cooking as well as professions like accounting, finance, banking, engineering, and software all rely heavily on mathematics. Mathematics is a powerful tool for developing mental discipline and aids in our understanding of the world. Mathematics is required to comprehend other fields of study. All rely on mathematics in some capacity. Mathematics is a natural method of conducting research and analysing data to find solutions to mathematical problems. At all levels, mathematics is taught as a fundamental subject. However, at every stage, teachers face several problems while teaching mathematics. The problems are related to planning a lesson, teaching of concepts, methods of teaching and assessment and upgradation of teachers in the subject. This paper discusses the aims of mathematics education at different levels based on NCF 2005 and sheds light on the problems faced by teachers in imparting mathematics education. Prevailing practices in mathematics education are also key aspect of this paper. The paper is concluded with some suggestions to resolve the issues related mathematics teaching.

**INTRODUCTION:**

“Mathematics is the gate and key to all sciences. Neglect of mathematics works injury to all knowledge, since he who is ignorant of it cannot know the other sciences or things of the world and what is worse men who are thus ignorant and so do not seek a remedy” (Eves, 1983) Mathematics is a study of measurements, numbers, and space. It has Greek origin which means tendencies to learn.

**Mathematics in daily life**

Everyday activities like driving, timekeeping, and cooking as well as professions like accounting, finance, banking, engineering, and software all rely heavily on mathematics. Strong mathematical skills are necessary for these functions, and scientific experiments by scientists require mathematical methods. They serve as a vocabulary for describing the work and accomplishments of scientists.

The science of mathematics examines the logic of order, quantity, and shape. We use math in everything we do and it is all around us. Everything in our daily life, including mobile technology, computers, software, ancient and modern architecture, art, money, engineering, and even sports, is built on it.

**Importance of Mathematics in School Education**

Human intellect and logic are fundamentally based in mathematics, which is also essential to our efforts to understand the outside world and ourselves. Mathematics promotes logical thinking and mental rigour and is a useful method for developing mental discipline. Additionally, comprehending mathematics is essential for learning other academic disciplines like physics, social studies, and even music and art.

Mathematics is a potent tool for intercultural understanding and communication that streamlines and prevents confusion in our daily lives.

Mathematics is a powerful tool for developing mental discipline and aids in our understanding of the world.

Math fosters logical reasoning, critical analysis, inventiveness, abstract or spatial thinking, problem-solving aptitude, and even good communication abilities.

The foundation of modern ordered life is mathematics. We are unable to settle any problems in our daily lives without the use of numbers and mathematical evidence. We would be faced with uncertainty and turmoil in the absence of these data related to times, measures, rates, wages, tenders, discounts,

claims, supply, jobs, inventories, contracts, taxes, money exchange, consumption, etc.

As a result, ever since the dawn of humankind, mathematics has accompanied and assisted man. The first time a man needed to find an answer to a query like "How many?" he created math. Then computations, measurements, analysis, and engineering were made easier thanks to the invention of algebra.

Trigonometry is a branch of mathematics that was developed to help people find high mountains and stars.

Although the value of mathematics cannot be overstated, many students around the world have a general aversion to math.

Mathematics is required to comprehend other fields of study. All rely on mathematics in some capacity. Other than mathematics being the key to it, there is no science, art, or expertise. The scale of mathematics is closely related to the discipline and mastery of any other science or art. The usage of this science in all spheres of life and across all disciplines is what makes mathematics so significant. It is a process based on investigation and analysis to arrive at the desired outcomes, and it is utilised for data calculation and presentation.

**The Importance of Mathematics to Individuals**

The demand for mathematics in an individual is equal to the need for mathematics in society, making it one of the most crucial sciences that cannot be ignored. Math helps an individual manage time, plan activities, understand economics, and convey the most precise and objective ideas.

**The Importance of Mathematics to Society**

Mathematics is a natural method of conducting research and analysing data to find solutions to mathematical problems. At all levels, mathematics is taught as a fundamental subject.

- The accuracy of performing social research through the statistics branch is strongly dependent on mathematics, including mathematical knowledge and skills, as is the case with the study of physics or chemistry.
- Mathematics helps in the development and refinement of personality, through organization and accuracy, research and investigation.
- Civilization developed through innovations made by people, discovery of zero is one example.
- Technological advancement with the help of binary

numbers has changed the word society.

The figure below reflects how mathematics remained helpful in cognitive and intellectual development.



**Fig: How mathematics is useful?**

**Aims of Mathematics Education**

The primary objective of mathematics education is to increase students' capacity for mathematization. The sole purpose of math instruction in schools is to help students acquire "useful" skills, particularly those that deal with numbers, number operations, measurements, decimals, and percentages. The ultimate goal is to help the youngster build the skills necessary to reason quantitatively, follow presumptions to their logical conclusion, and deal with abstraction. It entails a method of operation as well as the capacity and disposition to identify issues and find solutions (NCF,2005).

In mathematics lesson at school, students are taught abstraction, quantification, analogy, case analysis, reduction to smaller circumstances, even guess-and-verify tasks. While learning the aforementioned problem-solving techniques, students are exposed to heuristics. Mathematics can aid in the development of skills such as visualisation and representation. Math is best used to model situations using numbers, shapes, and forms. There are numerous ways to represent mathematical ideas, and these representations can be used for a number of goals in various situations. Additionally, links between mathematics and other fields of study are required. Children should be encouraged to understand functional relationships in the sciences and how useful mathematics is in the study of science. Systematic thinking, precision, clear language use, and rigour in mathematical formulations are all essential elements and significant in mathematical communication.

**Aims of Mathematics Education at Early Childhood**

The National Council of Teachers of Mathematics (NCTM) and the National Association for the Education of Young Children (NAEYC) concur that a foundational mathematics education that is of the highest calibre, engaging, and accessible for children aged three to six is essential for future mathematics learning.

Children should be exposed to effective, research-based curricula and teaching strategies in every early childhood environment. Policies, organisational supports, and sufficient resources are needed for teachers to perform this difficult and crucial task in order to provide such high-quality classroom practise.

Children notice and explore the mathematical features of their world throughout the early years of life. They compare quantities, identify patterns, move through space, and solve actual issues like balancing a tall block structure or dividing a bowl of crackers equitably with a playmate. Children who are proficient in mathematics are better able to understand the

world around them and provide a strong basis for future academic achievement.

**Aims of Mathematics education at the pre-primary stage:**

At the pre-primary stage, children learn through play, they learn and understand the connection between word games and counting, and between counting and quantity. Through play way methods, they are taught simple comparisons and classifications along one dimension at a time. They identify shapes and symmetries through activities(NCF,2005).

**Aims of Mathematics education at the primary stage**

Development of positive attitude towards mathematics is crucial for further learning at primary stage. Mathematical games, puzzles and stories help in developing a positive attitude and in making connections between mathematics and everyday thinking. Along with numbers and their operations, emphasis is placed on forms, spatial awareness, patterns, measurement, and data management. In addition to computational skills, emphasis is placed on pattern recognition, expression, and explanation, estimation and approximation in problem-solving, linkages, and the growth of language skills in communication and reasoning.

At the upper primary stage, students learn to apply powerful abstract concepts. They are introduced to algebraic notation and its use in solving problems. Data handling, representation and interpretation and spatial reasoning and visualisation skills develop through proper mathematics education at this stage(NCF,2005).

**Aims of Mathematics education at the secondary stage**

Students in the secondary stage begin to understand the structure of Mathematics as a discipline. They become acquainted with the defined terms and concepts, the use of symbols to represent them, precisely stated propositions, and proofs justifying propositions. These aspects are particularly developed in the field of geometry. Students improve their algebra skills. They integrate many concepts and skills into problem-solving ability. At this stage, mathematical modelling, data analysis, and interpretation can be taught to consolidate a high level of mathematical literacy. Students must get opportunity to explore individually or in groupvarious connections and patterns, visualisation and generalisation, and making and proving hypotheses. This can be done by the use of appropriate tools such as concrete models found in mathematics laboratories and computers(NCF,2005).

**Aims of Mathematics education at the higher secondary stage**

The goal of the higher secondary mathematics curriculum is to provide students with an appreciation for the wide variety of applications of mathematics, as well as the basic tools that enable such applications. Topics that belong more naturally to other disciplines may be excluded from the mathematics curriculum and must naturally arouse the interest and curiosity of students (NCF,2005).

**Problems In Teaching And Learning Of Mathematics As Per Ncf 2005**

1. A majority of children have a sense of fear and failure regarding Mathematics. Hence, they give up early on, and drop out of serious mathematical learning.
2. The curriculum is disappointing not only to this non-participating majority, but also to the talented minority by offering them no challenges.
3. Problems, exercises and methods of evaluation are mechanical and repetitive, with too much emphasis on computation. Areas of Mathematics such as spatial thinking are not developed enough in the curriculum.
4. Teachers lack confidence, preparation and support.

**Difficulty faced by teachers in teaching mathematics at**

**school**

There are four major areas where a mathematics teachers need to pay attention. These are:

- Planning for teaching mathematics
- Executing mathematics lesson
- Assessment
- Mathematical knowledge

Below are some problems faced by teachers while providing mathematics education to children under each of the above four areas:

**Problems related to planning for teaching mathematics**

- Analyzing the mathematical content of the lesson to concepts, generalizations, skills and mathematical problems
- Determining the goals of the lesson
- Determining the appropriate teaching methods
- Determining the appropriate activities and teaching tools
- Determining the pre-learning of the lesson
- Determining the appropriate assessment techniques
- Determining the appropriate time for each teaching activity

**Problems related to execution of mathematics lesson**

- Attaining the appropriate teaching tools
- Using computer effectively in teaching mathematics
- Taking care of the individual differences between students
- Executing the planned teaching methods
- Using the different pattern of questions during the class discussions
- Motivating the students toward learning mathematics
- Managing the planned time for each teaching activity
- Introducing the lesson
- Executing the planned activities and teaching tools
- Getting the attention of the student toward the new learning

**Problems related to Assessment**

- Analyzing the exams results statistically
- Preparing questions that enhance the mathematical thinking
- Preparing the achievement test
- Diagnosing the difficulties that the students faced during their mathematics learning
- Diversifying the assessment techniques and test questions between essay and subjective questions
- Helping the students to overcome the difficulties of learning mathematics
- Preparing and pursuing the students' homeworks

**Problems related to Mathematical knowledge**

- Need of training courses to enrich mathematical knowledge
- Difficulty in teaching some mathematics concepts and some of the questions and exercises that exist in the mathematics textbook
- Difficulty in getting assistance from other teachers/colleagues to explain some mathematical concepts
- Unavailability of teacher guide book to answer the questions and exercises that exist in the mathematics textbook
- Inaccessibility of references and extra books in mathematics to clarify some mathematical issues

Crystal Stein, Research Assistant, SAMPI—Western Michigan University came out with the following barriers for mathematics teachers which are student related:

- Lack of prior knowledge
- Lack of motivation/effort/interest
- Lack of Parental support/involvement
- Addressing misconceptions

- Mathematics teachers set goals of learning for their students with respect to achievement in mathematics every day and at every stage.
- They engage students in tasks that promote mathematical reasoning and problem solving while providing multiple entry points and diverse solution strategies.
- They assist students in making connections between mathematical representations in order to deepen their understanding of mathematical concepts and procedures, as well as problem-solving tools.
- They facilitate student dialogue in order to develop a shared understanding of mathematical concepts by analysing and comparing student approaches and arguments.
- They use purposeful questions to assess and advance students' reasoning and sense making about key mathematical concepts and relationships.
- They build procedural fluency on a foundation of conceptual understanding so that students can become skilled at using procedures flexibly as they solve contextual and mathematical problems over time.
- They provide students with opportunities and supports to engage in productive struggle as they come out with mathematical ideas and relationships, both individually and collectively.
- They use evidence of student thinking to assess progress toward mathematical understanding and to continually adjust instruction to support and extend learning.

**Conclusion and suggestions:**

Mathematics is an important subject in the school curriculum. It is a required subject in all levels of the educational system, from pre-primary to higher secondary. The importance of mathematics in school curricula stems from the subject's role in scientific and technological development as well as national building. However, there are numerous issues with teaching this vital subject. To deal with those issues and problems it is important that pre-service or in-service, must focus on developing class teachers' mathematical teaching skills and providing them with the necessary mathematical knowledge. Educational administrations must also work to provide classroom teachers with the educational materials and tools they require to teach mathematics. It is also important that the difficulties and obstacles that mathematics teachers face in various grades and educational levels must be investigated properly.

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**Prevailing Practices In Mathematics Teaching**