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Dealing with Mathematics Phobia at Early Stages

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Abstract

Right from the childhood, mathematics is usually considered a burden or a difficult subject. Many students lack a strong foundation in mathematics. People often believe that mathematics requires much hard work and intellect to be proficient. Many times, teachers ignore if children do not understand the fundamental concepts of a topic. This happens when they are under pressure to follow the school's fixed schedule to cover the syllabus as prescribed. Such children feel anxious when forced to start learning further advanced topics. In the early stages, children do not ask questions in classrooms for various reasons— they may be shy or afraid, or do not know how to ask questions. When they grow a little older, they may think that they would not be considered good children by teachers if they ask too many questions. All these factors cumulatively harm the psychology of a young child, and he/she starts distancing themselves from the subject that is connected with their daily lives and could be interesting if learned properly. This may develop an avoidance attitude and cause anxiety in their young brains. In our day-to-day conversation, we may call it a phobia. The research findings deny any such phenomenon. This may be observed because of continued neglect of mathematics learning by the child. Once we help build a solid foundation, we can get them excited about mathematics. They may start as not being able to solve even a basic maths problem, but in a short period, they start finding maths much more enjoyable. This experience can be compared to cycling; once you learn the basics and witness wins, further effort becomes much easier.

INTRODUCTION

Shreya, a Class 2 child, would often say, “Give me any task; I will do it, but please don’t ask me maths problems

... I fear adding and subtracting ... I start getting butterflies in my stomach as my mathematics class starts ... I have told my mom several times, but

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she says, 'Don't fear, just practise' ... I don't know how ... I am just waiting for the day when mathematics will be out of my life."

Such an experience is not uncommon. Parents are also left wondering why their child fears mathematics, "I don't know why, but Shreya fears mathematics." Such statements should not be taken casually. There is no phenomenon like 'phobia', which is generally cited. Perhaps, it indicates a lack of proper pedagogy in the early years to engage children in the learning of mathematics, which ultimately leads to a lack of interest and then wanting to escape learning maths.

Various state and national level surveys have presented a gloomy picture of children's achievement in literacy and numeracy in the early years of primary education. The average performance of children (at the national level) in Class 3 according to the National Achievement Survey (NAS) 2021, on a scale of 500, was 323 (64.6 per cent). Although NAS and ASER use different metrics and methods for assessing learning, both point to the fact that basic learning levels of school children need significant improvement. Besides these two national level surveys, the state governments also conduct achievement surveys to assess the health of their education system, especially in the critical areas of literacy and numeracy. The low levels of literacy and numeracy in early

grades have always been a concern for policymakers.

Before the launch of the National Education Policy (NEP) 2020, the world faced the COVID-19 pandemic, during which schools were shut and no face-to-face teaching was taking place. During this period, children in government primary schools were the most deprived, from an educational point of view. Private schools and teachers in higher grades in government schools managed to teach through the remote mode, using online technologies, like WhatsApp, emails, etc. The policymakers of NEP 2020 were aware of this situation. Children learn at the best pace during their early years. Taking cognisance of this fact, NEP 2020 highlighted the urgent need to ensure that by Class 3 all children must acquire basic reading and arithmetic skills. The launch of NEP 2020 and the conditions of learning in primary schools after the pandemic caught the much-needed and focused attention of policymakers.

With all this in the background, the National Initiative for Proficiency in Reading with Understanding and Numeracy, or the NIPUN Bharat Mission, more popular as the Foundational Literacy and Numeracy (FLN) Mission, was launched in 2021. This mission reflects concern for poor achievement levels in literacy and numeracy, and calls for immediate intervention at all levels in a time-bound manner. The push given by NEP 2020 to achieve universal

foundational literacy and numeracy by the end of Class 3, recently amended to Class 2, was visualised as a priority need to improve the learning losses.

WHAT IS MATHEMATICS ANXIETY OR MATHEMATICS PHOBIA?

Mathematics anxiety is a common experience among students. In the early stage, it may cause a young child to feel worried or scared about solving mathematics problems, which prevents him/her from thinking. This leads to a cycle of low confidence and anxiety that can affect school or work performance. Students' feelings about mathematics may not always be obvious to the teacher. Careful observation can help the teacher to detect early symptoms of mathematics anxiety. For example, the teacher may find that a student is quiet, avoids eye contact and has closed body language only in the mathematics class. A student uses avoidance techniques to give up when solving mathematics problems or tasks. While these situations cannot be perfect indicators of mathematics anxiety, these performances could be indicative. Teachers must be aware of and attentive to these behaviours. At the foundational stage, mathematics anxiety or phobia can be easily handled by bringing changes in the pedagogy and developing connections with each child.

WHY IS LEARNING MATHEMATICS IMPORTANT?

Mathematics should not be considered just a subject involving numbers, subtractions and addition. It is a critical part of the cognitive development of children and a necessary life skill. The practice of mathematics is an exercise for the brain. It sharpens the mental capacities and cognitive skills of children. As a result, they become capable of imagining and understanding the cause-and-effect relationship. Through mathematical learning, children get opportunities to recognise, and draw shapes, symbols and patterns. They can craft connections and build on brain synapses. Research of human brain also indicates that the neuro connections, synapses, will be wasted if these are not activated through exercises and experiences in the early years. That is why the early stages, ranging from 3 to 11 years, are considered critical. Mathematical learning plays a significant role in cognitive development. Experiences also reveal that children make use of daily interactions to understand the concept of subtraction and addition. It may not be a part of their school learning process, but they have relatively informal engagements with peers and adults. The National Curriculum Framework for School Education (NCF-SE) 2023 has recognised mathematical learning “as

a challenge for our present system”. It mentions that our current education system has faced multiple challenges with respect to learning mathematics. Currently, a large proportion of students in the early grades are not achieving foundational literacy and numeracy. This makes it difficult for the students to achieve further higher learning in mathematics and excludes them from effective economic and democratic participation in the later years (NCF-SE 2023).

WHAT ARE FOUNDATIONAL NUMERACY SKILLS AT THE EARLY STAGES OF EDUCATION?

As a concept, foundational numeracy is the ability of a person to understand numbers and related concepts in ways that are used in day-to-day life. It also means that a person is able to make sense of numbers that direct their everyday lives, from being able to pay for things to counting items they purchase, or making basic financial decisions about saving, spending and more of such decisions. Numeracy skills generally involve understanding numbers, counting, solving number problems, measuring, estimating, sorting, noticing patterns, adding and subtracting numbers, and so on. Foundational numeracy works as the building block for more abstract mathematical concepts later. It develops the fundamental skills in young children to learn complex mathematical concepts, develop

problem-solving skills and sharpen their analytical abilities.

The numeracy skills for the foundational stage, early childhood and Classes 1 and 2 generally involve understanding numbers, counting, solving number problems, measuring, estimating, sorting, noticing patterns, adding and subtracting numbers, and so on. Number sense, spatial sense and problem-solving are considered critical numeracy skills at this stage. How soon can you teach a child how to do all these things? The answer is at the earliest! However, to impart foundational numeracy correctly, the approach should be competency-based and not through rote learning. Competency-based mathematical learning emphasises providing diverse opportunities to practise the same concept in different situations. These situations should be age-appropriate and interesting for the children. Regular practice towards sharpening foundational numeracy develops interest in learning mathematics in the initial years. Once children start taking interest in learning mathematics, their mind is freed of maths anxiety. Besides, there are so many fun ways to learn it!

TRACKING THE SOURCE OF ANXIETY IN MATHEMATICS

Mathematics phobia starts from anxiety in learning mathematics. It is important to observe children and notice that they don't suffer from

mathematics anxiety. “Math anxiety severely impacts a student’s ability to enjoy math, motivation to take more math or do well in mathematics” (Ash Craft and Krause, 2007). There can be several reasons which cause anxiety or maths phobia in the early years. Some common situations could be as follows:

1. Students are unable to imagine the strong connection between mathematics and real life. They struggle to understand ‘why’ they need to understand the concept and how it will help them in the future.
2. Many teachers and parents unmindfully tell young children that they are either a maths person or not. However, neuroscience studies have negated such an assumption. Rather, these studies show that all students can learn mathematics.
3. Mathematics is taught as a subject of speed, having depth, analysis, creativity and ideas.
4. Mathematics is taken as a subject of repeated practice, with no change in the methods of delivering a concept. This makes the subject monotonous and boring.

PEDAGOGY FOR EARLY MATHEMATICS

Teaching and learning through formal methods provides limited learning experiences to children. They remain passive recipients in this process, as they find the learning atmosphere dull and

joyless. Young children learn better through hands-on activities, games, visual aids and real-life examples. The use of toys, manipulatives and other concrete materials facilitates joyful and play-based learning. The teachers and parents can provide a supportive and inviting learning environment with age- and developmentally appropriate material to further the development of numeracy skills. They can use manipulatives, incorporate mathematics into conversation and everyday activities, and offer a variety of pedagogic methods to accommodate all. If needed, the teachers should try to provide differentiated learning experiences to ensure that each student has mastered the foundational concepts in mathematics. There are many creative ways to teach foundational numeracy to children. It is a matter of engaging them in ways they want to learn. Children enjoy doing things that are fun and interesting. For example, while buying fruits, give children a chance to compare the prices of different fruits and tell you which fruit is cheaper than the other. If they are a little older, give them a problem with limited money to buy two types of fruits in different quantities. Make it fun and interesting. The important consideration is to ensure that children like this engagement. They should never be given the feeling of ‘not being able to do’. Of course, the questions must be according to the child’s skill level.

NCF-SE 2023 ON THE FEAR OF MATHEMATICS

There are two major aspects that cause fear of mathematics. Firstly, the nature of the subject and how it is taught and assessed, and secondly, how it is perceived in the society. Concepts in mathematics are often cumulative in nature. When children do not understand fundamental concepts, they cannot learn higher concepts with proficiency. For example, if the students struggle with place value, they will certainly struggle with all four basic operations and decimal numbers and hence, even word problems. Most assessment techniques and questions focus on facts, procedures and memorisation of formulae. When symbols, part of the 'language' of mathematics, are operated without understanding, many students encounter boredom and confusion. Besides, societal perceptions and expectations cause many parents to pressure their children into choosing a career in the science stream, ignoring their passion and interests. This deprives children from an early stage of enjoying the process of mathematical exploration. Similarly, mathematical ability is considered critical to pass any competitive examination, such as JEE, NEET, etc., for entering professional courses. Due to immense competition in these exams, these children enrol into coaching classes to get a high score in mathematics by any means. They miss the chance

to understand their own pace or grasp mathematical concepts well. Apart from that, they are unable to appreciate its joy and wonder. All these factors cause detachment and make children avoid the subject.

Another important reason for math phobia is the methods, techniques and expectations that govern assessment. While assessment should focus on understanding, reasoning and applying different mathematical techniques in different contexts, the current need is to reflect on the approach towards teaching mathematics. Children should be exposed to different experiences so that they are able to see maths as an important part of their lives and enjoy it. The greater focus should be on reasoning, innovative thinking and problem-solving. Children should not be allowed to fall behind in mathematics—if they do fall behind for any reason, the effort should be to support them in catching up immediately.

MATHEMATICS PEDAGOGY AND NATIONAL CURRICULUM FRAMEWORK FOR FOUNDATIONAL STAGE 2022

Research findings show that children may develop a strong dislike and negative attitude towards mathematics as early as in Class 3. Thus, early learning should not only focus on developing mathematical competencies but also on supporting children in developing a positive relationship with mathematics as a

subject. The NCF-FS 2022 provides the following approaches to making learning mathematics enjoyable.

I. Developing Concepts Through Concrete Experiences: The Experience, Language, Picture, Symbols Approach

It is important that children learn abstract concepts by first engaging in concrete experiences, then developing language through communication, and gradually progress from pictorial representation to fully abstract understanding. The following sequence can be followed:

1. *Experience*: For example, counting concrete objects for learning numbers.
2. *Spoken language*: Describing the experience in language, for example, what is being counted, how many have been counted, etc.
3. *Pictures*: Representing mathematical concepts in a pictorial form. For example, if three balls have been counted, these can be represented through three pictures of the ball.
4. *Written symbols*: Concrete experience and pictorial representation can be generalised in written symbols such as writing the number three for three balls.

II. Connecting Mathematics Learning with Children's Real-life and Prior Knowledge

Children become interested in learning when classroom transactions and experiences are connected to their

daily life discussions and chores. Teachers and adults should use real-life examples to build conceptual and problem-solving abilities.

III. Mathematics as a Problem-solving Tool

The utility and benefits of learning mathematics should be demonstrated by using maths as a problem-solving tool, and problems should be situated in the context of the child. Children should learn more than one way of problem-solving. For example, what would be different strategies to solve $9+6$?

IV. Using Mathematical Talk, Communication and Reasoning

In a mathematics classroom, the conversation between teachers and children should be around mathematical concepts, processes, applications and reasoning. An oral maths talk must be encouraged in the classroom rather than engaging in written tasks silently. The discussion or conversation must relate to the mathematics that children encounter in their real life and provide an opportunity for children to explain their mathematical thinking and reasoning.

V. Developing a Positive Attitude towards Learning Mathematics

Sometimes children come with a preconceived notion that maths is difficult. The priority should be to remove such biases from children's minds by giving them small

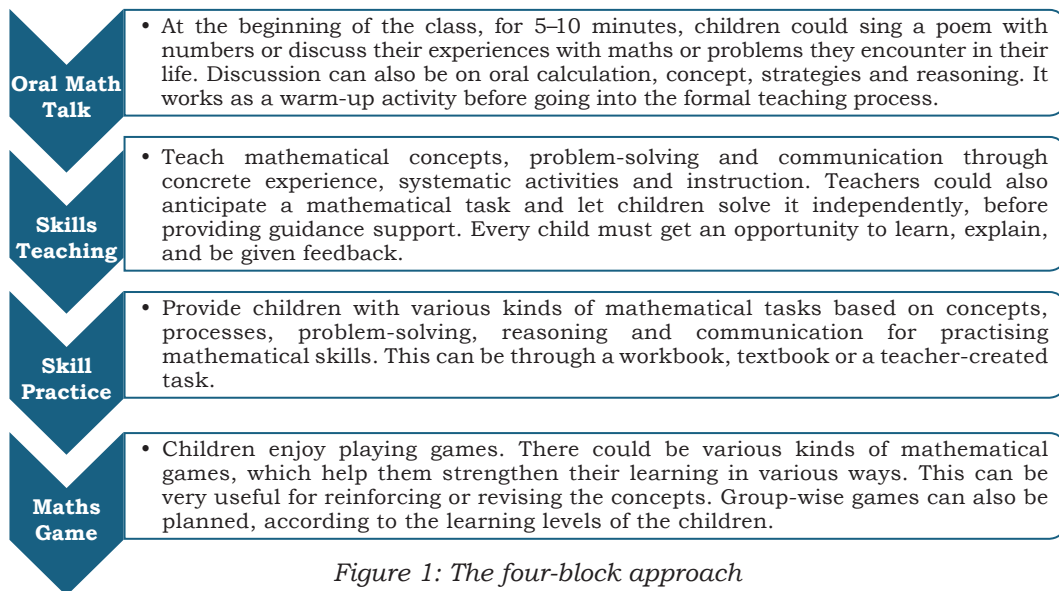


Figure 1: The four-block approach

data-handling or pattern-making tasks. Teachers and adults should help children progress by taking small steps, with clarity.

Another pedagogical approach suggested under NCF-FS 2022 is popularly known as the ‘Four-block Approach’. When the teacher understands both ELPS and the four-block approach, they can use them judiciously to sharpen children’s mathematical skills and inculcate an interest in learning mathematics. Figure 1 illustrates this four-block approach.

HOW TO OVERCOME MATHEMATICS PHOBIA?

1. Exposure to maths should be provided from an early age.
2. Helping the child understand the basic concepts and their application in our lives can generate interest and strengthen the foundation for learning mathematics.
3. The use of calculators or other similar mathematical aids can mar responsiveness and impede rational thinking in young children. Therefore, it should be discouraged.
4. Pictures can be very helpful as they can help overcome language barriers. Help children visualise any mathematical problem in terms of figures and drawings.
5. Never encourage children to implement tricks and shortcuts in mathematics. Direct application of core concepts will strengthen foundational learning.
6. Practice is the key to everything. Tell children to ask someone to

explain the concept, if they are in doubt. They must never be eager to get ready-made solutions for any problem. That way their analytical skills will improve.

7. Do not consider mathematics an alien subject that will trouble you whenever you go for it.

CONCLUSION

Mathematics is a core subject with applications in all fields and day-to-day life. The teachers, parents and adults surrounding young children can offer mathematics learning through

interesting activities, using toys, games and other material. The adults need to be conscious of their pedagogy or ways of interacting with the child, while introducing the math concepts and further building upon that. They must also be good observers to catch early signs of interest or disinterest. The collaboration and sync among teachers, parents and adults have a lot of potential to develop interest in learning maths in the early stages of education. The overall conclusion is that the subject does not matter so much as making it fun and interesting.

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