Fazl Ali College Journal, ISSN:2319-6769, Vol. 7 (2017) 101 - 104

Familiarization not Memorization for Better Learning of Mathematics (A Perspective)

Aotemshi. I* and Watitoshi

Department of Mathematics, Fazl Ali College, Mokokchung, Nagaland

Mathematics Education

Received : 20 October 2017

Abstract

Mathematics is an interesting area in which one can trace the roots of civilization. Early mathematicians developed the base for today's mathematics. It is a vital subject which is used in our daily lives. A thorough understanding of how to learn Mathematics should be introduced through 'Familiarization' of numbers not 'Memorization.' In our society, it is quite contradictory when we connect Mathematics and its needs. Many learners have Maths Phobia. So, before the concept has been understood, we have preconceptions like, "It is a very difficult subject," "The formulas and steps are hard to memorize," etc. Maths need to be addressed as a familiar every day usage topic. Its understanding should go beyond formulas and tests.

Key words: arithmetic, geometry, algebra, memorization, familiarization, understanding the problem, solution, practice, phobia, formula, implementation.

Introduction

Mathematics is the science that deals with the logic of shape, quantity and arrangement. Math is all around us, in everything we do. It is the building block for everything in our daily lives, including mobile devices, architecture (ancient and modern), art, money, engineering, and even sports. Since the beginning of recorded history, mathematic discovery has been at the forefront of every civilized society, and in use in even the most primitive of cultures. The need of math arose based on the wants of society. The more complex a society, the more complex the mathematical needs. Primitive tribes needed little more than the ability to count, but also relied on math to calculate the position of the sun and the physics of hunting.

History of mathematics

Historical records show that several civilizations in China, India, Egypt, Central America and Mesopotamia contributed to mathematics as we know it today. The first people to develop a counting system were the Sumerians. Slowly the Mathematicians that followed developed arithmetic, which includes basic operations, multiplication, fractions and square roots. The Sumerians' system passed through the Akkadian Empire to the Babylonians around 300 B.C. Six hundred years later, in America, the Mayans developed elaborate calendar systems and were skilled astronomers. About this time, the concept of zero was developed.

With the progress of civilization, mathematicians began to work with geometry, which computes areas

* Corresponding author : draobalkr@rediffmail.com

and volumes to make angular measurements and has many practical applications. Geometry is used in everything from home construction to fashion and interior design. Geometry went hand in hand with algebra, invented in the ninth century by a Persian mathematician, Mohammed ibn-Musa al-Khowarizmi. He also developed quick methods for multiplying and dividing numbers, which are known as algorithms. Algebra offered civilizations a way to divide inheritances and allocate resources. The study of algebra meant mathematicians were solving linear equations and systems, as well as quadratics, and delving into positive and negative solutions.

Mathematicians in ancient times also began to look at number theory. With origins in the construction of shape, number theory looks at figurate numbers, the characterization of numbers, and theorems. The study of math within early civilizations was the building blocks for the math of the Greeks, who developed the model of abstract mathematics through geometry. Greece, with its incredible architecture and complex system of government, was the model of mathematic achievement until modern times.

After the fall of Rome, the development of mathematics was taken on by the Arabs, then the Europeans. Fibonacci was one of the first European mathematicians, and was famous for his theories on arithmetic, algebra, and geometry. The Renaissance led to advances that included decimal fractions, logarithms, and projective geometry. Number theory was greatly expanded upon, and theories like probability and analytic geometry ushered in a new age of mathematics, with calculus at the forefront. People often wonder what relevance mathematicians serve today. In a modern world, math such as applied mathematics is not only relevant, it's crucial. Applied mathematics is the branche of mathematics that are involved in the study of the physical, biological, or sociological world. The idea of applied math is to create a group of methods that solve problems in science. Modern areas of applied math include mathematical physics, mathematical biology, control theory, aerospace engineering, and math finance. Not only does applied math solve problems, but it also discovers new problems or develops new engineering disciplines. Applied mathematicians require expertise in many areas of math and science, physical intuition, common sense, and collaboration. The common approach in applied math is to build a mathematical model of a phenomenon, solve the model, and develop recommendations for performance improvement.

A thorough understanding of how to learn Mathematics should be introduced through 'Familiarization' of numbers not 'Memorization.'

What is 'Memorization'?

'Memorization' according to *Compact Oxford Reference Dictionary* is "learn by heart." **Rote learning** is a memorization technique based on repetition. Rote methods are routinely used when fast memorization is required, such as learning one's lines in a play or memorizing a telephone number. Rote learning is widely used in the mastery of foundational knowledge. Examples of school topics where rote learning is frequently used include phonics in reading, the periodic table in chemistry, multiplication tables in mathematics, anatomy in medicine, cases or statutes in law, basic formula in any science, etc.

In math and science, rote methods are often used, for example to memorize formulas. Nothing is faster than rote learning if a formula must be learned quickly for an imminent test and rote methods can be helpful for committing an understood fact to memory. A useful way to improve memorization is to use chunking, a method in which a person categorizes the information they are trying to memorize into groups. For example, a person wishing to memorize a long sequence of numbers can break the sequence up into chunks of three, allowing them to remember more of the numbers.

Similarly, this is how we often memorize telephone numbers, by breaking them up into the three sections: an area code, followed by a three-digit number and then a four-digit number. If a list of words is to be memorized, using chunking, the words could be broken up into groups based on their starting letter or based on their category (ex: Months of the year, types of food, etc.).

According to Stanford University's Jo Boaler, teachers and parents should stop using math flash cards, stop drilling kids in addition and multiplication and especially stop forcing students to do calculations quickly under time pressure. According to her study drilling without understanding is harmful in understanding Mathematics. She says, "I'm not saying that math facts aren't important. I'm saying that math facts are best learned when we understand them and use them in different situations." In a new working paper, *Fluency Without Fear: Research Evidence on the Best Ways to Learn Math Facts,* Boaler argues that many common math teaching tools – flash cards, math sprints and repetitive worksheets – are not only unhelpful, but also "damaging." And she singles out the new Common Core math curriculum in New York State, saying it misinterprets numerical "fluency" to mean rote memorization and speed. She explains that the key to success in math is having something called "number sense," and number sense is developed through "rich" mathematical problems. Too much emphasis on rote memorization inhibits students' abilities to think about numbers creatively, to build them up and break them down. She found that low-achieving students tended to memorize methods and were unable to interact with numbers flexibly. And she is currently working on a study with the Organization for Economic Cooperation and Development (OECD) in which she is finding that the lowest performing students in the world are the ones who think math is about memorization.

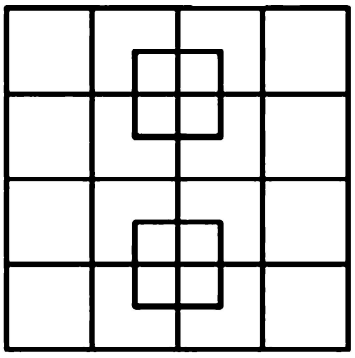
Therefore, Memorization of math facts, such as times tables, turns students off from math. Often, they're high achieving students who have the kind of creative minds that would otherwise excel at it.

What is 'Familiarization'?

'Familiarization' according to *Compact Oxford Reference Dictionary* is "**give (someone) knowledge or understanding of**." **Understand the problem. Focus on the solution.** Understand the problem, and then focus everything on the solution. It sounds easy, but many of us just focus on the problem, are often overwhelmed and filled with anxiety by its negative consequences and end up procrastinating. Others dive into the solution without fully understanding or addressing the problem. This risks seeking a solution to the wrong problem or a problem that doesn't even exist.

One's mind works best when it is directed on one thing. One can either move in the direction of the problem or the solution but not both at the same time. Once one has understood the problem it is time to change direction towards the solution, because as we all know, problems grow bigger when we brood on them.

How many squares are there in this picture?



Ninety two percent fail in this simple test. Why? It is because they have not understood the problem. This picture puzzle speaks volumes about our mathematical ability. If familiarized we get the

accurate answer, if taken as an exam task without pondering or familiarizing we get the wrong answer. To get the accurate answer one need to understand the problem first. One has to make out that the figure is square and not any other shape. Then, after understanding and familiarizing the figure one has to focus on the solution. The point to focus is possible only when one understands the problem. So, when we go about deducing the squares in the figure with interest because we have understood it, we get the solution. Therefore, one can easily agree that every problem has its solution in itself. The given figure has forty squares.

How can math be made familiar? First, human beings didn't invent math concepts; we discovered them. Also, the language of math is numbers, not English or German or Russian. If we are well versed in this language of numbers, it can help us make important decisions and perform everyday tasks. Math can help us to shop wisely, buy the right insurance, remodel a home within a budget, understand population growth, or even bet on the horse with the best chance of winning the race. Each year, millions of people travel to casinos hoping they will come away richer. Many more people visit their local supermarket each day to bet with lottery cards. People play the stock market, join in the office football pool, and meet with friends on the weekend for a game of poker. Why do we invest this money on chance? We do it because we believe we can beat the odds. We believe in the possibility of winning. Math is in reality, an indispensable part of everyday life. Familiarization of any problem is the core matter for anyone to get to the solution.

Conclusion

In our society, it is quite contradictory when we connect Mathematics and its needs. Many learners have Maths Phobia. So, before the concept is understood, we have preconceptions like, "It is a very difficult subject," "The formulas and steps are hard to memorize," etc. There is greater understanding if students commit a formula to memory through exercises that use the formula rather than through rote repetition of the formula. Newer standards often recommend that students derive formulas themselves to achieve the best understanding. According to popular research, students who learn with understanding are able to transfer their knowledge to tasks requiring problem-solving with greater success than those who learn only by rote. Mathematics thus is a subject which we live with every day. It can be enjoyed as a part of learning curriculum with right implementation.

Bibliography

1. Boaler, Jo. *What's Math Got to Do With It? : How Teachers and Parents Can Transform Mathematics Learning and Inspire Success*. UK: Penguin Books, 2015.
2. Courant, Richard. *What is Mathematics?: An Elementary Approach to Ideas and Methods*. London: Oxford University Press, 1996.
3. Gilbert T, George, Rhonda L. Hatcher. *Mathematics Beyond the Numbers*. United States: Kendall Hunt Publication Company, 2012.
4. Hoffman, Paul. *The Man Who Loved Only Numbers*. United States: Hyperion Books, 1998.
5. Powell, Michael. *Brain Boosting*. UK: Parragon Books Ltd., 2014.
6. Seife, Charles. *Zero: The Biography of a Dangerous Idea*. New York: Penguin Putnam Trade, 2000.
7. Soanes, Catherine. Ed. *Compact Oxford Reference Dictionary*. New York: Oxford University Press, 2001.