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OPINION

Mathematics phobia: Are the mathematical sciences a pothole in the road of life?

Pavlov Rameau and Clifford Louime

The anxiety feeling that leaves some of us defenceless at the thought of solving a mathematics problem has been dubbed mathematics phobia. It has also been described as an 'irreversible psychological pathology' interfering with one's ability to address mathematical issues¹. Symptoms of mathematics phobia could include excessive sweating, shortness of breath, heart palpitations, inability to speak or think clearly, or a full-blown anxiety attack². Most people directly affected are astounded to discover that they are far from alone in this shockingly widespread, although often unspoken, phobia. While mathematics phobia sufferers recognize that these worries are irrational, they are still overwhelmed by panic emotions when facing or at the contemplation of confronting the feared situation.

To better understand this condition, one should draw a big picture and analyse it from a societal perspective. First of all, what is mathematics? Mathematics is a language, a mode of communication, where universally accepted codes or symbols are used to replace longer statements and draw conclusions³. As in religion, mathematics as its core, has conventional concepts which are yet to be confirmed. A Christian, for example, does not require any proof regarding the birth of Jesus, neither does a mathematician, when it

comes to define a point, a line or an angle. Christianity indeed has a set of rules that Christians recognize as true, without questioning, such as the ten commandments. The mathematical sciences also have sets of viewpoints that mathematicians do not argue about. These are called axioms; for example, 'two right angles are equal' is an axiom. Many lines of faith follow the rules of the ten commandments. Forgiveness has replaced 'an eye for an eye'. In mathematics, many theorems follow the axioms. We have all heard of the Pythagorean theorem. As much as Christians believe in the *Bible*, there are reported inconsistencies in the *Bible*; for example, there are neither three days nor three nights between Good Friday and Easter Sunday, nor was Joshua able to stop the sun for 40 days, as the sun is fixed. Similarly, there have been some discrepancies in the theorems over the years. For example, L'Hopital's rule, named after mathematician L'Hopital, had originally some errors and was corrected later on by other mathematicians who have kept the name of the original author. Mathematics just like a religion is based on common accepted beliefs.

Knowledge and application of basic mathematics have always been an inherent and integral part of individual and collec-

tive life. Today, mathematics is used throughout the world in many fields, including the natural sciences, engineering, medicine and the social sciences⁴. Therefore, one should wonder how mathematics phobia sufferers go by without dealing with the subject. Simply put, mathematics is necessary, though not indispensable to individual achievement. As it has been shown in many cases, success in life can be achieved without being mathematics savvy. Knowledge and understanding of basic mathematical concepts can undoubtedly simplify your life, but do not preclude living a quality life. In addition, mathematics has several limitations when it comes to explaining some basic life theories. Although mathematics has been able to elucidate observations and discoveries in physics, astronomy, etc. it cannot be used to explain beauty, love or popularity. Mathematics is the only plausible working system at our current disposal. Therefore, it appears to be more than crucial in certain situations.

Mathematics is not a recipe for success. One is not guaranteed a successful life by being good in mathematics, and vice-versa. We are constantly being bombarded with great success stories, such as Bill Gates, one of the richest men in the world, who mastered mathematics at an earlier age. What these stories failed to

mention is that, the arts and social sciences have put forward successful entrepreneurs as well, such as lawyers, athletes and authors, who may not have been proficient in mathematics. Mastery over mathematics is also not the only indicator of intelligence. Bill Gates is not necessarily more intelligent or smarter than a talk-show host. The latter may not be able to solve a mathematics problem with ease, as would the former. However, they both can be good at what they do and become successful.

The seeds of mathematics phobia seem to have been shown in most of us at an early age. Since kindergarten we have been dealing with family and friends who constantly complain how challenging mathematics is. The subject always had a bad reputation. In addition, in pre-school, 'it is not cool to be good in mathematics'. From K1 to 12, children are subjected to the ridicules of their friends when they easily understand and know how to solve a mathematics problem. This so-called nerd-factor does not motivate children to be proficient in mathematics⁵. Saying that mathematics is difficult is a widely accepted sentiment. This negative attitude arises not only from parents but also from some mathematics teachers, who for the most part do not master the subject area. Someone who has a master's degree in mathematics is less likely to be found in a first-grade classroom. Unfortunately, one has to wait till he/she gets to college to find university professors, who not only care about the subject and have a true interest in teaching it, but also have a mastery over it. By that time it is usually too late for somebody who does not have the background or has a negative attitude toward mathematics to hone the subject.

In the midst of all this debate, the students' responsibilities seem to get lost. The basic expectations from the teachers are not equally met. Students are expected to put in extra hours learning mathematics when they get home after class. But only

a minute number of students, whose parents are watchful and understand the importance and difficulties of mathematics, seem to abide by these rules. Students are expected to go to the library, borrow books and compare class notes in order to get a full picture of any subject. One hour in class should be followed by 2–4 h of individual learning. Part of the role of schools is to guide students and put them on the right path, not to spoon-feed them. In addition, there are learning techniques that students should apply if they want to be proficient in mathematics. It has been proven that memory games and conscious repetition is a good way to remember things⁶. The same method works with mathematics. In order for mathematics to become second nature to one's life, a lot of self-convincing and brain exercises should be implemented. This requires self-discipline, but it can be achieved.

Mathematics is everywhere⁴. Nowadays mathematics is present in all the areas of sciences including computer science, statistics and biology. In our daily life, it is less evident at times. The concept of beauty in the human body is known to be based on symmetry, e.g. the distance between two eyes, body mass index, or the distance between the eyes and the mouth. Flowers too have a remarkable symmetry. Studies have also found facial symmetry to be linked to human intelligence⁷. Mathematics is also closer to us than we would like to believe. On the other end, asymmetry and even chaos can also be attractive.

In order to break the mould of mathematics phobia, major teaching and learning adjustments have to be implemented. Mathematics has to be taught in a way that students can directly relate to it in terms of words, exercises and examples used. First and foremost, the students' interests should be taken into account. Examples should include units, forms and shapes from the students' daily routine. One of the most efficient ways to

spike one's interest in mathematics is to expose him/her to teachers who are passionate about the subject. In addition, the teaching and delivery methods have to be tailored to each student or a group of students. The first duty of a mathematics teacher should be to evaluate the learning styles of each student in the classroom. Some students learn better in groups, others individually or with examples, with pictures, by watching television or playing games; therefore to bring the subject of mathematics closer to them, these learning styles need to be taken into consideration. With the metric system being the current standard for sciences, one wonders whether the US students are at a disadvantage. There should be more studies to determine the level of motivation and knowledge in mathematics of kindergarten, first- and second-grade teachers.

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