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Current Issues in Mathematics Education: Teaching and Learning

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***Abstract*—*Students may dislike or enjoy mathematics depending on how the subject is taught and learned. From elementary school through post-secondary education, the question of how to effectively teach mathematics to students requires not only the teacher's mathematical knowledge but also his or her skill, approach, and, lastly, how they handle the feedback mechanism processes. In addition to outlining some of the basic issues that math teachers and students face, this paper made some helpful recommendations based on previously published research that have been validated by classroom implementation*.

Keywords*—*Problems, teaching strategies, learners, teachers, and mathematics.

I. Introduction

Issues with mathematics instruction at the elementary, middle, and high school levels are not new. UNESCO began examining these phases of mathematics education research as early as 1935. Numerous publications, including books, articles, reports, policies, and more, have been documented since then. Alongside this endeavor, other significant systems have been tracking the efficacy of educational systems across a number of nations, including the Trends in International Mathematics and Science Study (TIMSS) and the Program for International Student Assessment (PISA). For instance, TIMSS's summary of the findings on "Classroom Teaching Limited by Students Not Ready for Instruction" demonstrated a clear correlation between the extent to which students' lack of readiness for instruction limited instruction.

According to Beckmann (2005), Carpenter, Moser, & Bebout (1988), and van der Walle, Karp, & Bay-Williams (2010), mathematics has generally been a scourge on students. One unfortunate aspect of this issue is that, despite everyone's recognition of its nature, not much is being done to address it. Most students develop certain preconceptions that work against them pursuing mathematics before they even begin studying it in its most basic form. While some of these biases are the result of outside influences, others are innate. Many students lack innate abilities, but a small percentage do (Thompson, 1999). Thus, it is up to the outside forces to, in a sense, instill in these students whatever it takes to awaken the mathematical talent in the majority of them, nurture some, and see it through to completion so that its successful application can become second nature and routine.

II. Methodology

Elementary school instruction in mathematics

Primary school mathematics instruction faces a wide range of challenges. In the following paragraphs, I address a few of these issues in the context of the previously described methodology. These issues are as follows:

Issue (1): many students' failure to understand the concept of numbers at an early enough stage of development.

Indeed, there is much to support the idea of "late developers," but it's also true that early development doesn't necessarily mean that anything is lost. However, it is also evident that there is a good chance of improving such development (Wright, 1994). However, it's also true that late developers might miss out on valuable time that could have allowed them to fully understand what they've learned. Solving this problem should not wait until the student has completed elementary school or even until he has developed his mathematical skills independently. In order to solve this issue as quickly as possible, it is imperative that we assist him as much as possible. The question that now emerges is: how should we approach the problem? Here, we must always remember that exposure to ideas in general on a regular basis makes for improved focus and understanding of the concepts. Therefore, we need to expose the students to contexts and situations that provide them with lots of opportunities to interact with the concept of numbers (Fuson et al., 1997; Wright, Martand, & Stafford, 2006). The heuristic approach is highly appropriate when it comes to teaching students about numbers and wanting them to comprehend the meaning that they convey (Carpenter, Hiebert, & Moser, 1983; Gravemeijer & Stephan, 2002).

Issue (2): Inadequate introduction to fundamental mathematical operations

Addition, subtraction, multiplication, and division are the fundamental arithmetic operations that are discussed here. As with the idea of numbers, the difficulty here is in understanding and appreciating the concepts being taught at a young age. Regarding application and arithmetic as a unit of knowledge, assisting students in gaining a comprehension of the fundamental operations of arithmetic through daily interactions will improve their ability to transfer mathematical concepts smoothly and effortlessly (Wright et al., 2006). According to the literature (Klein, Beishuizen, & Treffers, 1998; Carpenter et al., 1989), Mullis et al., 2020), it is evident that when one concept is not fully understood, the imposition of another and yet another on such a precarious basis ultimately results in a situation where the learner's entire mathematical knowledge system becomes a bundle of confusion. Frustration and a dislike of mathematics are the ultimate outcomes (De Corte, 1995). In light of the previous argument, let's now examine the fundamental arithmetic operations. Most students are in a good position to handle the fundamental arithmetic operations successfully after they have a solid understanding of the concept of numbers (Klein et al., 1998). The teacher is the only one who can choose the best strategy.

Issue (3): When handling basic arithmetic operations, there is a significant dependence on memory work. The word "heavy" is the focus of this issue. Students in our schools are traditionally forced to memorize specific mathematical relations and bodies of knowledge. For example, I'm referring to the tables for multiplication as well as other tables like the weights and other measures tables. There may be a valid case for memorization of these materials, but we must undoubtedly confront reality in these situations. It may be healthy enough to commit multiplication tables and a few relations to memory, but it is crucial to link such memory exercises to real-world scenarios. For example, when learning relations, students should be exposed to rules containing units of the millimeter, centimeter, decimeter, and meter itself are the units used in some meter rules, for example. Making the lesson meaningful requires a direct confrontation with these lengths. Saying things like "Ten millimeters make one centimeter" and similar phrases doesn't accomplish much, if anything. This is what my niece, who is nine years old, does. She wants to ignore my attempts to show her the ruler with these units written on it, stating that the teacher has stated that they must memorize it.

Issue (4): Insufficient experience

We cannot afford to disregard the age-old proverb that goes, "Practice makes perfect." In many nations, there is a noticeable lack of interest in raising the bar for mathematics education (Banwell, Saunders, & Tahta, 1972; UNESCO, 2020). The attitudes of students, instructors, and educational authorities are the cause of this. Let's take a look at each of these individually.

(a) Student attitude: Disgruntled students are challenging to manage as well as to motivate. The way teachers present the material irritates far too many students (Mullis et al., 2020). Some educators have a tendency to intimidate their students. This can occasionally be particularly noticeable in math classes. Teachers frequently say things like, "Mathematics is very hard." Usually, only a small percentage of people comprehend it. "If you don't sit up, there is no mercy, and you will fail." The unfortunate aspect of the situation is that some of the previously noted stumbling blocks may be the cause of the error rather than the learner. The students always acquire two things: (1) a dislike of math and numbers in general and (2) animosity toward the implicated teacher. Therefore, it is not surprising that whenever they encounter mathematics, they become, in a sense, rebellious (Carpenter et al., 1983; van der Walle et al., 2010).

(b) Teachers' and government education officials' attitudes: In many nations, teaching is no longer regarded as a noble occupation but rather as a "steppingstone" type of work. Too many teachers work as freelancers and are dissatisfied and hopeless (UNESCO, 2020). When teachers leave, they leave many vacancies, which are naturally filled by non-teachers who must survive, if not exist, in the struggle for survival. This and other related issues have long been of concern to government educational authorities. Due to other societal obligations that require attention, financial resources in many nations are insufficient for teachers and education in general, creating a sort of vicious cycle between the government and educators.

Issue (5): The lack of sufficient textbooks and resources

Without sufficient resources, no one can accomplish anything. As with other school levels, one of the most crucial ways to succeed in mathematics is to follow the guidance of books and have access to pertinent resources (Stigler, Fuson, Ham, & Kim, 1986). It is particularly satisfying to observe that, in this era of instantaneous and worldwide access to information, digital books, software, and applications pertaining to mathematics are emerging worldwide. Digital mathematical games, such as the Cross Number Puzzle game for practicing arithmetic expressions by Chen, Looi, Lin, Shao, and others, are among the programs designed to assist students in developing their computing skills in addition and subtraction.

Education in mathematics at the secondary level

In our discussion of primary mathematics education, the main point is to avoid making the student feel frustrated, averse, and even hate not just mathematics as a subject but, in certain situations, the math teacher herself. It is evident that the most sensible course of action is to make a concerted effort to pique the student's interest in the subject if the instructor and all parties involved are required to refrain from taking this approach. Some nations have made investments in teacher development training on how to use cutting-edge teaching strategies, digital resources, and tools in mathematics instruction in an effort to spark and maintain students' interest in and participation in the subject. But the degree to which The degree to which this actually occurs varies, though, depending on factors like a lack of computers, teachers' critical attitudes, or their resistance to breaking old habits (Kearney, 2010, p. 6). Indeed, common sense makes this very evident when we are confronted We get nervous and tense when faced with a challenging issue. We become motivated to find a solution to the issue in order to relieve the tension and, consequently, to find satisfaction. However, wanting something means becoming interested in it, so we can't accurately compare "difficulty" to "lack of interest."

Now, let's look at an example of a preventive strategy for the issues of creating and maintaining interest in mathematics in our secondary schools. Here, the teacher bears the burden in the first place. He is the one who approaches new math students initially. These new students are doomed before they even begin their formal studies in the subject if he keeps using the same subpar methods that we criticized at the primary level (Stipek, Givven, Salmon, & MacGyvers, 2001). The typical presentation of such a fundamental yet crucial subject as "The rule of signs in algebra" is a very obvious example of this. "Why is it that $(-2) \times (-3) = (+6)$?" a" Because, according to the rule of signs, minus × minus = plus," the instructor responds. Nothing can be more perplexing to a novice student than such inexplicable ideas. And mathematics contains a plethora of such ideas. Usually, the majority of students wind up learning these ideas by heart, which is not the same as studying mathematics. Simple tools like the Number Line, which eliminate most of the abstraction involved, can be used to explain naughty problems, like those presented by the so-called Rule of Signs, to the delight of students. Let's look at the number line PQ that is displayed below.

P- | +Q

-10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 +1 +2 +3 + 4 +5 +6 + 7 + 8 +9 +10

Figure:

Education in mathematics at the post-secondary level

Compared to the primary and secondary levels, the issues with mathematics education in post-secondary institutions are less concerning. Despite the fact that some post-secondary students find mathematics intimidating, lack the ability or desire to reason, and in some cases only possess basic copying and memorization skills. Others are motivated, capable, and prepared to do math. Nonetheless, a significant cause for concern at this educational level is the dearth of math graduates (number-wise). However, this is obviously because of the basis on which mathematics education has been established in many nations (De Corte et al.,1994). Only a small number of people who have demonstrated that the adage "survival of the fittest" is true are still able to pursue mathematics at the postsecondary level due to the issues previously mentioned. Students ultimately handle issues that affect the way a teacher approaches teaching mathematics in post-secondary institutions, whether they do so among themselves or with the help of superior wranglers on campus. Nonetheless, there are typically some mathematics topics in higher education that students find difficult to understand. For students to understand such subjects, lectures alone are frequently insufficient However, such an endeavor puts other subjects at risk, which is not the case. Therefore, we must come to the conclusion that strategies and tactics should be developed to attack. this issue. Using real-world examples to address such "stubborn" subjects is one such strategy. The point being made here will be made clearer by the following example involving the concept of limits. When faced with a statement such as: Let f (x) be defined for all $x \neq a$ an approaches over an open interval containing a, a beginner in the study of limits becomes confused. Suppose that L is a real number. If there is a $\partial > 0$ for every $\in > 0$, then Lim f (x) = L, so that if $0 < |x - a| < \partial$, $x \to a$

When $|f(x) - L| < \in$ is more experienced than described.

III. Conclusion

This essay has shown that teachers' methods of instruction and practice must adapt to the three stages of teaching mathematics to students (primary, secondary, and post-secondary school levels). This paper highlights a number of factors that contribute to the need for learners to switch from abstract representations of numeracy and arithmetic concepts to more real-world examples. However, in order to succeed in algebra, students should eventually move from using real-world examples to using abstract reason in and beyond, in addition to enjoying mathematics. Since they are defined in abstract forms, the importance of the abstract approach to teaching mathematics in situations involving 4-D spaces, for instance, cannot be geometrically represented (visualized) in our 3-D world. Thus, despite their formal description, 4-Dimensional spaces have many uses, such as "The Quaternions," which are used to model Einstein's "General Theory of Relativity." Finally, teachers who do not learn to reflect on their teaching are unlikely to understand the rationale for certain practices and are therefore less able to select and interpret instructional practices that support motivation and learning, given the seemingly contradictory efforts to reform mathematics instruction (and foster learners' interest and participation in the subject) (Turner, Warzon,2011)

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