

The Role of Mathematics Education: The Matter of Classroom Culture and Learning Theories

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Abstract—The teacher's beliefs derived from their experiences (including learning theories) surroundings should play a significant role in ensuring that students receive a successful mathematics education through the implementation of the school mathematics curriculum. This is to make sure that every learning scenario in the math classroom creates comprehension for everyone involved, so that it has meaning. Our purpose in writing this paper is to draw attention to a few issues that are crucial to the study of mathematics education. The topics covered include theory and culture, the function of theory in research on mathematics curriculum. The goals of teaching and learning mathematics, the state of mathematics education as a field of knowledge, and the impact of well-known instructional theories in mathematics education as well as theories of models and modeling on research, teaching, and learning.

Keywords— Role, Matter, Culture, Learning Theories.

I. INTRODUCTION

The teacher is largely responsible for the foundation of any successful educational process. A perceived set of procedures used to promote learning through social interactions is called teaching. According to a study by [Raths – 1971], "Explaining, informing, initiating, and short communication are all components of good teaching." Overseeing, managing, bringing the group together, providing security, elucidating, diagnosing, and learning issues, creating curriculum materials, assessing, documenting, reporting, enhancing community events, setting up classrooms, taking part in school events, and engaging in professional development. This shows that learning mathematics gives people a chance to think critically about the moral, ethical, cultural, economic, social, and spiritual problems that humanity faces. Therefore, by disseminating specialized knowledge and skills, it aids in the development of the country, regarded as an essential component of survival.

Improving learning and comprehension is the primary goal of mathematics education. From their point of view, "Learning is the acquisition of habits, knowledge, and attitude," as it is easy to understand. It uses novel approaches to tasks and functions on regarded as an essential component of survival.

To improve coherence, consider adding a transitional sentence, such as: "Building on the importance of teacher knowledge and experience, it is essential to explore the specific skills and proficiencies that students need to develop in mathematics".

II. METHODOLOGY

Theories are essential to mathematics education as well as other disciplines. This implies that the majority of the theories we encounter during our training serve as the foundation for our classroom conduct and remarks as educators.

As a result, effective teaching necessitates a thorough comprehension of the fundamental theories that underpin education, including notions about how students learn, what they ought to learn, and how teachers can facilitate learning in our classrooms.

"Effective teaching requires a deep understanding of both conceptual and factual knowledge. Students must not only grasp this knowledge but also be able to apply it practically in real-world contexts". We can draw the following conclusions: teaching is an intellectual endeavor; teachers play a range of roles, such as team coaches and information providers; effective teacher strategically share their work with students; and Teachers focus on difficult material. According to research, personal experience is one of the primary sources from which we construct the learning theories that serve as the cornerstone of our attitudes and actions in the classroom [Lindgren – 1959]. Teachers get a great deal of experience over time as a result of their constant interactions with students in the classroom in a variety of ways. These encounters may put the instructor in risky circumstances such as teachers focus on difficult material. Changing an existing theory, coming up with a new one when feasible, or conducting additional study to improve an existing theory.

III. THE FUNCTION OF THEORY IN RESEARCH ON MATHEMATICS

Criteria for their theoretical applicability in organizing and enforcing behavior or action to achieve desired or prevent unwanted outcomes. Additionally, it offers defense against non-scientific approaches to a subject, problem, or theme, like as Random and nonsensical terminology selections, research techniques, and interpretation of findings. This goal is accomplished by situating one's study within a specific framework, defining underlying theories and choices in a clear and discussion-friendly manner, and announcing and outlining its features in relation to potential alternatives.

Furthermore, a theory aims to offer a uniform set of lenses for approaching, observing, researching, assessing, or interpreting certain facets or regions of the world. This is accomplished by focusing on particular aspects or problems,

integrating and applying particular viewpoints, selecting the pertinent items to include in the context while leaving out others, and offering the whole community that has a methodology. This provides protection from criticism from hostile or cynical peers in other fields of study. For instance, outside colleagues in the fields of pure mathematics, psychology, general education, and so on frequently criticize mathematics education researchers about the foundation of our work and its results. Using theory as a guide can assist in the following ways: imagining methods to improve the curriculum and the teaching/learning environment; Develop a methodology; describe, evaluate, explain, and defend student and instructor results in the classroom; transform real-world issues into research problems; list the procedures involved in studying a research problem; and develop research questions. Develop a methodology; describe, evaluate, explain, and defend student and instructor results in the classroom; transform real-world issues into research problems; list the procedures involved in studying a research problem; and develop research questions. But when theory functions as an object or thing, one of its goals will be the theory's own development. In order to produce new theoretical innovations, this may entail assessing a theory or other theory concepts or linkages in a specific setting.

IV. CERTAIN LEARNING THEORIES THAT ARE USED IN MATHEMATICS EDUCATION:

This body of knowledge aids in the instruction of mathematical ideas that guarantee the relationship between the instructor and the student, as well as any learning-based comprehension through the active participation of students by utilizing their knowledge and experience to create new experiences that successfully guide them into new circumstances. Formalism, structuralism, empiricism, radical constructivism, social constructivism, semiotics, theories of (applied) statistics, behaviorism and neo-behaviorism, cognitive structuralism, cognitive science in general, activity theory, psychoanalysis, APOS theory (Action-Process-Object-Scheme), concept definition and concept image theory, didactical situations (Brousseau's theory), didactical transposition (Chevallard's theory), conceptual fields (Vergnaud's theory), socio-mathematical norms, mathematics teaching theory, teachers' mathematical knowledge for instruction, and critical mathematical education are some of the widely recognized and frequently employed theories of learning in math education. None the less, the majority of math curricula worldwide support and advocate for the of well-known learning theories, such constructivism, in math instruction. Constructivism learning theory is an approach to mathematics education that guarantees student-teacher interaction, any Learning-based understanding is accomplished in four steps through the active participation of students who use their knowledge and experience to create new knowledge that leads them into new situations. These include making judgments, offering explanations and solutions, inviting others, and conducting investigations. This idea has an impact on arithmetic instruction and learning through allowing pupils to study in a number of methods. The

teacher should pose some challenging questions to them, keeping in mind that at this point in time, their knowledge is connected to what they have already learned. The pupils' abilities are being challenged. This phase entails using observation, measurement, experimentation, and working groups each with its own set of unique tasks—to find solutions to questions pertaining to their generated learning. All groups are given the opportunity to present their conclusions and interpretations of the answers and suggestions, and when students make mistakes, they either correct their misconceptions or provide scientific notions in place of them. As much as feasible, assist students in applying the results of their answers and conclusions in real-world situations [Andam – 2015]. We go to other fields that have addressed related difficulties and themes and seek their direction when new vistas in mathematics education research are raised and these theories attract attention. The aforementioned explanation led to the introduction of new study subjects and emphasis on the field agenda, as well as the more or less sequential implementation of ideas outside of psychology and statistics in mathematics education research. These issues and priorities include curricular reform, the use of mathematics in domains outside of mathematics, Mathematics classrooms, gender concerns, linguistic issues, sociocultural issues, including minority issues, student views, affections, and job perspectives; teacher education, in-service training, and instructor attitudes and beliefs; philosophical aspects of mathematics; and more [Niss – 2004].

Nevertheless, it turns out that other disciplines are only able to provide a limited amount of help because they are unable to make up for the crucial role that mathematics plays in mathematics instruction and learning. As a result, existing theories must be modified, recreated, or combined in order to meet the demands of mathematics education and ultimately to create new theories. This action will support a number of recently developed theories or concepts in the field of mathematics education research.

V. MODELING AND MODEL THEORIES AND THEIR IMPACT ON TEACHING, LEARNING AND MATHEMATICAL RESEARCH:

A subject is the first step in mathematical modeling, which includes teaching strategies and learning, after which questions regarding it surface. These issues may be resolved using mathematical methods and existing thematic research. Studying a subject that can assist students learn a significant amount of mathematics or gain knowledge about the topic under study can be rather fulfilling to some level. Each student can select a theme or subject in any field of interest, conduct research on it, formulate questions, and, with the help of the teacher, create a mathematical model as part of modeling education. As a result, the instructor takes on the role of counselor and students share responsibility for their education. Examines mathematics that has been presented as another area of study, but has also sparked sharpened his creative and analytical faculties.

The teaching of modeling education is motivated by the curriculum's substance, beginning with utilized mathematical models, and after that expanding one's knowledge in

numerous fields; at the guiding pupils to an inquiry study at the same time. It is an approach to mathematics education that seeks to improve the student's comprehension of mathematical ideas; to have him or her ready to read, understand, create, and resolve particular circumstances, and to arouse his or her critical.

Implementation and imaginative senses have been found to be effective. It is applicable to teaching at all levels, from elementary school to university education. The goal of the approach is to give the student: Integrating mathematics with other fields of knowledge; improving understanding of mathematical concepts; encouraging creativity in problem formulation and resolution; being able to operate machines (computers and graphic calculators); having the ability to collaborate with others; being oriented when conducting research and having the ability to report studies [Biembengut – 2020]. In order to include it into instruction, the teacher selects a topic or theme from any area of study that would be interesting to the students (based on the program's content) and creates a mathematical model that is modified for instruction. As an alternative, he or she chooses an established mathematical model and modifies it for use in creating program content. Consequently, the model would serve as a pattern or guide. It calls on the teacher to clearly explain the subject under discussion through a number of exercises and phases.

VI. MATHEMATICS TEACHING AND LEARNING GOALS

The study of mathematics and intellectual activity in general have played a significant role in human civilization. Actually, throughout the history of the school curriculum, mathematics has been taught as the main topic in every civilized region of the world [Atteh – 2014] "Mathematics should be visualized as the vehicle to train a child to think, reason, analyze, and articulate logically," the National Policy on Education emphasized. It should be viewed as a companion to any subject that involves analysis and interpretation, rather than as a distinct subject in and of itself. More than any other discipline—possibly more than any other human—its body of knowledge, language, and methodology have been shared throughout intellectual communities worldwide under taking. From the perspective of social advantage, there are four possible justifications for why mathematics should be taught in schools. These include: enhancing mathematical experts; fulfilling the requirements for advanced professional services in terms of mathematical understanding; and encouraging problem-solving abilities, such as those involving form or logical thinking; moreover, to assist individuals in becoming acquainted with the fundamental mathematical concepts require for daily living. The development of critical thinking, logical reasoning, induction, generalization, and the ability to draw connections between various elements can all be accomplished through the teaching of mathematics. The following guidelines should be followed when teaching mathematics in order to achieve the goals of learning the subject in general: Make mathematics engaging and useful. Take into account the student's prior knowledge. Create the maths curriculum. All sciences are built upon it; it correlates

to other topics and to human life; it fosters a rational attitude; and it creates clear thinking. provides a chance to enhance the students' cognitive capacities.

Mathematics learning theories

Classroom Cultures

VII. MATHEMATICS EDUCATIONAL STATUS AS ACKNOWLEDGE FIELD

The future of mathematics depends heavily on recent advancements in important mathematics teaching concerns. In addition to the numerous studies that have been conducted on the future of mathematics education, it appears that much more is in the works. The focus of Anacarolina Faustino's research was on the use of dialogic approaches in elementary mathematics instruction. With numerous parallels to adult education, dialogic education has developed over time. But Faustino reworked the idea of discourse itself, paying particular attention to younger kids. Amanda Quiroz Moura investigates deaf schooling. pupils studying mathematics. It gives her the opportunity to address various facets of both inclusive and dialectical education, opening up new avenues for the conversation on mathematics education for social justice [Alro – 2010]. In a different experiment, João Luiz Muzinatti employs a range of mathematical activities to question a number of preconceptions and assumptions that underpin middle-class conversations. As a result, Muzinatti developed fresh ideas for mathematical critical education [Skovsmose – 2012]. Guilherme Henrique Gomes da Silva talked about affirmative action. He looks at the many elements of these initiatives, highlighting the need for affirmative action to address the educational component of college education. Da Silva therefore expanded the discussion.

This implies that as an area of study, mathematics education has attempted to address issues related to conversation or dialogue between children and adults, inclusive education for advancing social justice, affirmative action to address all learning levels, and many more.

Researchers in the subject of mathematics education are also constantly examining mathematics in all of its diverse applications and practices.

VIII. CONCLUSION

Based on ideas, there are several methods for teaching and studying mathematics. In general, these methods are learner-centered and teacher-centered. This can necessitate using tactics one at a time, in groups, or selectively. These strategies are methods for resolving issues with projects, programs, risks, queries, and many other things. This is how determined seven methods of teaching arithmetic to promote efficient learning. They are as follows:

1. Child-centered style: In this approach, the teacher offers a framework, and the children follow it in line with their preferences and needs.
2. Teacher-centered style: The teacher is a key player in this. The teacher controls the teaching and learning process. Learners listed passively.

3. Subject-centered approach: In this case, the instructor's The structured substance of the subject matter that should be taught to the students is the primary focus.

4. Task Centered Style: In this approach, learning is viewed as occurring on an individual basis, with the instructor prescribing the content for the pupils to learn and then expecting particular performance from them

5. Learning Centered Style: In contrast to subject-centered and child-centered approaches, this approach places an emphasis on the students and their education, irrespective of their skills and limitations.

6. Cooperative Planner Style: The instructor plans the methods and objectives of the lessons in collaboration with the students. Here, the instructor motivates and supports the students in every manner.

7. Emotional Involvement Style: In this teaching approach, the instructor takes an affectionate role. He approaches the teaching and learning process with enthusiasm and commitment, which helps him create a positive learning atmosphere in the classroom.

The primary goal of education, as we all know, is to bring about the required changes in the behavior of the children. When those changes occur, we determine that the child has learnt. Teachers of mathematics are urged to implement learning theories that optimize instruction and learning and promote efficient comprehension of mathematical ideas in the classroom.

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