
**ROLE OF MATHEMATICS IN CONTRIBUTING DEVELOPMENT OF
CRITICAL THINKING ON STUDENTS FROM HISTORY UP TO NOW**

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Abstract

Authors of this paper draw attention to the importance of developing critical thinking in the process of education. Critical thinking skills should be owned by students. Therefore, schools should be responsible to develop and evaluate critical thinking skills through teaching and learning process at schools.

Keywords: Critical thinking, empower, education, mathematics, methods.

Introduction

Math is a subject that is often associated with numbers, equations, and calculations. However, it's also a subject that can help children develop critical thinking skills that can benefit them throughout their lives.

We must recognize that mathematics is not a static, isolated discipline but an integral part of our daily lives, embedded in various aspects of our personal and professional endeavors. This transformation seeks to empower students with not just the ability to manipulate numbers and formulas but also the capacity to think critically, reason logically, and adapt flexibly to novel challenges. It encourages them to embrace mathematics as a dynamic tool for exploring the world, solving complex problems, and making informed decisions. As we delve into the key aspects of this educational transformation, it becomes evident that fostering critical thinking skills on students is the linchpin of this endeavor. Critical thinking transcends the memorization of algorithms; it involves the cultivation of inquisitive minds that can analyze, evaluate, and innovate.

Math can help children develop critical thinking skills through some ways.

Problem-solving skills: One of the primary skills that children can develop through math is problem-solving. Math problems are essentially puzzles that need to be solved using critical thinking skills. By practicing math regularly, children can develop the ability to analyze problems, break them down into smaller parts, and find solutions. These skills can benefit them not only in math class but also in other areas of life where problem-solving is necessary.

Logical reasoning: Math also helps children develop logical reasoning skills. They learn to identify patterns and make logical connections between different pieces of information. This can help them in various areas, including science, where logical reasoning is essential in understanding concepts and making predictions.

Attention to detail: In math, precision and accuracy are crucial. Children must pay close attention to detail when working through math problems to ensure they arrive at the correct answer. This skill can carry over into other areas of their lives, such as reading comprehension and writing.

Creativity: Math may seem like a subject that doesn't allow for much creativity, but that's not the case. As children solve math problems, they must use their creativity to come up with different solutions. They can also explore different ways of solving a problem and think outside the box to find the best solution.

Materials and Methods

The goal of developing thinking skills is to have a quality of thought, in which the quality of thinking is required not only at school but also outside school. Thinking skills related to the students' ability to understand the thought process when studying the subject content (Swartz, 2001). Therefore, students should not only understand the content of mathematics but also the process of mathematical thinking (Cobb et al., 1992; Rajendran, 2010). Many educators argue that thinking skills can be learned and should be taught explicitly and students should be informed about the types of thinking skills taught to them (Swartz, 2001; McGregor, 2007). Research shows that students' thinking skills can be developed if teachers create a classroom environment that supports the thinking activities (Swartz and Parks, 1994; Rajendran, 2010; Mason, Burton and Stacey, 2010). Teachers do not necessarily dominate and control the learning activities but should encourage students to take an active role and demonstrate good multilateral interaction between teacher and student or student to student interaction (Henningsen & Stein, 1997). There are two different methods in developing thinking skills, some researchers believe that thinking skills can only be taught separately (Lipman, 1985), while some other researchers believe that thinking skills can be infused in school subjects (Swartz, 2001; McGuinness et al., 2003; Rajendran, 2010). Based on the state curriculum in schools today, the proposed method for teaching thinking skills are infusion method (Rajendran, 2010). It is supported by Swartz (2001) and Butera et al. (2014) which stated that a more effective teaching thinking skills in the context of the subjects because integrating thinking skills in teaching is a natural way for teachers to teach students how to think.

As efforts to develop the critical thinking skills of mathematics have become the main agenda in the curriculum of mathematics education worldwide. Many researchers have shown that the development of critical thinking skills can improve mathematics achievement. Similarly, critical thinking skills will encourage students to think independently and solve problems at school or in the context of everyday life.

Critical thinking skills in mathematics closely related with problem solving in mathematics, as with mathematical open-ended problems and contextual problem will challenge students to solve the problem up to encourage students to mathematical thinking. Efforts should be made on an ongoing basis using various methods and appropriate learning methods in developing the critical thinking skills. One method that can help students to develop critical thinking is a method of problem-based learning (PBL) (Krulik & Rudnick, 1995; Herman, 2006). This method gives students the opportunity to make the exploration, investigation and problem solving (Arends, 2007; Gallagher, 1997). Therefore, PBL was believed to help students generate new knowledge and also encourage students to think critically through a variety of processes to solve problems. Mathematics learning can develop critical thinking skills in mathematics require complex mathematical tasks that can encourage higher order thinking skills (Henningsen & Stein, 1997). High level mathematics problems that involve thinking, analysis, synthesis can stimulate students' critical thinking skills. Thus the complex problem-solving activities will enhance students' understanding and can apply the knowledge built in the new situation (Henningsen & Stein, 1997). Most of the teachers use the textbooks only that involve low-level thinking skills such as memorizing facts. Therefore, there is necessary learning material covering complex issues to support the development of mathematical critical thinking skills in the classroom.

Critical thinking is a fundamental skill that mathematics education should emphasize. It involves the ability to analyze, evaluate, and solve complex problems by thinking logically and critically. Here are some strategies to promote critical thinking in math education:

Open-Ended Questions. Encouraging students to ask and answer open-ended questions that necessitate them to delve deeply into mathematical concepts is a fundamental aspect of promoting critical thinking in mathematics education. By engaging with open-ended questions, students are prompted to think critically about the underlying principles of mathematics. They are challenged to dissect problems, identify patterns, and construct logical arguments to support their conclusions. These questions spark curiosity and curiosity fuels the desire to learn and discover.

Assessment and Feedback. Assessment in mathematics education should shift towards assessing not only the correctness of answers but also the thought processes and reasoning behind them. Constructive feedback is essential for students to understand their strengths and weaknesses and improve their critical thinking skills.

Rubrics for Problem Solving. To enhance mathematics education and foster critical thinking, it is crucial to develop comprehensive rubrics that delve into the intricacies of problem-solving processes. These rubrics should go beyond merely evaluating the correctness of the final answers. Instead, they should provide a holistic assessment of a student's problem-solving journey. One key aspect of these rubrics is evaluating how

students approach a problem. This entails examining whether students have developed a systematic and organized method for dissecting complex mathematical challenges. It involves assessing their ability to identify the key components of a problem, formulate relevant questions, and outline a clear plan of action [5]

Conclusion

In conclusion, mathematics education is a necessity in our rapidly evolving world to develop critical thinking of school students. Fostering critical thinking skills on students through inquiry-based learning, real-world applications, collaborative work, and assessment reform is also considered to be relevant. Mathematics education is not just about numbers but also, it's about nurturing informed, analytical, and innovative thinkers who will shape the future

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