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RESEARCH ARTICLE

CHALLENGES ENCOUNTERED BY LEARNERS IN INTEGRATING COMPUTATIONAL THINKING INTO THE MATHEMATICS CURRICULUM

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OFELIA R. CASTILLO

APAYAO STATE COLLEGE

Abstract

This qualitative study explored the challenges learners faced in integrating computational thinking into the mathematics curriculum at David M. Puzon Memorial National High School during Academic Year 2024–2025. The study specifically focused on identifying the cognitive, pedagogical, and structural difficulties Grade 11 learners encountered when applying computational thinking skills in mathematics learning activities. A qualitative case study design was employed, with semi-structured interviews as the primary data-gathering tool. Eleven senior high school students from different academic tracks served as participants. Collected data were analyzed using thematic analysis to identify recurring patterns and significant themes. Findings revealed that learners encountered several challenges, including difficulty breaking down mathematical problems into step-by-step processes, limited understanding of computational thinking concepts, limited time for practice, inadequate learning resources and technological tools, and confusion in applying logical reasoning during mathematical problem-solving. The findings further showed that these challenges affected students' confidence, comprehension, and engagement in mathematics learning activities. Despite these difficulties, learners recognized the importance of computational thinking in improving logical reasoning and problem-solving skills. The study concludes that successful integration of computational thinking in mathematics requires sufficient instructional support, teacher guidance, adequate resources, and learner-centered activities. Based on the findings, an intervention program focusing on scaffolding strategies, contextualized activities, and enhancement of computational thinking skills was proposed.

Keywords: computational thinking, mathematics curriculum, challenges, qualitative research, problem-solving, secondary education

*Corresponding author: OFELIA R. CASTILLO

INTRODUCTION

Computational Thinking (CT) has become an important component of 21st-century education because it develops learners' ability to solve problems systematically, think critically, and apply logical reasoning in various situations. As technology continues to evolve, educational institutions are increasingly integrating computational thinking into different learning areas, particularly mathematics. Computational thinking involves decomposition, pattern recognition, abstraction, and algorithmic thinking, which are all closely connected to mathematical reasoning and problem-solving. Mathematics education traditionally focused on a procedural and algorithmic approach to solving problems. However, the demands of modern society require learners to possess higher-order thinking skills and the ability to apply mathematical concepts in authentic and complex situations. Integrating computational thinking into mathematics allows learners to understand mathematical concepts more deeply and apply logical strategies in solving problems.

Several studies emphasized the importance of computational thinking in mathematics education. Wing (2006) described computational thinking as a fundamental skill that should be developed alongside reading, writing, and arithmetic. Similarly, Weintrop et al. (2016) explained that integrating computational thinking into mathematics creates opportunities for learners to develop problem-solving skills and engage in meaningful mathematical exploration. Despite its educational advantages, integrating computational thinking into mathematics presents several challenges for learners. Students often experience difficulty understanding computational thinking concepts, breaking down problems into manageable steps, and applying logical reasoning in mathematical activities. In addition, limited resources, insufficient technological tools, lack of exposure, and time constraints further hinder the successful implementation of computational thinking in classroom instruction.

At David M. Puzon Memorial National High School, learners encounter different difficulties in integrating computational thinking into mathematics lessons. While students recognize the value of computational thinking in improving their analytical and logical skills, many still struggle to adapt to this approach due to unfamiliarity with computational concepts and limited opportunities for guided practice. This study aimed to identify and analyze the challenges encountered by learners in integrating computational thinking into the mathematics curriculum at David M. Puzon Memorial National High School during the Academic Year 2024–2025.

The study is important because it serves as a basis for proposing interventions that may help improve learners' computational and mathematical competencies.

METHODOLOGY

This study employed a qualitative case study research design to explore the challenges encountered by learners in integrating computational thinking into the mathematics curriculum at David M. Puzon Memorial National High School. Qualitative research was appropriate because it allowed the researcher to obtain detailed descriptions of learners' experiences, perceptions, and difficulties. The participants of the study are the eleven (11) Grade 11 senior high school students enrolled during the academic year 2024 – 2025 with direct experiences related to computational thinking integration in mathematics. The participants were selected using criterion purposive sampling.

Semi-structured interviews served as the primary data collection method, allowing participants to express their thoughts freely while ensuring that key topics were addressed. The interviews were conducted face-to-face and online, depending on the availability and preference of the participants.

The collected data were analyzed using thematic analysis, following Braun and Clarke's six-step approach. The interviews were transcribed, coded, and categorized into emerging themes that reflected students' perceptions and challenges encountered in the integration of computational thinking into the mathematics curriculum. To

ensure credibility and trustworthiness, member checking was conducted, allowing participants to review and validate the findings. Triangulation was also employed by comparing interview responses with institutional documents and existing literature.

RESULTS

Challenges Faced by Learners in the Integration of Computational Thinking in the Mathematics Curriculum

Theme 1: Cognitive Difficulties in Problem-Solving

Many respondents experienced difficulty breaking down mathematical problems into smaller and manageable steps. Learners found it challenging to organize their thinking processes systematically. These are experienced by the participants as evident by their utterances.

"One of the difficulties I experience is figuring out how to organize problems into step-by-step processes."[P3]

"Sometimes, I get confused trying to turn a word problem into a step-by-step logic map."[P8]

The findings indicate that learners struggle with decomposition and logical sequencing when solving mathematical problems using computational thinking.

Theme 2: Limited Understanding of Computational Thinking Concepts

Several participants expressed limited familiarity with computational thinking concepts and terminology. Students reported confusion regarding abstraction, algorithms, and logical reasoning.

"I am not very familiar with the term computational thinking."[P1]

"I also struggle with unfamiliar terms and concepts related to computational thinking."[P9]

These responses suggest that learners need clearer explanations and guided instruction regarding computational thinking concepts.

Theme 3: Lack of Resources and Technological Tools

Participants identified insufficient learning materials, technological devices, and computational tools as major barriers to learning.

"There is also a lack of ready-made learning materials and activities aligned with our curriculum."[P5]

"Limited resources, time, devices, and large classes make it difficult."[P8]

The findings imply that resource limitations negatively affect learners' opportunities to practice and apply computational thinking skills.

Theme 4: Time Constraints and Learning Adjustment

Many participants reported difficulty adjusting to the new approach because computational thinking activities require additional time and practice.

"The lack of time in the dense curriculum and limited equipment causes confusion and slows down the class."[P3]

"It became harder for me to improve and use computational thinking because I do not have enough time to practice."[P2]

The findings indicate that learners need adequate time and continuous exposure to computational thinking activities for effective learning.

DISCUSSION

The findings of the study revealed that learners encounter cognitive, conceptual, and structural challenges in integrating computational thinking into mathematics lessons. The difficulty in breaking down problems and applying logical reasoning supports the findings of Chytas et al. (2024), who noted that learners often struggle with decomposition and abstraction.

The study also confirmed that insufficient resources and limited technological tools hinder computational thinking integration in the mathematics curriculum. These findings align with previous studies emphasizing the importance of adequate educational technology and instructional materials in facilitating meaningful computational thinking activities.

Moreover, the results showed that computational thinking requires learners to adjust from traditional procedural learning to logical and analytical problem-solving approaches. While learners initially experienced confusion and frustration, many acknowledged that computational thinking eventually improved their understanding and engagement in mathematics.

CONCLUSION

The integration of computational thinking into the mathematics curriculum presents several challenges for learners, particularly in terms of logical reasoning, conceptual understanding, and resource accessibility. Learners encounter difficulties in organizing problems systematically, understanding computational thinking concepts, and adapting to new problem-solving approaches.

The findings indicate that computational thinking integration requires adequate instructional support, sufficient technological resources, and learner-centered teaching strategies. Although students initially experience confusion and adjustment difficulties, continuous exposure and guided practice contribute to the development of their problem-solving and analytical skills.

Therefore, effective integration of computational thinking in the mathematics curriculum should focus on strengthening learners' conceptual understanding, providing accessible learning materials, and creating supportive classroom environments that encourage exploration and logical reasoning.

REFERENCES

- Arbain N, Shukor NA. The effects of GeoGebra on students' achievement. *Procedia - Social and Behavioral Sciences*. 2015;172:208–214.
- Calao LA, Moreno-León J, Correa HE, Robles G. Developing mathematical thinking with Scratch. *Proceedings of the Workshop in Primary and Secondary Computing Education*. 2015.
- Chytas C, van Borkulo SP, Drijvers P. Computational thinking in secondary mathematics education with GeoGebra: Insights from an intervention in calculus lessons. 2024.
- Piaget J. *The origins of intelligence in children*. New York: International Universities Press; 1952.
- Weintrop D, et al. Defining computational thinking for mathematics and science classrooms. *Journal of Science Education and Technology*. 2016;25(1):127–147.
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Wing JM. Computational thinking. *Communications of the ACM*. 2006;49(3):33–35.

Wing JM. Computational thinking and thinking about computing. *Philosophical Transactions of the Royal Society A*. 2008;366(1881):3717–3725.