

Reengineering of Student-Teacher Coding Program for Philippine Grade Schools Curriculum: A Literature Review

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ABSTRACT

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The main objective of this literature review is to delve into the situation of coding programs in schools in the Philippines, examining both the obstacles they encounter and potential areas for improvement. By analyzing a range of studies, scholarly articles, and relevant literature, this research aims to comprehend how coding programs impact students' acquisition of skills, logical reasoning abilities, creativity, and cognitive development. Moreover, it evaluates approaches and best practices for

integrating coding courses into the curriculum while considering the advantages and challenges associated with their implementation. In addition, the study



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explored how students' academic performance and future job prospects are influenced by their coding skills and proposed strategies to enhance coding programs that promote the development of these abilities. The insights gathered from this analysis provide recommendations for research and valuable insights into designing coding curricula that cater specifically to elementary schools in the Philippines within the broader educational landscape.

INTRODUCTION

In recent years, the integration of coding education into school curricula has gained global attention, with various studies highlighting its significance in developing essential skills among students. For instance, Yadav et al. (2014) emphasize the importance of computational thinking in education, arguing that coding fosters problem-solving and critical thinking abilities. Similarly, Grover and Pea (2013) discuss how early exposure to coding can enhance students' logical reasoning and creativity, preparing them for future challenges in a technology-driven world. Furthermore, a meta-analysis by Scherer et al. (2018) reveals that coding education positively influences cognitive skills, particularly in areas directly related to programming concepts. These findings underscore the necessity of incorporating coding into educational frameworks to equip students with the skills needed for success in the 21st century (Kafai & Burke, 2014; Resnick et al., 2006).

Including skills such as curiosity, adaptability, and tenacity in coding programs for schools in the Philippines is a significant initiative as it can positively impact children's academic performance and overall quality of life. Research suggests that students' success in computer science classes involving programming heavily relies on their ability to develop these skills. A study has also emphasized the importance of teamwork and communication for IT graduates, highlighting the necessity of nurturing these abilities (Patacil & Tablatin, 2017).

Moreover, the research paper titled "Microlearning as a Fresh Approach to Teaching Skills to University Students" delves into how alternative teaching methods like microlearning can contribute to the growth of education students (Romanenko et al., 2023). By incorporating research findings and exploring ways to integrate these skills into coding programs, this literature review aims to bridge the knowledge gap and ultimately enhance students' academic achievements and overall wellbeing. The outcomes underscore the significance of merging skills into coding education better prepare students

for the demands of the IT sector while equipping them with the abilities for success in their careers.

METHODOLOGY

Schools in the Philippines are encouraged to include a study of literature as part of their coding curriculum. Exploring and analyzing research papers, academic publications, and other relevant sources is crucial gaining insights into the state of coding programs. Understanding the challenges they face and identifying areas for improvement is essential. The literature review should focus on how students' ability to create coding programs impacts their thinking and creative abilities. It should also evaluate the pros and cons of approaches and best practices for integrating coding classes into the curriculum. Additionally, it is important to examine how these skills influence students' academic achievements and future career prospects while providing recommendations for enhancing coding programs that foster the development of these competencies. Lastly, suggestions should be given for conducting research and designing coding curricula that meet the requirements of schools in the Philippines as broader educational settings.

RESULTS AND DISCUSSION

Cognitive skills. Learning to code can potentially enhance skills such as problem-solving, critical thinking, and mathematical competency. Numerous studies have investigated the impact of coding on education and these skills. For instance, Özcan et al. (2021) conducted a randomized trial to explore how learning to code influences reasoning, fluid intelligence, and spatial orientation. Surprisingly, their findings demonstrated effects on thinking abilities due to coding education.

Another interesting meta-analysis by Scherer et al. (2018) examined the relationship between coding and skills. Their research revealed that the impact varied depending on how aligned the skills were with coding concepts. They found effects for skills directly connected to coding compared to those related.

In a cluster randomized controlled trial carried out by Arfé et al. (2020), researchers focused on how engaging in coding activities affected children planning and inhibition abilities. The results indicated that participating in coding activities improved functions like response inhibition and planning while also enhancing problem-solving in coding tasks.

Overall, these studies provide insights into the benefits of learning to code and shed light on implications for programs. However, they also emphasize the

need for exploration in this field.

Creativity imagination. Encouraging children to create something from scratch is beneficial for their development as it nurtures their imagination and creativity. The three research studies shed light on how preschoolers can enhance their abilities and the importance of fostering a learning environment that promotes creativity. Muhammad et al. (2019) delve into the significance of a learning environment inspired by the Reggio Approach and other approaches that stimulate creativity in three to four-year-olds. They also explore having an artist in residence as part of this environment. Egamberdiev et al. (2022) emphasize the value of creating an atmosphere and allocating time to support growth in preschoolers' activities. Cremin and Barnes (2018) underscore the necessity of cultivating students' creativity in classrooms through an environment that encourages thinking and proactive engagement. These studies highlight how the setting plays a role in nurturing children's thinking skills. Achieving this objective may involve integrating learning into the curriculum or adopting approaches.

Logical structural thinking. Encouraging individuals to think and organize their thoughts can be highly beneficial. One notable advantage is that it allows them to recognize patterns and develop problem-solving strategies. Recent research by Ontuganova et al. (2022) and Shabrina and Lestarinigrum (2020) explores redesigning school coding curricula, focusing on teaching methods that enhance cognitive abilities and language development among young students. Sabrina and Lestarinigrum (2020) delve into using activities to improve problem-solving skills with an approach specifically designed for children. Meanwhile, the study by Ontuganova et al. (2022) aims to implement teaching approaches that foster critical thinking processes and language development among primary school students. These studies offer insights for designing programs to nurture essential skills such as logical reasoning and effective problem-solving techniques, among young learners.

Preparation for the future. When children learn how to code, they acquire skills that will benefit them throughout their lives. Coding helps them navigate the world effectively and enhances their prospects for future employment.

In a 2019 study titled "The Littlest Learners; Introducing Coding Concepts to Preschoolers," Dragenflo (2019) highlighted the importance of exposing children to coding principles. The focus was on teaching children coding concepts to improve their literacy and early language skills.

Furthermore a study conducted in 2022 by Ontuganova et al. (2022) titled "Teaching Methods for Developing Critical Thinking and Language Skills in Primary School Students" explores how logical approaches are employed in

classrooms to foster thinking and language development among primary school students. The research findings indicate that these approaches impact the development of speech and critical thinking skills.

In another study conducted by Shabrina and Lestarinigrum in 2020, “The Benefits of Play with Loose Parts for Enhancing Logical Thinking Skills at KB Lab School,” the researchers explore how engaging in play activities with parts can enhance children’s development by fostering their thinking abilities, creativity and problem-solving skills. This study emphasizes the importance of nurturing these skills from an early age.

Whether it involves introducing coding principles or implementing teaching strategies that promote thinking through play and problem-solving activities, these studies significantly contribute to understanding child skill development.

Soft Skills and Academic Achievement. Skills such as perseverance, teamwork, and effective communication are developed during schooling. These skills have an impact on preparing students for success in their lives. Numerous studies highlight the importance of acquiring these skills within the classroom and how they contribute to student achievement. For instance, Dimitrova (2018) emphasizes how soft skills shape an individual’s personality in our changing world. Kumar et al. (2022) underscore the essentiality of skill development for children to thrive in environments. Additionally, Feraco et al. (2023) delve into how qualities like adaptability, curiosity, and perseverance influence levels of achievement. These studies emphasize the significance of these skills in education and their long-term effects on growth and future endeavors.

By investigating the importance of adaptability, curiosity, and persistence in achieving success and overall life satisfaction among students in 2023, we can contribute to the existing body of knowledge. This research aims to deepen our understanding of these abilities’ significance for student performance in classrooms and workplaces while highlighting their integration into contexts.

LIMITATIONS OF THE STUDY

The study presents several limitations that should be acknowledged. Firstly, the literature review primarily focuses on existing research, which may only encompass some relevant studies or the most recent developments in coding education, potentially leading to gaps in the analysis. Additionally, the findings are based on limited studies conducted in specific contexts, which may only be generalizable to some educational settings in the Philippines or other countries. Furthermore, the research relies on the subjective interpretation of the literature, which could introduce bias in selecting and evaluating sources. Lastly, the

dynamic nature of technology and education means that the recommendations may require continual reassessment to remain relevant in the face of rapid advancements in coding practices and educational methodologies.

CONCLUSIONS

Studies have found that including coding courses in the curriculum has advantages, such as fostering imagination, creativity, and logical thinking and preparing students for the future. These programs do not encourage creativity and imagination. Coding also enhances critical thinking, problem-solving, and mathematical abilities. By equipping students with these skills, coding programs effectively prepare them to meet the challenges of tomorrow.

Furthermore, research highlights the significance of perseverance, teamwork, and communication in achieving success and seizing opportunities in the future. Therefore, it is vital to incorporate coding programs into curricula to promote rounded development that encompasses a range of abilities, including creativity, logical reasoning, and soft skills. These elements are essential for thriving in today's world.

This research underscores the importance of developing context-specific approaches to coding education in Philippine grade schools to enhance students' cognitive skills and prepare them for future career opportunities.

In summary, further research should include longitudinal studies on coding education's long-term effects, evaluations of diverse teaching methodologies for skill enhancement, and investigations into the link between coding skills and career success in the IT field.

RECOMMENDATIONS

Based on the findings presented, the following are the recommendations for this research;

A comprehensive and long-term investigation would be beneficial in understanding how skills such as perseverance, teamwork, and communication relate to students' academic performance. This could involve implementing targeted interventions to enhance these skills and evaluating their impact on achievement.

Another area worth exploring is the effectiveness of methods in promoting skill development. Researching problem-based assignments and evaluation criteria that support students' growth in problem-solving, teamwork, leadership, time management, analytical thinking, and creative thinking could provide

insights. Comparing these approaches with teaching methods may help identify practices.

It would also be worthwhile to examine the connection between these skills and career success in today's valued environment. This research could involve identifying attributes contributing to achievement and designing focused training programs to enhance these abilities among professionals and students.

TRANSLATIONAL RESEARCH

The practical translational research projects for this study may include pilot coding programs that can be adapted and focused on the Philippine school context, training workshops for teachers that can work towards the proper implementation of coding curricula in schools, and partnerships between schools and local tech industries that can provide real-world experiences and direct mentorship of students. This can further be supported through outreach programs in the community that provide education to other people on why everyone should have a basic knowledge of coding and the initiation of mechanisms on how to continuously improve the curriculum of coding skills by feedback from teachers and students.

CONFLICTS OF INTEREST AND FUNDING

The authors declare that they have no conflicts of interest, financial or otherwise, that could influence or bias the content of this article. This study was conducted independently without any external funding from organizations or individuals that could have a vested interest in the findings.

The data supporting the findings of this study are available upon request to ensure transparency and facilitate independent verification of the results. AI was utilized ethically solely to enhance readability, with due diligence and mindfulness applied to ensure that it did not contribute to the analysis or interpretation of the content.

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