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**PROGRAMMING FIELD AND TECHNOLOGY IS TODAY'S TOPIC**

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**ABSTRACT**

The Philippine education system is strongly geared toward technological advancement in this era of the Industrial Revolution (IR 4.0). This study aims to evaluate the computer programming competence of selected grade 9 students of Philippine Science High School (PSHS), Cagayan Valley Campus, and identify their learning experiences and challenges for learning strategy. This study used a qualitative method using exploratory study. A semi-structured interview was used to determine the programming learning experience and challenges of the students. Purposive sampling was used with 29 grade 9 students. The main finding of this study is that PSHS students are competent when it comes to their level of computer programming competency. Based on their learning experiences, computer programming subject helps to improve their critical thinking skills, which serve as a tool to solve real-world problems and allows them to learn different programming languages. In addition, they learned the value of patience and improved creativity. Moreover, there were identified challenges when it comes to more technical aspects of programming, such as improper coding syntax, incorrect solutions to problems, and difficulty in debugging. Overall, students' computer programming competence is good but needs further enrichment to hurdle some technical challenges. The results of the study provide useful information for computer science teachers to improve teaching strategies and approaches further. This study provides additional knowledge to the existing literature on computer programming in the K to 12 curricula of the Philippines education system.

**Keywords:** computer learning strategies, computer programming, student computer competence.

**INTRODUCTION**

The training of future professionals is very much evident in the high school K to 12 curricula, but the question is how prepared Filipino high school students are for the future. Do they acquire the essential technological competencies expected from them? Recently, activities that include computing have become universal in the classroom setting, whether it is integrated in the subject that serves as a tool to make the teaching and learning processes effective and efficient with the use of technology. The emergence of Information Technology (IT) has drastically improved students' academic performance, given the several benefits of IT. The utilization of IT became more evident and essential to education delivery when the COVID-19 pandemic struck. Technology and software play an increasing role in almost all areas of society, as well as every aspect

of life with the rapid development of digitalization. It is essential to gain a better understanding of its workings as well as what opportunities and risks this entails. As a result, more and more countries have started in the process of starting to introduce Computer Science (CS) into their school curricula. Some countries, such as Finland and Sweden have taken an interdisciplinary approach, and England have introduced CS as a subject of its own, building on the concept of digital competence (Skolverket, 2017). Innovative technologies and practices are implemented in teaching and learning as well. Many countries, such as the United Kingdom, United States and Greece, have introduced a new initiative in their curricula, replacing existing ICT courses with computer and computational science, where students are gradually learning how to program and engage in computational thinking (Psycharis, 2016).

### Main Body

The introduction to computer programming is becoming increasingly popular among students, especially to high school students. Students' curiosity and interest in learning how to utilize new technology is high. The teaching of Science, Technology, Engineering, and Mathematics (STEM) includes computer coding that involves writing, modifying, and putting into practice computer code while exposing students to computational thinking (Grover & Pea, 2013). However, simply teaching students to code does not guarantee that they can apply the knowledge and abilities they have acquired in computer programming to different contexts and circumstances; rather, certain strategies and approaches how to learn the processes need to be created to support technology transfer, especially when it comes to the computer programming (Grover & Pea, 2018). Programming is one of the highly sought-after skills in both the present and future labor markets.

The global economy is fast-changing, where robots are replacing more and more workers, and artificial intelligence (AI) is the instantaneous source of knowledge and information. In order to adapt to the fast-changing landscape of our modern world, the basic education must train students with relevant skills in digital fields like programming, AI, machine learning, data science, data analytics, cloud computing, and cybersecurity (Kim & Lee, 2016). Learning computer programming is not that easy for many students, but it has tremendous role and useful in developing students' technological talents and skills (Sima & Parumal, 2019).

Introducing programming in schools can provide a better understanding of basic and essential concepts of coding in solving typical issues and for the purpose of reusability. Programming languages such as C, C++, Python, Ruby, Java, and other platforms were used to create programs or applications that make programmers' work efficient, effective, and faster. Babas (2020) projected that the Philippines would be one of the next ICT hubs and the best breeding ground for ICT professionals in Asia with the help of an ICT-equipped workforce for the advancement and progress of ICT.

The Philippine Science High School (PSHS) Systems offers Computer Science (CS) subjects with advanced Programming Languages such as Python (CS1), C++ (CS2),

JavaScript - HTML and CSS (CS3), and Java (CS4). These are the most widely used programming languages today, both in industry and education. The goal of the subject is to facilitate students learning about STEM fields to become future-ready. Some researches show that with the aid of programming, it helps to improve students' learning experiences to strengthen their abilities and thinking skills. The PSHS Computer Science Curriculum aims to develop students to become proficient in technological problem-solving by grounding them in the use of Information and Communications Technology in everyday life and in computational thinking; develop program logic formulation skills through pseudo-coding, flowcharting, and procedural or structured programming using a programming language; teaches the students to understand abstract and theoretical analysis; cultivate student collaboration, innovation, and a sense of community and responsibility; prepare the student to analyze problems needed for the everchanging modern world; train and develop the student to find solutions using computers for real-life applications; help students learn modularization (work independently to achieve a greater task); and prepares students for careers in Science and Technology. After analyzing the CS1 to CS4 curriculum, the following common content/topic was identified: (a) Programming Basics - Data Types, Constants, Variables, Input, Output, Operations, and Precedence Rules (b) Logical Control Structures -Control Statement and Loops (c) Arrays - Declaration, Initialization, Referencing, Traversing and Practical Applications (d) Functions - Declaring and calling functions. The current study aims to evaluate the students' competence on computer programming and propose relevant strategies and approaches to improve student knowledge and skills.

In programming, one of the skills that students need to learn is computational thinking skill. This kind of skill could use by the student to learn the process of breaking down a problem into simple components which promotes not just computational skill but also analytical and critical thinking skills of the students to solve complex real-world problems (Lai, 2021). Technology, has recently been progressively utilized in various fields and industries, such as the social, health, economics, environmental sectors and most especially in education sector, from basic to higher education. Teachers' teaching strategies have been greatly changed by the use of computer and multimedia technologies inside and outside the classroom setting (Rebuta et al., 2022). Computer programming is the skill of creating programs that may be used by a variety of devices, such as operating systems, the internet, electronic devices, computer-aided devices, or a mix of these technologies. Students in computer programming, acquire the necessary skills in order to perform well in various IT sectors and industries (Ibezim & Chibuogwu, 2016). In a study by Sima and Parumal (2019), they noted that one of the cornerstones of information technology education is the teaching of computer programming. Rapid advancements in technology help to promote students' creativity, analytical and critical thinking skills, and problem-solving skills, especially in computer programming subject. Computational thinking is acquired through programming; hence learning to program a computer can ultimately help the student to develop computational thinking abilities

(Scherer et al., 2020). Computer programming enables users to communicate with computers and other computerized devices, utilize computing in all aspects of human effort, automate processes, and build intelligent machines.

## Conclusion

The PSHS Computer Science Curriculum aims to develop students to become competent in problem-solving through computational thinking. The results have shown that the majority of the Grade 9 students have competent level of competency in computer programming based on the curriculum. This implies that there is a need for competency improvement since the level is lower than proficient and expert. The students' learning experiences in computer programming includes the subject as fun and exciting, teaches patience, improves creativity and critical thinking, and helps students to use different programming languages. However, there is a need to improve on the students' coding syntax, finding the right solution to a problem, debugging, and learning challenges. And in order to address the challenges of the students, there is a need to strengthen and innovate the teachers' teaching methods or strategies in delivering programming lessons. Based on the nature of exploratory study, as a possible introduction for further research the future researchers may diversify and expand the number of participants to different grade levels in junior high school and include schools that offer computer science. The results of the study are useful in guiding computer science teachers to further improve their teaching strategy implemented in the class. In addition, the research paper provides additional knowledge to the existing literature of computer programming in the Philippines.

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