

The Use of Artificial Intelligence as a Support Tool in Programming Learning Among Polytechnic Students

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Abstract: The advancement of Artificial Intelligence has significantly impacted programming education by providing support in concept understanding, code generation, and problem-solving. This study aims to investigate the use of this technology as a support tool in programming learning among polytechnic students, focusing on usage patterns, learning effectiveness, risk perception, and student acceptance. A quantitative research design was employed using a structured questionnaire to collect data related to usage, learning effectiveness, risk perception, and acceptance among students. The findings indicate that the technology is primarily used for understanding programming concepts, followed by generating code examples and debugging support, while its use for completing assignments is relatively lower. Overall, students demonstrate positive perceptions of its effectiveness, particularly in enhancing understanding, improving problem-solving abilities, and increasing learning engagement. Risk perception related to dependency and passive learning is found to be low, indicating controlled and responsible usage of the technology. In addition, instructor guidance is identified as an important factor in ensuring effective integration of the technology in programming learning. The study concludes that Artificial Intelligence serves as an effective support tool in programming education, with important implications for teaching practices in polytechnics.

Keywords: Artificial Intelligence; Programming Education; Instructor Guidance; Polytechnic Students.

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I. INTRODUCTION

Artificial intelligence tools refer to software, applications, or technological systems that utilize AI technology to perform tasks automatically, intelligently, and efficiently. This technology is developed to enable computers to emulate human capabilities, such as understanding language and solving problems through the analysis of complex data patterns, to produce accurate recommendations or decisions [1].

Furthermore, artificial intelligence systems can generate outputs based on received data through an automated analytical model-building process [1]. Among the popular AI tools today is ChatGPT, which is used for answering questions and assisting with writing [2], while Gemini is frequently applied for information retrieval and extensive data analysis through large-context processing [3]. This technology has become a cornerstone in various fields, including business, healthcare, education, and software development, to meet the demands of the current digital era [1].

However, the use of AI tools in the education sector has raised several critical questions. Among these is the extent to which students truly utilize AI for learning purposes as opposed to merely completing assignments mechanically, which risks creating an over-reliance on technology [2]. Additionally, the lack of clear guidelines for AI usage can lead to misuse, subsequently negatively impacting the development of higher-order thinking skills and academic integrity among students [2][1].

Accordingly, this study is conducted to identify the level of AI tool usage among students, analyze the purposes of its use in learning C++ programming, and evaluate students' perceptions of the effectiveness of AI as a learning support tool. This study also aims to understand the potential risks of AI usage, including technological dependency and its implications for the learning process.

II. METHODOLOGY

A. Research Design

This study adopted a quantitative approach using a survey design to identify patterns of Artificial Intelligence (AI) tool usage among students and to evaluate its purpose and effectiveness in learning C++ programming. This approach was selected for its capacity to collect data systematically from a large pool of respondents, enabling accurate descriptive statistical analysis.

B. Population and Sampling

The research population consisted of Information Technology Diploma students at polytechnics who were enrolled in the C++ programming course. The research sample was selected using a convenience sampling method, involving students who were undertaking the relevant course during the semester based on accessibility.

C. Research Instrument

The research instrument was a structured questionnaire developed based on the research objectives and a review of existing literature. The questionnaire was divided into six main sections:

- Section A: Respondent demographics
- Section B: Level of AI usage
- Section C: Purpose of AI usage
- Section D: Perceptions of AI effectiveness
- Section E: Risks and negative impacts of AI usage
- Section F: Attitudes and acceptance towards AI

Items in Sections C through F were measured using a five-point Likert Scale (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree). The use of this scale allowed for the quantitative measurement of respondents' perceptions and tendencies.

D. Data Collection Procedure

Data were collected through the distribution of an online questionnaire via the Google Forms platform. In accordance

with research ethics, respondents were provided with a briefing regarding the purpose of the study and a guarantee of information confidentiality before providing their responses.

E. Data Analysis Method

The data obtained were analyzed using Microsoft Excel to process the responses from the survey. The following analyses were conducted:

- Descriptive Statistics: Percentages were used to summarize respondent demographics (class and gender) and AI usage patterns, such as the specific tools used (e.g., ChatGPT, Gemini) and the frequency of use.
- Mean Analysis: Mean scores were used to evaluate the level of agreement for Section C through Section F, measuring the extent to which students use AI for purposes like debugging, understanding concepts, and its perceived effectiveness in learning C++.

III. FINDINGS

A. Respondent Demographic Profile

A total of 47 respondents participated in this study.

- Class: DIT1A (51.1%) and DIT1B (48.9%).
- Gender: Male (59.6%) and Female (40.4%).

B. Level of AI Tool Usage

- AI Usage: 100% of students use AI tools in their C++ programming learning process.
- Preferred AI Tools: ChatGPT is the most popular tool (69.0%), followed by Google Gemini (36.2%).
- Frequency: The majority of students use AI at a Moderate (48.1%) and **Frequent** (30.8%) level.

C. Mean Score Analysis (Purpose, Effectiveness, Risk, & Attitude)

For interpretation, the mean scores are categorized as follows: Low (1.00-2.33), Moderate (2.34-3.66), and High (3.67-5.00).

Table 1: Summary of Mean Score Analysis for AI Usage in C++ Learning

Section	Key Item	Mean Score	Level
C: Purpose	Understanding C++ concepts	3.88	High
	Enhancing programming logic	3.79	High
	Finding code examples	3.75	High
D:Effectiveness	Assisting in solving programming problems	3.83	High
	Making learning more interesting	3.83	High
	Understanding programming faster	3.74	High
E: Risks	Becoming too dependent on AI	2.89	Moderate
	Thinking less independently	2.79	Moderate
F: Attitude	Lecturers should provide guidelines on AI usage	3.98	High
	Continuing to use AI in the future	3.66	Moderate

- **Primary Purpose:** Polytechnic students use AI not just to complete assignments (mean 3.33), but primarily to understand concepts and enhance logic (mean 3.88). This supports your argument that AI serves as a learning support tool.
- **Effectiveness:** The mean score for effectiveness is high (>3.70), indicating that AI has a significant positive impact on helping students solve C++ programming problems.
- **Risks:** The level of dependency (2.89) and reduced independent thinking (2.79) remain at a moderate level. This suggests that while students are aware of these risks, they have not yet reached a critical stage.
- **Need for Guidelines:** The most significant finding is the mean score of 3.98 (the highest), which indicates that students strongly agree that lecturers must provide clear guidelines on how to use AI appropriately.

IV. DISCUSSION, RECOMMENDATIONS AND CONCLUSION

➤ *Discussion of Key Findings:*

- *The Role of AI as a Learning Facilitator*

The findings indicate that polytechnic students strategically use AI to understand C++ concepts (Mean: 3.88) and enhance their programming logic (Mean: 3.79). This aligns with [1], who posits that AI functions as an intelligent system aiding in the resolution of complex problems. This evidence suggests that in a technical education context, AI is not merely a tool for duplicating answers but acts as a "personal tutor" that assists in cognitive development.

- *Effectiveness in Programming Education*

The high mean scores regarding perceived effectiveness (Mean: 3.83) demonstrate that tools like ChatGPT and Gemini help students grasp C++ syntax more rapidly. These results support the report by the [3] regarding the capability of large language models to process vast data contexts—in this case, intricate programming code. The ability of AI to provide instant feedback on errors significantly reduces the learning curve for novice programmers.

- *Awareness of Risks and the Need for Guidelines*

While students acknowledge the effectiveness of AI, there is a moderate concern regarding technological dependency (Mean: 2.89). The most critical finding is the overwhelming demand for formal guidelines from lecturers (Mean: 3.98). This reinforces the argument by [2] that without clear policies, AI usage in education risks undermining academic integrity and diminishing critical thinking skills.

➤ *Recommendations:*

- *Establishment of Official Guidelines*

Polytechnics should develop a formal manual or code of ethics specifically for AI usage in programming courses to prevent academic dishonesty and misuse.

- *AI Integration Training*

Lecturers should guide students on how to use AI for debugging and logic verification rather than simply generating final code outputs.

- *Alternative Assessment Methods*

Assessment strategies may need to be adapted, such as conducting "offline" practical exams or "code defense" (viva voce) sessions to ensure students truly understand the logic behind the code generated by AI.

➤ *Conclusion:*

This study concludes that AI tools have a significant and positive impact on learning C++ programming at the polytechnic level. While AI enhances student efficiency in understanding and writing code, constant monitoring and guidance from educators are essential to balance the benefits of technology with the preservation of higher-order thinking skills.

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