

A LOOK BEYOND THE CODE: STUDENTS' PERSPECTIVES ON THE ROLE OF ARTIFICIAL INTELLIGENCE IN TRANSFORMING PYTHON PROGRAMMING LEARNING

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Abstract

The study delves into integrating Artificial Intelligence (AI) through ChatGPT into computer programming courses, considering the impacts on student learning experiences, specifically in Python programming. It emphasizes the benefits of using ChatGPT in enhancing student engagement, motivation, and understanding of programming activities. The research adopted quantitative and qualitative approaches, focusing on the Technology Acceptance Model (TAM) to gauge students' perceptions. The findings showcased favorable outcomes from students' use of ChatGPT, highlighting improved interest, diversity, motivation, and understanding in programming exercises. While the study revealed significant positive outcomes, it also acknowledged challenges such as potential overreliance on AI tools hindering critical thinking skills. The implications underscore the importance of balancing the benefits and challenges of ChatGPT integration, promoting personalized learning experiences, continuous training for instructors, and fostering ethical considerations in AI-ChatGPT utilization. This abstract encapsulates the study's emphasis on maximizing AI's benefits while addressing challenges to optimize educational outcomes in computer programming courses.

Keywords: Programming, Artificial Intelligence, ChatGPT, Learning Management System.

1. INTRODUCTION

Instructing computer programming classes presents considerable difficulties, especially for students not enrolled in Information Technology Education (ITE) programs. ITE Instructors must comprehend the syntax and principles of programming languages like Python, along with the essential structures, content, and analytical abilities required for proficient problem-solving and program implementation. Safeguarding students from getting lost is critical when introducing programming instructions, syntax, and algorithms, which are fundamental elements of any programming language.

Python has been widely used in programming classes because of its simplicity and clarity. It's clear and short code structure makes it natural for beginners to comprehend fundamental programming principles without complicated syntax. The code structure fosters sound programming practices and underscores readability, which is essential for students acquiring coding skills. Understanding programming commands, the vital elements of code, syntax, and the rules that govern a well-designed program is crucial for students to write functional programs efficiently.

Moreover, algorithms and systematic methods for problem-solving are essential in programming education. Instructing students in algorithm design, analysis, and implementation

cultivates their logical reasoning and problem-solving abilities. By implementing algorithmic thinking, students can more confidently apply programming concepts by deconstructing big issues into manageable tasks. This process gains significance as students engage in more complex initiatives, necessitating a firm understanding of these fundamental components.

Current investigations indicate that AI may effectively address substantial deficiencies in programming instruction. AI solutions such as ChatGPT may enhance learning experiences by improving student engagement, comprehension, and problem-solving abilities, thereby addressing the unique needs of each student.

This individualized approach can enhance motivation and engagement in programming, resulting in a more inclusive educational atmosphere and a future where no student is excluded from programming instruction. Writing structured instructions that the Python interpreter can comprehend and carry out is also known as creating program code in Python. Python's simple syntax and built-in functions allow programmers to create algorithms, control flow structures, and data manipulations that solve issues quickly and make code easier to read and maintain.

Further investigation into this technology can provide insightful information about workable approaches to integrating AI in diverse educational contexts, resolving potential issues, and devising solutions. In 1989, Davis developed the technology Acceptance Model (TAM), which offers a framework for analyzing how people embrace new technologies. Students' opinions on artificial intelligence (AI) in the classroom are greatly influenced by how beneficial and simple they believe tools like ChatGPT to be, which in turn shapes their readiness to accept these technologies as teaching tools.

Furthermore, instruction on programming commands, syntax, and algorithms can be difficult, particularly for non-ITE program students with no prior coding knowledge. This difficulty underscores the necessity for innovative and creative pedagogical approaches to improve students' learning experiences. Tadlaoui and Chekour (2021) assert that adopting educational frameworks that integrate collaborative group work and blended learning methodologies can significantly enhance instructional quality.

This study examines and evaluates various pedagogical methods, instructional strategies, and learning environments, such as traditional lectures, collaborative group work, and blended learning approaches, along with their integration with AI in programming education. This study will examine the perceived effects of utilizing AI tools such as ChatGPT in blended learning environments for computer programming courses at the College of Agriculture, Forestry, and Environmental Science (CAFES) during the first semester of the 2023-2024 academic year, concentrating on Python programming.

The results will ultimately improve pedagogical methods in programming education, equipping educators with a thorough comprehension of utilizing AI to effectively enhance student learning outcomes and engagement. This work aims to provide recommendations for optimal practices in employing AI to foster dynamic and inclusive learning experiences for all students, ensuring they acquire the essential abilities to navigate the intricacies of programming.

2. RESEARCH METHODS

This study examines the expected results of ChatGPT use in blended learning settings for students enrolled in a Python-focused computer programming course at Mindanao State University in Misamis Oriental's College of Agriculture, Forestry, and Environmental Sciences (CAFES). To guarantee the validity and dependability of the findings, the researcher used a mixed-methods strategy, combining qualitative and quantitative techniques.

Students' output of the programming code was examined for structural integrity in Python programming, and programming lessons were taken from the course's outcomes-based curriculum. The Technology Acceptance Model (TAM), developed by Davis (1989; 1993), looks at the variables affecting technology adoption and serves as the foundation for the study. TAM focuses on two main components: perceived usefulness, which reflects users' opinions about the system's efficacy, and perceived ease of use, which indicates the system's usability.

To collect data, the researcher, who is also a course instructor, jointly created pre- and post-questionnaires with both closed- and open-ended questions. Students engaged in exercises and activities in the lab, and their work was evaluated using the code they submitted. To assess their experiences with ChatGPT, a Google Forms questionnaire was used to collect feedback.

Students used ChatGPT, a web-based interface, during the course, enabling real-time communication for various programming tasks. Conversations between students and ChatGPT were recorded and examined to learn more about students' experiences, viewpoints, and general involvement with the technology in their programming assignments.

3. RESULTS AND DISCUSSION

Enhancing problem-solving skills in practical applications and enriching learning experiences through hands-on exposure to cutting-edge tools are only two benefits of incorporating artificial intelligence into computer programming courses. However, there are drawbacks to this integration as well. The possibility that students may grow unduly reliant on AI tools, which could impair their capacity for critical thought, is one major worry. Therefore, by striking a balance between the advantages of artificial intelligence (AI) and the requirement that students acquire critical cognitive abilities, information technology education (ITE) instructors must negotiate the challenges of integrating AI into programming instruction.

In this process, ChatGPT can be extremely helpful in assisting students in gaining the knowledge they need to successfully finish their assignments and projects (Kasneci et al., 2023). For example, students can ask ChatGPT questions about particular subjects, and the language model will reply with knowledge gleaned from the internet. Furthermore, in line with the student's field of study, ChatGPT can suggest pertinent books and articles (Alafnan et al., 2023; Cooper, 2023). By utilizing these resources, teachers can assist their students' critical thinking growth while producing creative learning opportunities.

The study results indicate that the utilization of artificial intelligence, and more specifically ChatGPT, considerably improves the learning process. Students have remarked that ChatGPT

has significantly increased the variety and interest in Python activities. While creating laboratory exercises, instructors should ensure the activities are designed and delivered engagingly. This is because it is one of the most important factors in fostering students' active engagement.

Table 1: Students' Perceived Outcomes of Using AI in Performing Exercises and Activities

Characteristics	Mean	SD	Description
1. Make the Python activities more interesting when using AI like ChatGPT.	4.02	.72	To a great extent
2. Use AI like ChatGPT to improve understanding and analysis of Python debugging/ tracing error codes in the learning materials.	4.00	.72	To a great extent
3. Makes the Python programming code more diverse when using AI like ChatGPT.	3.82	.81	To a great extent
4. Makes Python programming more motivating when using AI like ChatGPT.	3.80	.76	To a great extent
5. Helps understand the Python programming activities/exercises better when using AI like ChatGPT	3.73	.70	To a great extent
6. Develop students' learning skills in performing programming exercises/activities when using AI like ChatGPT.	3.92	.67	To a great extent
Average	3.88	.63	To a great extent

Interventions like frequent interaction and active engagement in programming exercises provided through a blended platform using ChatGPT can get students even more interested. Students did a good job of using ChatGPT to understand better and analyze what they were learning. Because of this, ITE professors should be aware of what might happen if they use ChatGPT in the laboratory setting.

Brown et al. (2020) claim that the Generative Pre-trained Transformer (GPT-3) model has 175 billion parameters and aims to improve task-agnostic skills by showing better performance than previous best fine-tuning methods. Plus, GPT-3 is a lot better than earlier non-sparse language models. This makes it a top engine for natural language processing applications in many areas, such as education (Williams, 2023; Tate, 2023), engineering (Qadir, 2022), journalism (Pavlik, 2023), healthcare (Nisar & Aslam, 2023; O'Connor & ChatGPT, 2023), and economics and finance (Alshater, 2022; Terwiesch, 2022). ChatGPT, based on the GPT-3 model, has much potential to improve teaching and learning.

The result revealed in Table 2 shows that students' perceived outcomes of using ChatGPT are not significantly correlated to their integration of ChatGPT when performing exercises and activities since the p-value of 0.566 exceeded the 0.05 level of significance. This indicates that students' use of ChatGPT is not associated with their perceived outcomes of using ChatGPT. Thus, the null hypothesis, which states no significant relationship exists between students' perceived outcomes of Using ChatGPT or the natural language and their use when performing activities and exercises, was not rejected at the 0.05 level.

Table 2: Correlation Analysis between Students’ Perceived Outcomes of Using ChatGPT and their Use in Coding Python

		Students’ Perceived Outcomes of Using AI like ChatGPT
Students’ Use of AI like ChatGPT	Pearson Correlation	.084
	Sig. (two-tailed)	.566
	N	49
^{ns} Correlation is not significant at the .05 level.		

This study investigates the correlations between students' reported outcomes of utilizing ChatGPT and their involvement with the platform for executing laboratory activities and exercises in blended learning contexts. In conclusion, students in the College of Agriculture, Forestry, and Environmental Sciences (CAFES) who engaged in the Computer Programming course acknowledged substantial advantages from utilizing AI-ChatGPT in their blended practical exercises and activities. All six observed features were regarded as significant outcomes, illustrating the considerable positive influence of ChatGPT on the learning experience.

4. CONCLUSION

In conclusion, students' observations show that using ChatGPT in Python programming tasks has big benefits. The results show that students' interest, engagement, variety, and persistence during programming tasks improved significantly. This shows that natural language processing tools like ChatGPT can help students learn and become more involved in blended learning environments. The study stresses the importance of using methods that keep students interested and involved in ChatGPT-based computing activities. To get the most out of this tool, you need to keep interacting with it and communicating clearly. There is also no strong link between how much students use ChatGPT in exercises and how they think it helps. This says that we need to do more research and develop more effective ways to teach. This gap shows how important it is for teachers to learn how to use AI tools in the classroom to have the most teaching impact.

In addition, this work shows how powerful advanced language models like GPT-3 can be in changing natural language processing applications and the way we teach. ChatGPT is an amazing tool that helps students improve in programming classes and makes teaching more interesting. Receiving real-time comments and answers to difficult programming questions can help students understand complicated ideas better, making them less tricky and more manageable. Adding ChatGPT to the curriculum is also in line with current trends in education, which encourage individual learning experiences that meet all students' needs and learning styles. While traditional teaching methods may be hard for some students, AI tools can help them by making the learning experience more interactive and supportive.

Finally, this research shows that ChatGPT makes learning more accessible for students in the Computer Programming class at the College of Agriculture, Forestry, and Environmental Sciences (CAFES). The results make it even more apparent that new technologies must be used to improve teaching methods and student outcomes. Schools need to keep up with how quickly

technology is changing, and this study's findings can help them ensure that their full-length lessons include AI tools that work well, giving students the skills they need to succeed in the digital age.

5. IMPLICATIONS

The findings of this study have a wide range of major implications, particularly with regard to the role that ChatGPT plays in helping to change Python programming education. To begin, including ChatGPT into laboratory activities has the potential to significantly boost student engagement by boosting their interest, enthusiasm, and comprehension of programming assignments. These findings lend credence to the viewpoints of students regarding the ways in which advanced language models might enhance the learning experience by making it more participatory and effective.

With regard to the design of instructional materials, educators in the field of ITE should concentrate on developing activities that make full use of the possibilities offered by ChatGPT. When it comes to programming classes, educators have the ability to maximize the transformative potential of artificial intelligence by incorporating a wide range of interesting activities that are tailored to the preferences and requirements of their pupils. It is crucial to retain student attention and ensure that the benefits of artificial intelligence are achieved in the learning process by ensuring continuous communication and interaction during programming activities that ChatGPT enables. The research underlines the favorable perceptions of utilizing ChatGPT; however, it also highlights the potential for further research into the elements that drive student involvement with this technology and its overall impact on learning outcomes. Specifically, the study focuses on the characteristics that influence student engagement with ChatGPT. By understanding these processes, it may be possible to integrate AI technologies more successfully into Python programming courses.

On the other hand, it is essential to consider the potential difficulties linked with relying on ChatGPT. Students may be less able to acquire critical thinking and problem-solving skills if they are overly dependent on artificial intelligence software. In addition, the quality of the content that AI generates might vary greatly and can result in errors or misconceptions, affecting the learning process. When adopting artificial intelligence technologies like ChatGPT into educational practices, several other problems must be considered carefully. These challenges include a lack of personalization, ethical concerns, technological restrictions that limit access, and limited possibilities for human connection.

Therefore, educational institutions and educators must traverse these issues to develop a balanced approach to incorporating AI. To maximize the transformative learning effects while also developing a thorough and practical programming experience for students, it is essential to find a balance between the benefits and obstacles of using ChatGPT. Teachers can create a more enriched learning environment for their students by carefully combining artificial intelligence technologies and resolving the limitations of these tools. This environment allows students to develop the necessary technical skills for critical thinking.

6. SUGGESTION

Several suggestions can be made to maximize the integration of AI technologies, like ChatGPT, into learning environments that emphasize Python programming activities based on the research findings. First and foremost, it is critical to give students a customized learning experience by modifying assignments and feedback to suit their unique learning styles and stages of development. This customized approach can significantly improve student involvement and comprehension during activities and exercises. To guarantee their competence in creating and executing successful learning activities with AI tools, educators should also have access to continual professional development opportunities. Ongoing training enables teachers to take full advantage of AI's potential, eventually enhancing student learning. Additionally, feedback systems should be incorporated into the learning materials that instructors generate to collect students' opinions, difficulties, and preferences. By using this input to guide instructional design, teachers will be able to modify their methods to better suit their pupils' needs. Addressing ethical issues is essential to maximizing the advantages of incorporating AI technologies in educational contexts. Encouraging research collaboration can help us better understand how ChatGPT and AI affect learning outcomes. Additionally, carrying out long-term impact analyses will assist in determining how well AI integration in programming classes and other academic fields works. By implementing these suggestions, universities can develop a dynamic and adaptable learning environment that improves students' learning in programming and other subjects.

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