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AI AS AID TOOL IN VISUAL PROGRAMMING COURSES AT UNIVERSITAS MULTIMEDIA NUSANTARA

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Abstract: *This research investigates AI usage within a Visual Programming course at Universitas Multimedia Nusantara, focusing on how design students integrates AI into interactive media development. In this case, the output is game development using Unity platform that requires fundamental programming logic. This study aimed to assess AI's involvement in the development process and explore its limitations for programming for design students. Data was collected via questionnaires (n=44) and continued by interviews (n=8) to further pursue insights on AI's potential to replace programmers. The questionnaire results showed 100% of the respondents use AI across various game development stages, from ideation and story development to asset creation, soundtracks, programming, and animation. The practical application of AI in a first-person controller game demonstrated its effectiveness for generating basic code, but also highlighted the need for human intervention in debugging, adaptation, and quality assurance. The interview reveal students' challenges with faulty logic AI solutions. The research concludes that AI is a valuable programming assistant during game development, expanding human capabilities, but cannot fully replace human understanding of programming logic, problem-solving, and creativity. This underscores the importance of strategically integrating AI into curricula to enhance, but not replace, human learning and programming skills.*

Keywords: *visual communication design; technology of artificial intelligence; learning assistance*

Introduction

Artificial Intelligence (AI) has become an important part of various industries. Its implementation can be seen on various aspects, such as in marketing (Octavany & Wicaksana, 2020) and in agriculture (Shabrina et al., 2023). However, the integration of AI becomes more prominent in the programming sector (Coello et al., 2024). Previous GitHub research mentioned how game developers found incorporating AI in their game development process as useful. Enhancing both the creation process and the player experience (Barke et al., 2023). It can be said that AI applications span across multiple stages of development, not only as an administration tools. With this in mind, the study further studied how AI is used in game development. The statement has

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raised questions on how AI can push the boundaries of what interactive media can achieve. Previous research has proven AI integration in the game developing process in the game industry. For instance, AI has been incorporated in the asset and game mechanics (Filipović, 2023). Game mechanics focused on the fundamental of the gameplay experience. In this case, having AI as part of the game mechanic development process, significantly highlights its evolving capabilities in refining the dynamic adjustments. For example, through AI-driven behaviors, developers can create game mechanics where players can encounter unexpected interactions or emergent gameplay. Continuing, developers can also use AI to develop sandbox or simulation games with evolving world building in response to the player's decision.

It is necessary to always consider the fundamental elements in game development before incorporating AI to advance the development process. In this case, the fundamental elements in shaping a meaningful gameplay experience, considered player goals (purpose and direction), rules (boundaries and play structure) and conflict (challenges that player need to overcome). Additionally, the storytelling and narrative structure also enhanced the gameplay context (Schell, 2008).

When talking about developing game mechanics, this study highlighted one of elements in game mechanics named first-person shooter. This type of game mechanic was intended to enhance immersive aspects to the game (Kishor, 2024). The first-person controller is a game feature that positions the camera at the player's eye level. By doing this, the game is the one that simulates the player's direct point of view. Given this context, the perspective enhanced the immersive experience. The player was able to get better spatial awareness and personal perspective to the gameplay (Fullerton, 2024). That being said, there are many game developers onto this industry to achieve the immersive aspect.

To develop a first-person shooter game, one of the game development tool is called Unreal Engine 5. As the latest Epic Game's industry-leading game engine, it was first released in 2022 aiming for next-generation gaming, film production, virtual reality to other types of real-time applications. It is known for its capabilities to push boundaries in graphic, workflow and scalability. Previous research has mentioned its key features such as Nanite (virtualized geometry) and Lumen (real-time global illumination) that supported visual clarity without compromising game performance. The Unreal Engine 5 itself supported the developers with enough physics system and animation controllers that empowered them to create responsive design in a multiplayer setting. In addition, it also supported debugging and quality assurance process through live coding and automated testing (Kishor, 2024).

Debugging and quality assurance are part of the critical stages in game development that game developers cannot ignore. It aims to ensure the game smoothness and consistency. As games grow its complexity, it is essential for game developers to spare time to undergo this stage. At the same time, it is known for its time-consuming aspect. The manual testing is repetitive and labor-intensive. But nowadays AI has been incorporated in this stage as well. Using AI, game developers were able to accelerate the process to be smarter, faster and thorough.

Aligned to this, there were also another research that prove generative AI has huge impact on game design and development processes, augmenting coders (programmer) from coding manually to assisted by AI, or even procedural content generation that help developers to create

assets on the fly (Ratican & Hutson, 2024).

These findings also enable players to create their own worlds and challenges thus making player without programming capabilities to code (Ratican & Hutson, 2024). However, both study wanted to underline it is essential to remember that by nature, game development requires essential programming logic as well. Thus, in preparing future game developers, academics need to prepare students to have necessary workability skills (Fauziah & Vantissha, 2021) With this in mind, educators are further encouraged to consistently integrate real-life applications with academic content (Hefira, 2024).

This is aligned with earlier study that mentioned how teachers are encouraged to consistently integrate real-life applications with academic content (Hefira, 2024). One of the courses offered by Universitas Multimedia Nusantara, is called Visual Programming. An elective course for undergraduate visual design communication students majoring in interaction design, that prepares design students to create interactive media with programming skills. One of the class outcome is to develop a game. Formerly the Visual Programming class curricula taught students using ”Bolt”, a visual scripting tool in Unity, to understand the basics of programming. “Bolt” is a native node-based visual scripting tool used for Unity platform, to help game developers in creating logic and interactivity without writing the traditional code. So instead of applying the script with C# language, students were taught to connect visual blocks (nodes) that represents logic operations, variables, events, and game functions. With this in mind, it can be said that using “Bolt”, encourages students to focus more on creative aspects (such as 2D/3D asset development) in an interactive design ecosystem. The visual scripting became a solution to answer the student’s struggle in understanding the C# programming logic. The course’s goal itself is not to have programming fluency but help design students to understand them, so that in they can collaborate with developers in the future (Martyastiadi, 2022). To date, the class curricula continued to teach design students using ”Unity” as the game development platform. The use of AI on an academic level cannot be avoided.

Previous research has proven how AI usage in courses has shown benefits to certain extent (Holmes et al., 2019). AI has helped teachers in developing teaching material and assisting lectures in class (Sangheethaa & Korath, 2024). Aligned, previous survey also mentioned 56% of 1000 undergraduate student admitted using AI in assignments (Grattia, 2023; Nam, 2023). This has proven AI can do simple tasks that are manually done (Brey & Dainow, 2023; Hauer, 2022). In the implementation, one of the most used AI platforms is ChatGPT (Annur, 2023), a Large Language Model that works from user input. Large Language Mode is an advanced type of AI that is developed to understand, generate and manipulate human language based on its vast database. With that extensive capability, the AI model continuously update itself with learning language patterns, especially its structure (grammar, syntas, context, to tone).

On the other hand, there have been several issues when the whole game development process relies on AI (Sarkar et al., 2022). One of them is the dependency on AI (Huang, 2023) to create solutions from existing problems (Birkenkrahe, 2024). For example, AI can be seen in programming class where students can simply copy AI-generated code without understanding the underlying logic. This type of AI falls into the category of Generative AI. In the process, user asks, in the form of a command, to the computer to create (generate) a solution. The process generates an image, program or idea to

answer the problem (Egon et al., 2023). This is because Generative AI models work based on their intended use. But not all of AI output is 100% accurate, which will pose a problem in the future (Birkenkrahe, 2024; Coello et al., 2024; Sarkar et al., 2022). That can be said, the computer is the one that creates a solution to the problem, and AI still has some limitation on the programming side (Chen et al., 2021). AI system still driven by massive collection of data that gathered without consent and this raises the privacy concerns (Ratican & Hutson, 2024).

Therefore, this research investigates the use of AI in the Visual Programming course, operating under the hypothesis that AI serves as a valuable aid but cannot fully replace human understanding of programming logic.

Methodology

In this research process, the authors applied a mixed-method approach that included literature review, selective sampling questionnaires, and in-depth interviews. The literature review was conducted to establish a fundamental understanding and to contextualized the AI usage in the game development industry as well as academic setting. The references of this study were studies on AI in programming, visual learning tools as well as its potential roles in an interactive media development.

The primary data was collected from undergraduate students of Visual Communication Design at Universitas Multimedia Nusantara who had taken an interest focus in Interaction Design, and were eligible to enroll in this elective course named "Visual Programming" which were typically accessible starting from the second year onward. A selective sampling method was conducted, targeting 20% of the total population of 200 students across three semesters (Even Semester 2023-2024, Odd Semester 2024-2025, and Even Semester 2024-2025). This resulted in a sample size of 44 respondents across eight classes (n=44). The following table was questionnaire questions.

Table 1. Questionnaire Questions
(Source: Personal Research Documentation)

1.	Name	(Open Answer)
2.	On which term you took Visual Programming Courses	(Term Selection Answer)
The following **Yes/No** questions were asked to know what happens in students' group.		
3.	I/My group uses AI in **the game idea search/generation process.**	
4.	I/My group uses AI in **the game story creation process.**	
5.	I/My group uses AI in **the process of creating game visual assets.**	
6.	I/My group uses AI in **the process of creating soundtracks with AI**	
7.	I/My group uses AI in **the programming process**	
8.	I/My group uses AI in **character animation process**	
The following Likert scale was used to measure student AI capability understanding (Strongly Disagree, Disagree, Agree, Strongly Agree)		

9.	AI can create/ help the process of creating code for my group project
10.	AI can **replace the role of** programmers for my group project
11.	AI can create/ help the story creation process for my group project.
12.	AI can **replace the role of** story writer for my group project.
13.	AI can create/help the asset creation process for my group project
14.	AI can **replace the role of** asset creator (Audio, 2D / 3D) for my group project
Open Answer Section	
15.	Please write another use case of AI in your group
16.	What AI platforms do you use in class

The questionnaires aimed to gather data on the students' general usage and perceptions of AI in the interactive media development process, specifically in game design. Additionally, the study also conducted a quantitative finding through interviews (n=8) with selected students to further understand their experiences of using AI in developing their first-person shooter (FPS) game using Unity platform as part of their task in class. The interview questions explored how students approached the AI-generated code, their problem-solving methods when facing broken scripts and whether they had additional resources or relied solemnly on AI.

Result

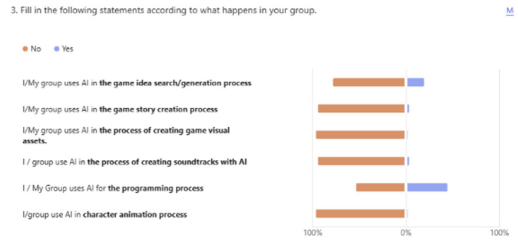

Figure 1. Respondent's Statement in Using AI in Class Project
(Source: Personal Documentation)

Based on the questionnaire results as can be seen in Fig. 1, it can be concluded that the use of AI is currently limited to story development and assisting in the programming process. The questionnaire shows that most students did use AI on their story or game assets creation. use AI on game idea creation (20.5%), story creation (4.5%), Visual assets creation (2.3%), soundtracks (4.5%), **game programming (45.5%)**, character animation (2.3%). Additionally, follow-up questions were conducted to assess the respondent's understanding of AI's functions.

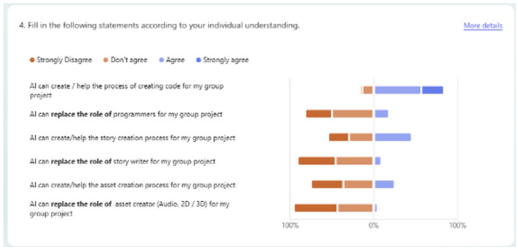

Figure2. Respondent's Statement in Understanding AI Capability
(Source: Personal research documentation)

Based on the follow-up responses, seen here in Fig.2, it can be concluded that all participants agree on the use of AI only to assist them in the creation of interactive media (such as programming and story design). However, only a few believe that AI can replace the role of

real programmers and designers. Furthermore, the author observes the following intriguing statement.

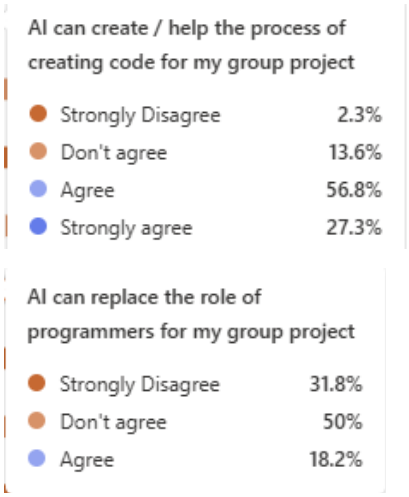

Figure 3. Respondent's Statement in Understanding AI Capability to Create Code and Replace Programmers (Source: Personal research documentation)

According to the statement that can be seen in Fig. 3, participants agree that AI can assist them in program development, according this Likert scale student states that AI could help them create code (Strongly Disagree: 2.3%, Disagree, 13.6%, Agree 56.8%, Strongly Agree 27.3%), but the majority do not believe that AI can replace programmers from this statement: "AI can **replace the role of programmers**" (Strongly Disagree 31.8%, Disagree 50%, Agree 18%.2).

The results of this questionnaire could be followed up with brief interviews of respondents who believe (or do not believe) that AI can replace programmers, as well as a comparative study with existing literature. Because most of the students don't agree that AI can replace programmer, authors selected 3 students, that don't agree (Group A) and 4 students that agree AI "mostly can" replace programmer (Group B). First, the authors ask about feedback for this course and how it feels to code with AI. Both respondents said they were shocked at first, and didn't know anything about code, and both of respondents already use AI to help them in class. The response piqued the author's interests and continue to follow up with the following question of: "did you validate the code?". Because the respondents have the same response about using AI to help their team code. Then the authors received opposing answers; Group A use other resources such as Unity Forum & YouTube whilst the other group decided to leave the programming side to ChatGPT. The authors asked one final question "Did your code works? And how it went?". Group A responded with "At first our generated code didn't work but we sought help on forum and watched some tutorials online, after implementing some changes from tutorials and asking our lecturer it did work". Group B responds with; "sometimes the code just works, but when the code straight up didn't work, we were just stuck in a place, so we tried to run the prompt again and again, until our friends came up with a solution".

After both qualitative and quantitative data gathered, the authors found out that some groups still depend on AI to a certain extent. The authors used AI with the aim of seeing how to code using AI to provide instructions for beginners to create a first-person controller in Unity. At first, the authors found that AI helps when the user already has basic Unity and code skills. The authors then generate the code by prompting the AI "I need the code for first person controller in unity" (Fig. 4). AI replies with detailed instructions but didn't explain any of the functions of the code, this will cause problems later on.

Instructions for creating a first-person controller in Unity and producing detailed steps. Based on the author's interviews, it was found that although AI provides detailed steps, when the author practiced these steps using the script, some steps were easy to follow, and the first problem

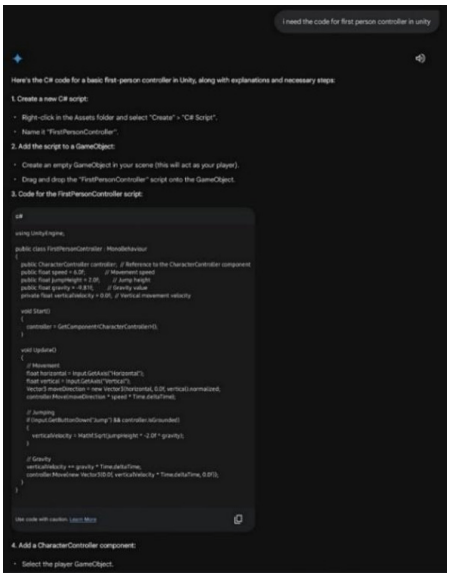

Figure 4. Prompting AI to Create Code of First Person Controller for Unity
(Source: Personal research documentation)

arose, this code couldn't be further developed because user cannot understand the code written by AI. This problem can be tackled after asking for an explanation for a specific line of code by prompting "can you explain the code? I need to understand the logic behind this scripts" , as seen in Fig. 5.

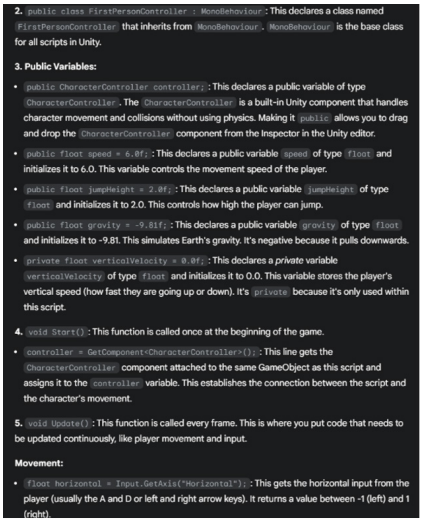

Figure 5. Prompting AI to Explain the Code Created
(Source: Personal research documentation)

AI did explain everything about that line, but still didn't mention how to extend the code and implement another feature to this generated code. The authors try to add another typically asked feature in game mechanics in to AI by asking it to implement features like "Double Jump", "Inventory System" to store items and the "Shooting" parts from FPS genre with this prompt "can I implement double jump to this code?" (Fig. 6). Then AI reply the following message.

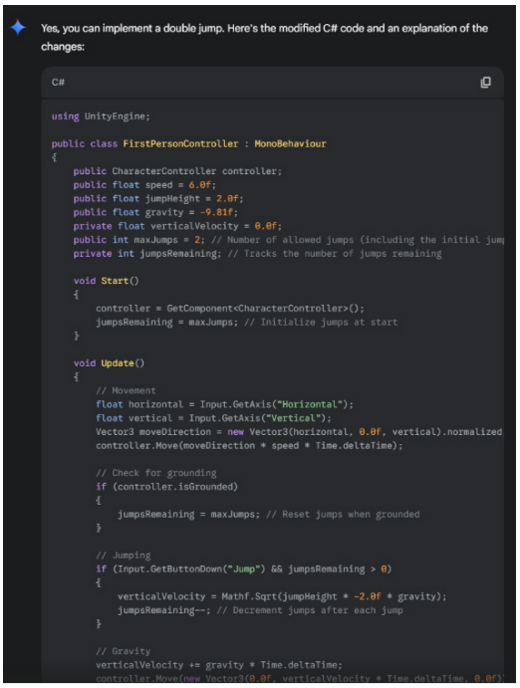

Figure 6. Prompting AI to Create Code of "Double Jump" Action for Unity
(Source: Personal research documentation)

When the authors decided adding double jump was a good decision, then the authors continue to add another mechanic to this code, like shooting and inventory which should be good to facilitate a simple game. After adding 2 features, the authors prompted once more and got another reply, as can be seen here in Fig .7.

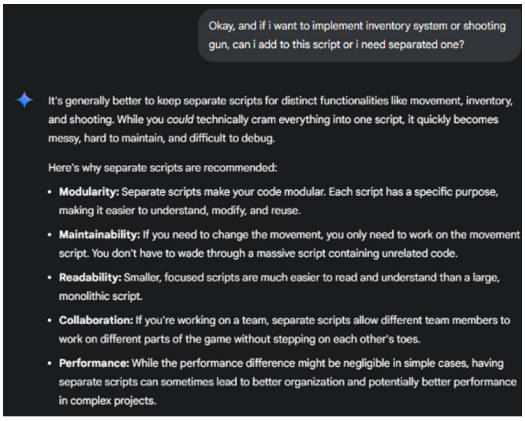

Figure 7. Prompting AI to Create Additional Mechanic Code for Unity
(Source: Personal research documentation)

The AI explains that the authors can add those features but must do so by trying to add new script and not to mix everything. Afterwards, the AI gave a response to separate "Shooting" and "Inventory" scripts from the "First Person Controller" scripts.

Figure 8. AI Created New Coding Script for "Shooting Gun" Action for Unity
(Source: Personal research documentation)

This is when the authors encounter a second problem where the AI gave two completely different script in single file as shown in Fig 8. Due to the fact that the authors had some experience in Unity and C#, the authors found this could be a problem in the future. At first, this small warning can be ignored because there are no errors in this specific code, but turns out the AI did not include expandability and modularity in the code section. Even so, the AI did clarify that this script has to be separated from first scripts as shown here on Fig. 9.

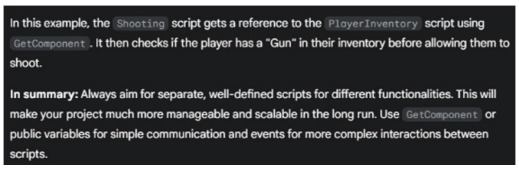

Figure 9. AI Created Coding Script Excluded Expandability and Modularity for Unity
(Source: Personal research documentation)

AI has its own reasoning to keep both scripts separate (Fig 9), and claimed "well managed" code is separated. There might be more to explore in relation to how AI define or reasoning when to separate or when to combine two scripts in a further research. After a couple of attempt, the authors finally manage to achieve the first-person controller with AI, with results that met the author's expectation. This entire process of prompting, trial and error as well as debugging, the authors realized that there are still a lot of AI base code tweaking that must be done, in order to meet the author's needs. Because there's previous research that discusses programming from a visual perspective, that focuses on understanding the logic behind the programming for interactive media (Martyastiadi, 2022), that proves AI cannot replace the skill of programmer entirely.

Discussion

The findings of this study offer a multidimensional perspective of how AI is currently used in the context of visual programming education for design student, specifically in undergraduate Visual Communication Design students who took Interaction Design at Universitas Multimedia Nusantara. Based on the questionnaire distributed as well as the follow-up in-depth interviews, it can be seen that AI has been predominantly used to assist in their early stages of interactive media development, specifically in game design development as part of their task at class. On the other hand, the study also found that there was a variation of perceptions on the AI's capabilities.

The Mult perspectives can be seen while all research respondents accepted AI as a tool to support their game development, there was also a few who believed it can replace human game developers and designers. This finding is aligned with prior research (Chen et al., 2021; Sarkar et al., 2022) where it has previously highlighted that while AI can definitely automate tasks, it is also lacking in the contextual awareness and adaptability that only human possessed, possibly human cognition. Historically, humans have utilized machines in daily life, with significant advancements beginning during the Industrial Revolution. Human roles and contributions are more expansive compared to AI, which is limited by the data it possesses (Birkenkrahe, 2024; Coello et al., 2024; Sarkar et al., 2022). Our research affirmed this distinction, where although all respondents in this study used AI at various stages of the game development, none believed AI could fully replace human expertise. It can be said that, rather, AI was seen as a supportive tool that made the process more efficient, specifically code generation and task execution.

The study also wanted to underline the triangulation of both quantitative and qualitative data that further supported this view on AI that cannot fully replace human. It can be said that Group A (students who believed AI cannot replace developers) validated the AI-generated code through YouTube tutorials, Unity forums as well as lecture assistance or consultation. On the other hand, the other group or Group B relied more heavily on AI assistance but struggled more when they faced with broken or incomplete AI-generated code. This difference underlined a critical aspect where AI as a learning assistant in programming, still need human intervention in terms of debugging, adapting as well as testing, which further emphasis what Chen et al. (2021) had stated previously.

From a pedagogical or academic teaching view, it can be said that this human intervention on AI as a learning assistant is aligned with previous statement where the class taught students with Unity and previously "Bolt". Previously, "Bolt" has supported design students to construct logic through node-based systems, which has proven to eased their cognitive load of learning C# programming language but still actively introduced to computational thinking. The upgraded curricula to include AI-assisted learning can be seen as an iterative process to continuously update the knowledge. This view is aligned with previous statements where AI-assisted learning promoted a broader educational trend on how AI can support educators in delivering materials and enhance student's productivity (Grattia, 2023; Hefira et al., 2022; Nam, 2023; Sangheethaa & Korath, 2024). However, as previously mentioned by Huang (2023) and Egon et al. (2023), this study wanted to underline that there were also valid concerns regarding this over reliance on the Generative AI, specifically on ChatGPT. This study wanted to also remind that students risk their surface-level of understanding of programming language, when they

used AI to skip their critical problem-solving and logic-building skills. It can be said that, AI must be framed as a co-pilot, not a substitute to their learning journey.

The integration of AI in visual programming course offered significant promise, particularly in supporting accessibility and efficiency among design students. However, its effectiveness can only be used effectively when there is fundamental human cognitive level of creativity and logic reasoning. Drawing on the historical pattern of human and computer interaction, it is evident that AI is best positioned as an assistant or extension of human capability, not a total replacement.

Conclusion

This concludes the author's hypothesis that AI can only be used as an assistant in developing code. Humans possess authentic intelligence necessary for open-minded thinking in situations with various probabilities, such as work environments that require high levels of strategy and creativity (Cremer & Kasparov, 2021).

This research found that for now, AI still cannot replace real human touches, but AI can help for basic tasks such as generating base code or auto correct. Our survey data, reflecting the widespread use of AI tools by students, aligns with broader trends of AI integration in education (Holmes et al., 2019). This widespread use underscores the importance of educators strategically incorporating AI into curricula to enhance, rather than supplant, human learning and skill development. Further research should explore the long-term effects of AI on student learning habits, examine the potential for over-reliance on technology, and investigate the ethical implications for designers and programmers working with AI.

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