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ChatGPT as a self-learning assistant: Perceptions among university students

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ABSTRACT

The rapid and multifaceted integration of generative AI tools into educational settings requires an understanding of students' perceptions of these tools. This study investigated university students' perceptions of a customized version of ChatGPT as a self-learning assistant from the lens of self-regulated learning. The study followed a descriptive research design in which a customized version of ChatGPT served as a self-learning assistant for students in a programming class for one semester. Then, fifty-five students from two sections of the class completed a questionnaire, and one instructor of one section of the course was interviewed. The results showed that students expressed positive perceptions of the customized version of ChatGPT as a self-learning assistant. Motivation and engagement emerged as the strongest areas, while self-evaluation and regulation were relatively weaker. The instructor observed improved participation, confidence, and independence among students. However, the instructor pointed out that students had variations in their skills in using the tool, and some had faced difficulties in crafting effective prompts. Based on the findings, a customized version of ChatGPT might represent a valuable tool that can be officially integrated into introductory programming courses to act as effective, 24/7 self-learning support. The integration of such a tool and its technical design needs to be aligned with pedagogy to enhance all aspects of self-regulated learning. The integration of a customized version of ChatGPT to support students' learning should be accompanied by AI/prompt training.

Contribution/Originality: This study contributes to the existing literature by advancing the pedagogical design of a customized GPT as a self-learning assistant grounded in self-regulated learning theory. It evaluates its implementation using a descriptive mixed-methods approach, examining students' perceptions in programming education and indicating variation, with stronger motivation and engagement alongside comparatively less developed self-regulation.

1. INTRODUCTION

For pre-service teachers whose primary language of instruction is Arabic, learning programming may represent one of the most challenging tasks. Some of these challenges are associated with nature of learning programming itself in terms of being in English language, requiring learners to understand syntax in a non-native language (Martono & Ohwada, 2025; Nnass, Cowling, & Hadgraft, 2022) highly abstract, cognitively demanding, algorithmic in nature, cumulative, non-intuitive for novices, dependent on problem decomposition skills, and error-prone (Bosse & Gerosa, 2017; Cheah, 2020; Derus & Ali, 2012).

Besides struggling with programming syntax, novice programmers usually face difficulties in deep conceptual understanding, problem decomposition, algorithmic thinking, and a lack of strategies (Lowe, 2019; Qian & Lehman, 2017), where they usually suffer from cognitive overload. Such an issue is evident in the indicators of students' academic vulnerability in terms of high failure rates, withdrawal, anxiety, and low self-confidence. However, students' difficulties are particularly evident when students lack timely support during practice.

Therefore, research has shown that different forms of extra support, besides traditional teaching methods, were provided for students who are learning programming to overcome previous difficulties and provide immediate feedback during practice. Examples of the forms of support include peer-based programming (McDowell, Werner, Bullock, & Fernald, 2002), instructional programming puzzles (Parsons & Haden, 2006), cognitively structured learning materials (Margulieux, Guzdial, & Catrambone, 2012), adaptive automated feedback for programming (Keuning, Jeuring, & Heeren, 2018), adaptive hypermedia (Brusilovsky, 2001) and gamified programming activities (Papastergiou, 2009).

Even though these forms of support have shown their effectiveness in supporting students' learning of programming skills, these types of support suffer from some restrictions. For instance, the support that relies on teachers and peers suffers from limitations related to high dependency on availability, competence, limited scalability, variability in feedback quality, and limited support for continuous self-regulation (Howard, 2006). On the other hand, the support that relies on various instructional materials suffers from limitations related to limited adaptability to individual learners, restricted feedback scope, lack of natural language interaction, fragmented learning experience, limited handling of novel or unexpected errors, reduced personalization of examples, and indirect motivational support.

Nowadays, the emergence of generative AI (GenAI) tools has made it possible to overcome some of the limitations of the previous forms of support for students in their learning process of programming. GenAI tools have a great effect on every aspect of educational systems. These tools have great potential to change the ways that teachers teach and the ways that students learn. Some of the common advantages of the use of these tools for students include, but are not limited to, enhancing students' learning experiences through facilitating personalized learning, improving collaboration and communication among students and with educators, improving access, enhancing efficiency, supporting critical thinking, and boosting creativity (Gasaymeh, Beirat, & Abu Qbeita, 2024). Some of the common advantages of the use of generative AI for instructors include, among others, enhancing instructional design efficiency, facilitating personalized feedback (Cabrera et al., 2025) supporting content creation (Dickey & Bejarano, 2024) improving assessment and grading accuracy (Xia, Weng, Ouyang, Lin, & Chiu, 2024) promoting innovation in teaching strategies (Mollick & Mollick, 2024) and saving time for higher-order pedagogical activities.

The widespread accessibility of GenAI tools such as ChatGPT among university students has recently increased dramatically, as the platform is freely available.

ChatGPT is one of the generative AI systems that has received great attention from students and educators worldwide. For academic purposes, students use ChatGPT for generating ideas, summarizing, proofreading, providing real-time feedback, supporting autonomous learning, translations, storming creative ideas, and offering personalized assistance (Ghufron & Zaniar, 2025; Sharma, Jyotiyana, & Kumar, 2024). In addition, educational institutions have been using ChatGPT to support students' learning in formal ways (Gasaymeh & AlMohtadi, 2024; Sumbal & Amber, 2025; Wang, Dang, Wu, & Mac, 2024).

One of the prominent uses of ChatGPT in supporting students' learning is serving as a smart self-learning assistant. For instance, Durgungoz and Kharrufa (2026) indicated that in their study, "ChatGPT is like a study buddy, a teacher, and sometimes just a friend", students perceive ChatGPT as a supportive companion that can enhance their learning experience in multiple ways, including offering guidance, providing explanations, and enhancing their motivation. ChatGPT has several capabilities that make it a significant self-learning assistant, including the capabilities to simulate tutoring, provide inquiry-based dialogue, and generate reflective feedback (Naznin, Al

Mahmud, Nguyen, & Chua, 2025). It can be employed in a way that helps students to clarify and understand any difficult topics that they may encounter during their study, either at home or in the classroom. In addition, ChatGPT is useful in allowing the students to practice critical thinking independently (De la Puente, Torres, Troncoso, Meza, & Carrascal, 2024). Furthermore, it allows for self-assessment of progress through natural conversation. Unlike traditional AI tutors, it supports open-ended learning. Moreover, it can help students solve problems creatively. ChatGPT can also be customized through customized prompts, rules, and optional data integrations to help students in specific educational tasks in specific ways.

There are a few advantages of a customized version of ChatGPT over ChatGPT for supporting students' learning. For example, a customized version of ChatGPT can be integrated and designed in a way that is aligned with instructional goals and theories. Besides helping the students learn educational content, customized versions of ChatGPT can be designed and employed to provide students with cognitive, metacognitive, context-aware, and psychological learning support (Masalaci, Shalawadi, & Papachristos, 2025). Previous research has shown that the use of a customized version of ChatGPT would contribute to improving the reliability of the tool and reducing hallucinations (Kabir, Shah, Haddad, & Raper, 2025; Shakil, Ortiz, Forbes, & Kalita, 2024). Furthermore, a customized version of ChatGPT can be useful in ensuring ethical use and protecting academic integrity associated with the use of GenAI tools.

In Jordan, students in the College of Education are required to take one course intended to introduce them to computer programming. This course serves as an introductory class for teaching Visual Basic 6 and its applications for educational purposes. Based on the author's experience and like findings from previous studies (Bosse & Gerosa, 2017; Cheah, 2020; Derus & Ali, 2012; Martono & Ohwada, 2025; Nnass et al., 2022) students in this course struggle with learning programming, particularly because many of them are introduced to programming for the first time in this class. ChatGPT and Custom versions of ChatGPT can be integrated in different ways to support students' learning. One of them is to integrate such a tool to act as a self-learning tool to support students in self-regulated learning. Self-regulated learning enables students to set goals, monitor their progress, and evaluate their strategies, in this manner becoming autonomous learners rather than passive recipients of information. In the era of knowledge explosion, helping students become self-regulated learners is as important as making them learn. Zimmerman (2002) discussed the importance of helping students become self-regulated learners and pointed out the significance of looking at self-regulated learning as a self-directive process, rather than a fixed ability, in which learners transform their mental capabilities into academic skills. Zimmerman (2002) stressed the strong association between self-regulation and lifelong learning, where learners should regularly acquire new knowledge, skills, and competencies independently in work, creative projects, and personal pursuits. Previous research argued that learners who can manage their time, observe progress, and adapt strategies are more prepared to achieve success, advancement, and sustain self-improvement (Islomov & Sabirova, 2025).

In the academic setting, self-regulated learners perform better, and they have higher satisfaction with the learning process (Ejubovic & Puška, 2019). A possible explanation is that self-regulated learners view their futures optimistically, and they maintain higher satisfaction through adaptive learning cycles of performance and self-reflection. One of the main characteristics of self-regulated learners are proactive rather than reactive (Zeidner & Stoeger, 2019), where they monitor their own learning using self-control oriented toward achieving goals. There is also a strong association between self-regulation and motivation (Werner & Milyavskaya, 2019). This association can be explained by the fact that self-regulated learners are guided by personally set goals, self-evaluation, and strategic action rather than depending solely on external guidance. Fostering self-regulated learning is central to education's mission, where self-regulated learning helps students become active, autonomous, and motivated learners capable of managing their own lifelong development.

Given Arabic-speaking students' struggle with learning programming languages and the drawbacks of early learning support tools for these students, there remains a need for more adaptive and pedagogically grounded forms

of support. Although GenAI tools such as ChatGPT are popular and offer various benefits, and customized versions of ChatGPT have capabilities that can support education and help prepare self-regulated learners, there is still limited understanding of how such tools can be officially integrated into programming classes and how students perceive their use. Therefore, there is a need to investigate university students' perceptions and reactions toward the use of a custom version of ChatGPT as a self-learning assistant in programming class, particularly in relation to its role in supporting self-regulated learning. The purpose of the study is to investigate university Arabic-speaking students' perceptions and reactions toward the use of a custom version of ChatGPT as a self-learning assistant in programming class, with a specific focus on its role in supporting self-regulated learning. This study aims to answer the following research questions:

- To what extent do students overall and individually across each dimension perceive the customized ChatGPT as supporting key aspects of self-regulated learning (Goal setting, monitoring, self-evaluation, and motivation)?
- How does the instructor perceive the role and challenges of the customized ChatGPT in enhancing students' self-regulated learning?

The following section presents a review of the relevant literature and provides a summary of previous studies related to the topic.

2. LITERATURE REVIEW

In the context of the current study, previous studies showed that there are studies that focused on the capabilities of using GenAI tools such as ChatGPT to act as an assistant for students' self-learning, while others focused on measuring students' reactions to using such a tool for self-learning.

In line with the studies that examined the effectiveness of ChatGPT as an assistant for students' self-learning. Lee, Kim, Park, and Choi (2023) conducted a study that investigated the potential of ChatGPT as a self-learning tool capable of answering multiple-choice questions as well as providing rationales for its responses. The study employed 78 test items from the Korean Comprehensive Basic Medical Sciences Examination between 2019 and 2021, which were translated into English and expanded into 312 MCQs through four different prompts; these prompts were related to the correct answer, rationale, references, and relevant paragraph. The findings revealed that ChatGPT achieved an overall accuracy rate of 76%, performing better on recall and interpretation questions than on problem-solving ones. The results also indicated weaknesses in referencing, as 69.7% of citations were incorrect. Despite these limitations, the study concluded that ChatGPT holds promise as a self-learning aid but should be used under teacher supervision to prevent misinformation and maintain students' critical thinking skills.

In another study that employed a specialized ChatGPT tool designed to support self-directed learning among medical students, Shalong et al. (2025) examined the impact of LearnGuide on self-directed learning, critical thinking, and flow experiences in medical students. The study followed a semi-experimental research design in which 103 medical students were assigned to either an experimental group, which received 12 weeks of problem-based training with LearnGuide support, or a control group, which received identical training without AI assistance. Students' self-directed learning, critical thinking, and flow experiences were measured in the middle of the experiment, at the end of the experiment that lasted for 12 weeks, and followed up after the end of the experiment by two weeks. The results showed that the tool had a significant effect on students' various learning aspects, i.e., self-directed learning, critical thinking, and flow experiences.

In another study, Sun, Xu, Zhang, Liu, and Zhang (2025) examined whether feedback generated by a large language model that was (GPT-3.5), integrated into a programming platform, improves students' self-regulated learning and academic performance in computer programming courses. The study followed a quasi-experimental design with 63 participants, and the experiment lasted for 10 weeks. The results showed that GPT-3.5-based feedback

enhanced motivation and metacognition and yielded better cognitive/behavioral indicators and exam performance, with authors noting possible overreliance for some learners.

In line with studies that have focused on measuring students' perceptions and experiences of using such tools for self-learning, one study employed a prominent technology acceptance model, specifically an extended version of the Technology Acceptance Model (TAM). Dahri et al. (2024) examined pre-service teachers' acceptance of ChatGPT as an AI-powered tool for Metacognitive Self-Regulated Learning (MSRL). The study adopted a mixed-methods design. Quantitatively, structural equation modeling was used to test the extended TAM with nine constructs: personal competence, social influence, perceived AI trust, perceived AI usefulness, perceived AI enjoyment, perceived AI intelligence, attitude toward ChatGPT, metacognitive self-regulated learning, and behavioral intention. Qualitatively, semi-structured post-task reflections and document analyses were used to triangulate the quantitative findings. Data from 300 participants revealed a high overall acceptance of ChatGPT for MSRL. Key positive predictors of ChatGPT adoption included personal competence, social influence, perceived AI trust, perceived usefulness, perceived enjoyment, and perceived intelligence, which collectively enhanced attitude, metacognitive self-regulation, and behavioral intention. The qualitative results confirmed positive perceptions of ChatGPT in learners' self-regulation and reflective control.

Al-Atrash (2024) conducted a study that aimed to explore the perspectives of English language students as a foreign language regarding the role of self-learning assisted by ChatGPT in enhancing self-directed learning in two Palestinian universities. To achieve this aim, the researcher used a mixed research design, where data were collected through interviews and a questionnaire from a sample of English language students as a foreign language. The study sample consisted of 348 students who were selected by stratified random sampling. The quantitative analysis revealed generally positive perspectives regarding the effectiveness of ChatGPT in enhancing self-directed learning. The questionnaire results showed a high overall response for the total score of the main question. In addition, there were no statistically significant differences attributed to the variables of academic level and university, while there were statistically significant differences due to the gender variable in favor of males. The qualitative data also confirmed its potential as a complementary tool, as it provides learners with methods to guide academic learning more efficiently. In general, ChatGPT is viewed as having valuable benefits in the educational process, although its success depends on integration with traditional teaching methods.

In another similar study, Monib, Qazi, and Mahmud (2025) examined learners' perspectives on using ChatGPT as a learning assistant in higher education. The researchers adopted a qualitative descriptive design in which data were collected through professional social media platforms, where the number of participants was 72 learners. The findings showed that students valued ChatGPT for several purposes. These purposes can be categorized into three categories that were related to supporting personalized learning, supporting writing and research, and enhancing academic efficiency. At the same time, participants reported limitations that were related to reliability issues, risks of cognitive dependence, and concerns related to writing authenticity.

The literature review showed growing acceptance of ChatGPT and similar GenAI tools in education, highlighting their potential as effective self-learning assistants. In addition, they showed that these tools can enhance learners' motivation, critical thinking, and academic performance, despite concerns related to accuracy, overreliance, and the need for teacher supervision. Most of the examined studies rely on student self-reported perceptions without examining structured institutional implementation. The literature review showed that limited research has explored the official integration of a customized ChatGPT in a programming course through a self-regulated learning framework, while also incorporating instructor reflections. Building on this evidence, the current study aims to explore university students' perceptions of the official use of a customized version of ChatGPT as a self-learning assistant in an introductory programming class through the lens of self-regulated learning. In addition, the instructor's reflections on students' experiences with the customized ChatGPT version in the programming class were examined. The following section provides a brief overview of self-regulated learning.

2.1. Self-Regulated Learning

As stated earlier, self-regulated learning guided the design and use of the Custom version of ChatGPT used in the current study. Self-regulated learning is an integrated process in which learners actively manage their cognition, motivation, behavior, and emotions to achieve learning goals through planning, monitoring, and reflection (Panadero, 2017; Zimmerman, 2002). Self-regulated learning is viewed as distinct from intellectual capacity or academic performance ability. Rather, it represents a self-managed process in which learners convert their mental capabilities into academic skills relevant to specific tasks (Zimmerman, 2001). However, the definition of self-regulated learning varies from one study to another, and that is evident in the several dimensions of self-regulation that were discussed in the literature. For instance, Barnard, Lan, To, Paton, and Lai (2009) measured self-regulated learning with six dimensions that were: goal setting, environment structuring, task strategies, time management, help seeking, and self-evaluation. However, in a deeper perception of self-regulated learning, Baumert et al. (2000) presented a model of self-regulated learning, which has distinguished between cognitive\metacognitive regulation and motivational self-regulation. Cognitive/Metacognitive Regulation refers to learners' ability to use cognitive and metacognitive strategies that include applying domain-specific knowledge, using memorization and deep processing, planning and setting goals, monitoring progress, and applying corrective actions to control their learning process. Motivational Self-Regulation is related to the learner's capacity to control motivation during learning by managing self-beliefs (such as self-concept, self-efficacy, and control beliefs), maintaining interest and intrinsic motivation, handling test anxiety, and coping with success or failure. It involves directing attention, effort, and persistence while protecting learning goals from competing distractions. However, the focus in the current study is on the measurable constructs of self-regulated learning. Therefore, the current study adopted the following constructs to guide the investigation: Goal setting and planning, self-monitoring and organization, self-evaluation and regulation, and motivation and engagement. These dimensions were adopted from related previous studies (Cassidy, 2011; Zimmerman, 2002). These dimensions were used to assess participants' perceptions toward the use of a custom version of ChatGPT as a self-learning assistant in programming class and how the custom version of ChatGPT helped them achieve greater autonomy, effective learning management, and improved academic performance through enhanced self-regulated learning processes. "Goal setting and planning" refers to the learner's ability to set clear academic goals, create structured study plans, organize priorities, and manage time effectively. "Self-monitoring and organization" represent the learner's capacity to track progress, monitor understanding, manage study activities, and maintain organization throughout the learning process. "Self-evaluation and regulation" indicate the learner's skill in assessing performance, identifying mistakes, adjusting strategies, and applying feedback to improve learning outcomes. Finally, "Motivation and engagement" describes the learner's level of enthusiasm, interest, and active participation in academic tasks, driven by a desire for achievement.

3. RESEARCH METHOD

The current study followed a mixed research design in which qualitative and quantitative data were collected to investigate university students' perceptions and reactions toward the use of a custom version of ChatGPT as a self-learning assistant in a programming class. The quantitative side involves a descriptive research design in which a cross-sectional survey design was adopted. The data were collected using digital questionnaires. Students completed the questionnaire during class time. Participation was voluntary, no compensation was provided, and the questionnaire was completed anonymously. The participants were in two sections that were taught by two different instructors. The two instructors agreed to have their students participate in the experiment. The qualitative data were collected using interviews with the instructors. However, only one of them agreed to participate and follow up with an interview to assess his view of students' reaction to the custom version of ChatGPT as a self-learning assistant.

3.1. Participants

The participants were a group of students enrolled in an introductory programming course during the summer semester of the 2024\2025 academic year. The course introduced fundamental programming concepts using Visual Basic 6 and explored its applications in education. It was offered by the Department of Curriculum and Instruction in the College of Education at a Jordanian university in the Southern of Jordan. The course was a required component for all educational majors, typically taken in the third or fourth year of their undergraduate studies.

The total number of participants was 55 students. Most of them were female (n=48, 87.3%), while only seven (12.7%) were male. Most of the participants (n=41, 74.5%) were between 21 and 25 years old, while 11 students (20.0%) were between 18 and 20 years old. Only two participants (3.6%) were older than 36, and only one (1.8%) was between 26 and 30 years old. Regarding their majors, more than half of the participants (n=34, 61.8%) specialized in special education, while 17 students (30.9%) were class teacher majors, and only four (7.3%) were kindergarten majors. In terms of academic year, most students (n=29, 52.7%) were in their fourth year of study, 15 students (27.3%) were in their third year, seven students (12.7%) were in their second year, three students (5.5%) were in their first year, and only one student (1.8%) was in the fifth year (Table 1).

Table 1. Frequency distribution of participants by demographic characteristics (gender, age, major, and academic year).

	Category	Frequency	Percent
Gender	Female	48	87.3
	Male	7	12.7
Age	18-20	11	20
	21-25	41	74.5
	26-30	1	1.8
	> 36	2	3.6
Major	Class teacher	17	30.9
	Kindergarten	4	7.3
	Special education	34	61.8
Academic year	1	3	5.5
	2	7	12.7
	3	15	27.3
	4	29	52.7
	5	1	1.8

3.2. Instruments

The data collection tools were online questionnaires and interview questions. The questionnaire was developed to measure university students' perceptions of the official use of the customized ChatGPT version as a self-learning assistant in a programming class. The questionnaire consisted of two main sections designed to collect the following data: (1) demographic characteristics of the participants and (2) students' perceptions of the role of the customized ChatGPT version in supporting their self-regulated learning. The demographic section included questions related to the participants' gender, age, major, and academic year. The perception section included four dimensions with 20 items in total. These dimensions and items were derived from related literature (Cassidy, 2011; Zimmerman, 2002). The four dimensions were goal setting and planning, self-monitoring and organization, self-evaluation and regulation, and motivation and engagement. Each item was rated on a 5-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5). The interview questions aimed to explore the instructor's reflections on students' experiences with the customized ChatGPT version in the programming class. Examples of interview questions include.

- How do you evaluate the students' experience with the customized version of the ChatGPT program in the computer programming course?
- What is the impact of the program on students' ability to set goals and plan their studies?

- Have you noticed any improvement in students' time management and tracking of their progress? Please provide an example.
- In your opinion, how has the customized version of ChatGPT affected students' motivation and self-confidence?

3.3. Procedure

A programming class that was open to students from different educational majors was selected for the study. The class was offered as a required course by the Department of Curriculum and Instruction at a Jordanian university. The instructor and students agreed to participate voluntarily. During a scheduled class session, the researcher explained the purpose of the study, the functions of the customized ChatGPT version, and its intended use as a self-learning assistant. The customized ChatGPT version was used for a whole semester. At the end of the semester, students were invited to complete the digital questionnaire anonymously during class time. The collected responses were used to evaluate students' perceptions of the customized ChatGPT version and its contribution to developing their self-regulated learning skills. In addition, a short interview was conducted with one of the instructors of the class over the phone. The process of building the customized ChatGPT version followed a structured procedure. First, the researcher defined the tool's purpose and audience, focusing on providing programming assistance and enhancing self-regulated learning for students from diverse majors. Relevant reference materials that include course content, examples, course syllabi, and instructional guidelines were uploaded. Using the GPT Builder interface, the researcher entered the metadata, configured the system's behavior, and wrote detailed instructions guiding the model to function as a self-learning assistant. Reference files were added to ground its responses in course-specific knowledge, and sample conversations were created to demonstrate the expected interaction style. After iterative testing and refinement, the customized ChatGPT version was published and made available to students. It was then integrated into the course for an entire semester, allowing students to consult it for explanations and practice. Figure 1 shows the procedure for creating the customized ChatGPT. Figure 2 shows the user interface for the customized ChatGPT.

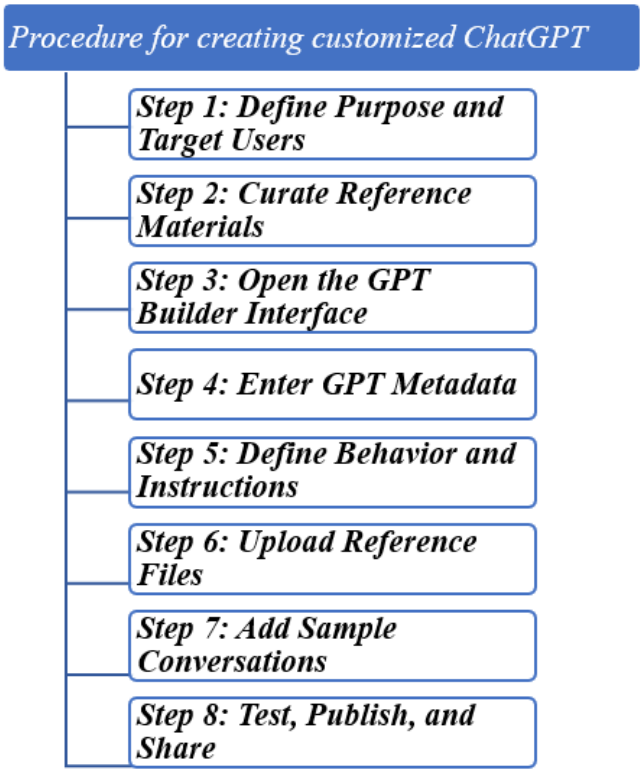

Figure 1. Procedure for creating a customized ChatGPT.

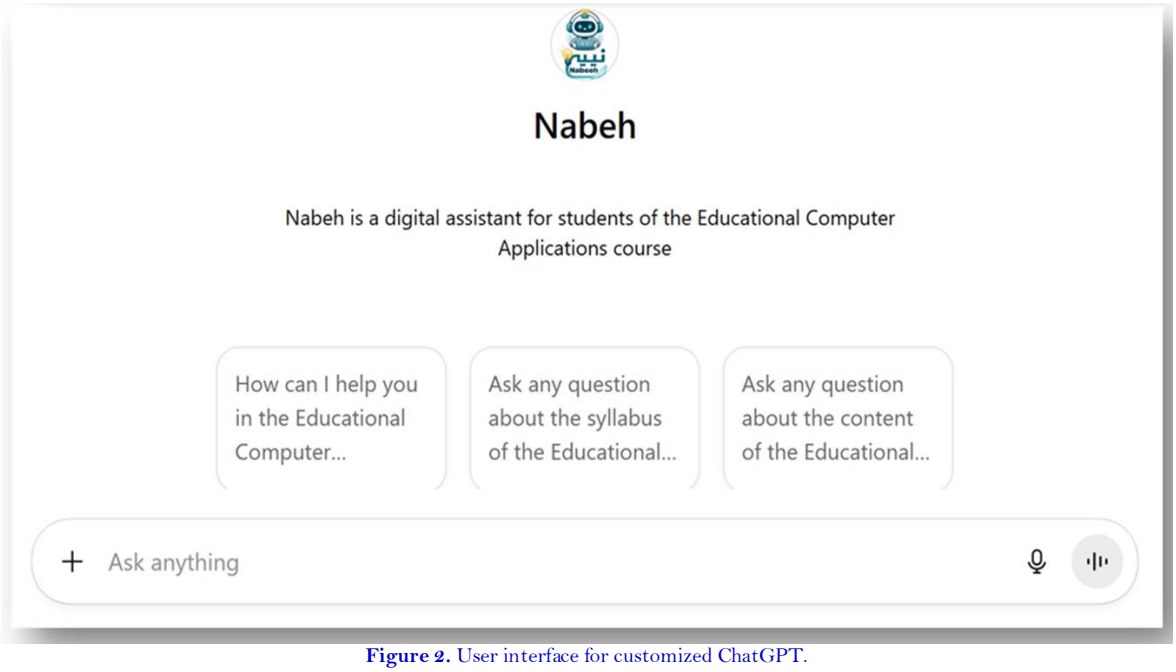

Figure 2. User interface for customized ChatGPT.

3.4. Data Analysis

Frequency distributions were used to present participants' demographic characteristics. Descriptive statistics, including means and standard deviations, were employed to analyze students' perceptions of the official use of the customized ChatGPT version as a self-learning assistant in the programming class. The software used for data analysis was SPSS 15.0. There was no missing data. All questionnaires were fully completed and included in the final analysis (N = 55). Mean scores were interpreted into three levels: low (mean=1.00-2.33), medium (mean=2.34-3.67), and high (mean=3.68-5.00).

These analyses provided insights into the overall extent to which students agreed with statements across the four self-regulated learning dimensions: goal setting and planning, self-monitoring and organization, self-evaluation and regulation, and motivation. The instructor's responses to the interview questions were also qualitatively analyzed through coding, categorizing, interpreting, and reporting. This procedure involves reading interview transcripts several times, forming initial open coding, grouping similar codes into categories, and developing broader categories related to the investigated matter. The coding process was mainly inductive, in which the themes emerged from the instructor's responses. To enhance trustworthiness, selected quotations were reported to allow readers to verify the alignment between data and interpretation.

4. RESULTS AND DISCUSSION

- To what extent do students overall and individually across each dimension perceive the customized ChatGPT as supporting key aspects of self-regulated learning (goal setting, monitoring, self-evaluation, and motivation)?

The results regarding participants' perceptions toward the use of a custom version of ChatGPT as a self-learning assistant in a programming class suggest that the participants had positive perceptions of this tool. The overall participants' perceptions of the tool were between "neutral" and "agree" (M = 3.48, SD = 0.78). Based on that, participants perceived the custom version of ChatGPT as an effective digital assistant (Table 2).

The first dimension, which was "goal setting and planning", aimed to measure the participants' perceptions of the role of a custom version of ChatGPT in helping them set academic goals, organize priorities, and plan their study activities. The participants' perceptions of this dimension were between "neutral" and "agree" ($M = 3.47$, $SD = 0.89$). Participants were found to have responded most positively to item 1, "The customized ChatGPT helps me identify

my academic goals in the class." (*M=3.71, SD =1.21*). However, students did not totally agree that the customized ChatGPT was useful in their planning for their study schedule before exams: they responded least positively to item 2, "I rely on the customized ChatGPT to plan my study schedule before exams." (*M=3.25, SD = 1.09*). The findings suggest that the custom version of ChatGPT was useful in promoting goal awareness, where the course syllabus that was uploaded to the customized ChatGPT was used as an interactive one, and students were able to interact with it in an effective way.

However, it seems that the participants still prefer traditional planning strategies during high-pressure periods, such as in exams.

The second dimension, which was "self-monitoring and organization", aimed to measure the participants' perceptions of the role of the customized ChatGPT in helping them track their progress, monitor their understanding, manage their study activities, and maintain their organization throughout the learning process. The results showed that participants' perceptions were between "neutral" and "agree" (*M = 3.52, SD = 0.90*). The participants were found to have responded most positively to item 8, "the customized ChatGPT provides me with feedback that helps improve my performance." (*M=3.76, SD =1.22*).

However, students did not totally agree that customized ChatGPT was useful in tracking their progress in the academic tasks: they responded least positively to item 6, "The customized ChatGPT helps me track my progress in academic tasks." (*M=3.33, SD = 1.17*). The findings suggest that the nature of the custom version of ChatGPT used, as well as other GenAI tools, not keeping a database of users' interactions, would explain students' reliance on instant, timely feedback rather than on continuous interaction.

The students responded least positively to the third dimension, which was "self-evaluation and regulation" (*M = 3.37, SD = 0.90*). The dimension aimed to measure participants' perceptions of the role of the customized ChatGPT in helping them assess their performance, identify mistakes, adjust strategies, and apply feedback to improve their outcomes. The participants were found to have responded most positively to item 8, "I can identify and correct my mistakes through the customized ChatGPT's guidance" (*M=3.56, SD =1.17*). However, they responded least positively to item 14, "I use the recommendations provided by the customized ChatGPT to enhance my academic performance." (M=3.33, SD = 1.17). The findings suggest that students moderately agree that the custom version of ChatGPT they use assists them in reflecting on and regulating their learning behaviors. The findings suggest that while the customized ChatGPT provides valuable feedback to the students, they may not always translate it into concrete learning actions.

The results for Motivation and Engagement (*M = 3.54, SD = 0.90*) were encouraging. Motivation and Engagement aimed to measure students' perceptions of the role of the customized ChatGPT in enhancing their enthusiasm, interest, and active participation in academic tasks, and enjoyment. The participants were found to have responded most positively to item 17, "The customized ChatGPT encouraged me to engage more actively with the class." (*M=3.67, SD =1.04*).

However, they responded least positively to item 20, "I find using the customized ChatGPT enjoyable and stimulating as a student." (*M=3.42, SD = 1.26*). The findings suggest that the customized ChatGPT contributes positively to students' affective engagement. However, the effect of the customized ChatGPT on students' behavioral engagement was stronger than its effect on their emotions. A possible explanation is related to the characteristics of GenAI tools. The GenAI tools in general offer structured feedback that primarily stimulates active learning behaviors, while emotional engagement typically relies on more interactive features such as gamified experiences, which may be less emphasized in this context.

Table 2. Descriptive Statistics of Participants' Responses to Items regarding their Perceptions of a Custom Version of ChatGPT as a Self-Learning Assistant.

No	Dimension and items	M	SD	Level
	Goal setting and planning			
1.	The customized ChatGPT helps me identify my academic goals in the class.	3.71	1.21	High
2.	I can create a weekly study plan with the help of the customized ChatGPT.	3.58	1.12	Moderate
3.	I use the customized ChatGPT to organize my study priorities.	3.35	1.29	Moderate
4.	The customized ChatGPT tool supports me in identifying the skills I need to develop.	3.47	1.12	Moderate
5.	I rely on the customized ChatGPT to plan my study schedule before exams.	3.25	1.09	Moderate
	Total	3.47	0.89	Moderate
	Self-Monitoring and Organization			
6.	The customized ChatGPT helps me track my progress in academic tasks.	3.33	1.17	Moderate
7.	I can monitor my understanding of topics using customized ChatGPT.	3.55	1.26	Moderate
8.	The customized ChatGPT provides me with feedback that helps improve my performance.	3.76	1.22	High
9.	I organize my study time with the help of a customized ChatGPT.	3.35	1.09	Moderate
10.	I use the customized ChatGPT to review lesson content regularly.	3.60	1.10	Moderate
	Total	3.52	0.90	Moderate
	Self-evaluation and regulation			
11.	I assess my performance in class with the help of the customized ChatGPT.	3.27	1.15	Moderate
12.	I can identify and correct my mistakes through the customized ChatGPT guidance.	3.56	1.17	Moderate
13.	The customized ChatGPT motivates me to change my study methods when needed.	3.36	1.13	Moderate
14.	I noticed an improvement in my academic performance because of the customized ChatGPT.	3.47	1.09	Moderate
15.	I use the recommendations provided by customized ChatGPT to enhance my academic performance.	3.18	1.12	Moderate
	Total	3.37	0.90	Moderate
	Motivation and engagement			
16.	I feel motivated when using the customized ChatGPT during study sessions.	3.44	1.05	Moderate
17.	The customized ChatGPT encouraged me to engage more actively with the class.	3.67	1.04	Moderate
18.	Using customized ChatGPT motivates me to continue self-learning.	3.58	1.24	Moderate
19.	I feel that customized ChatGPT increases my desire to achieve.	3.60	1.05	Moderate
20.	I find using the customized ChatGPT enjoyable and stimulating as a student.	3.42	1.26	Moderate
	Total	3.54	0.90	Moderate
	Overall	3.48	0.78	Moderate

Note: 1 = 'Strongly Disagree', 2 = 'Disagree', 3 = 'Neutral', 4= 'Agree', 5 = 'Strongly Agree'.

How does the instructor perceive the role and challenges of the customized ChatGPT in enhancing students' self-regulated learning?

An interview was conducted with one of the instructors of the two sections of the course to answer the second research question. Questions were asked about how he perceives the benefits and drawbacks of the custom GPT, as well as the role of the tool in enhancing students' self-regulated learning. Based on his observations, the results showed that the experience had a noticeably positive impact on student learning. However, there were some reported challenges.

The instructor noted that the students reacted positively to the tool, where they were surprised by having a customized ChatGPT that is specialized in supporting their learning in this specific class only. The instructor stated, "The students were surprised that all the material was available, especially since it's related to artificial intelligence. "In addition, the instructor believed that the customized ChatGPT had a positive effect on students' performance and

their engagement with the class materials. He reflected, saying that, "The first assignment had a slight delay, but the next one was better, which proves that the program had a positive effect." In addition, he explained that the tool fostered individual learning interaction among students, helping them overcome shyness to ask questions. He described that "Students are sometimes shy about asking each other or the instructor questions, but when the material is readily available, it encourages them to interact more." He also pointed out that the availability of the smart assistant at any time gave students greater confidence in self-learning, saying: "The students felt they had a constant source of answers, and this gave them comfort and confidence... because the customized ChatGPT is always there, even when the instructor isn't."

The instructor also mentioned that the tool encouraged the students to ask questions, and that made them think deeply. He pointed out that "They started engaging in questions and discussions, and I expect they'll return to the customized ChatGPT often and come up with new ideas." "It definitely affected motivation... Many students were hesitant to ask questions in front of their classmates, but the customized ChatGPT alleviated this hesitation and allowed them to learn comfortably." This, according to the instructor, indicated a positive effect of the tool on the motivation of the students. The instructor believed that the tool helped students more than others, e.g., those with limited computer skills. He explained: "Many students lacked computer literacy, but the tool used solved some of these problems because they could always ask the tool for help." In concluding his positive assessment, he expressed his hope that the experience would be replicated, saying: "I hope there will be many more courses like this, especially applied ones, because he truly helped integrate technology into education."

However, the interviewed instructor reported some associated difficulties with the use of the customized ChatGPT as a learning assistant for the students. The difficulty was related to the students' lack of skills in forming the right prompts for the Customized ChatGPT. For instance, the instructor reported that "The students could not formulate questions in a way that would elicit the required answers. I noticed the variation in their assignments; I am sure that some of the mistakes in the students' assignment responses could have been avoided if they had asked the right questions, they would have received the correct answers from the used tool, as some students did." The instructor pointed out that the students need to practice using GenAI tools in general and the customized ChatGPT in particular. He stated that "If they practice more dialogue with this custom ChatGPT tool, the results will be more accurate. The instructor pointed out the importance of accompanying the use of GenAI tools with, he said, "Students need training on how to ask the intelligent assistant questions so that it gives them exactly the information they need."

Like prior studies that highlighted GenAI tools' potential to enhance self-learning capabilities (Lee et al., 2023; Shalong et al., 2025; Sun et al., 2025), the present results indicate that students generally perceived the customized tool as helpful in supporting key self-regulated learning behaviors. In addition, the findings align with perception-based studies such as Dahri et al. (2024), who reported high acceptance of ChatGPT for metacognitive self-regulated learning using an extended TAM model; Al-Atrash (2024), who found positive perceptions of ChatGPT-assisted learning among EFL students while emphasizing the need for teacher guidance; and Monib et al. (2025), who documented students' appreciation for ChatGPT's personalization, clarification, and academic support despite concerns about accuracy and overreliance. However, the findings highlight several unique aspects associated with the use of GenAI tools as a self-learning assistant in terms of focusing on customized ChatGPT tied to one course and syllabus, examining students' perceptions of custom ChatGPT through four clear dimensions: self-regulated learning and integrating instructor reflections with self-regulated learning-based survey results.

5. CONCLUSION AND RECOMMENDATIONS

The findings of the current study showed that the custom version of ChatGPT used was promising in providing meaningful, 24/7 support to students' learning experiences in the programming course. The student responses indicate that the Customized ChatGPT plays an important role in promoting self-regulated learning among students.

The students' responses showed that they have perceptions of the tool, especially in specific areas that include clarifying goals, offering timely feedback, encouraging active engagement in their academic tasks, strengthening their motivation, and helping students interact independently with course material. However, some aspects of the use of a custom version of ChatGPT were underrated, including helping with long-term planning, monitoring, continuous progress, and translating feedback into learning actions. Insights from the instructor confirmed these findings and emphasized the role of the tool in improving students' confidence and participation. However, the challenges related to prompt formulation and digital skill differences were also highlighted. These findings suggest that customized AI tools hold strong potential for enhancing self-regulated learning when accompanied by appropriate training (e.g., workshops, seminars, hands-on training sessions) and l instructional integration based on well-established pedagogy such as constructivism, experiential learning, and inquiry-based learning.

Based on the findings, a set of recommendations can be provided. The technical aspect of the used custom ChatGPT should be designed carefully to support students' self-regulated learning, where it would be great to have this kind of tool to have personalized planning functions, such as weekly planners and reminders. Having progress-tracking dashboards connected with a database for each user would help students in continuous monitoring of their learning. Future iterations of the Customized ChatGPT could incorporate gamification and visual interactivity to enhance engagement. The second category of the recommendations is related to teaching and learning practices. It is recommended to provide training for students on how to formulate effective prompts for these types of smart tools. Training and awareness programs can be provided to students on how to use them for planning, goal setting, prioritizing tasks, and learning to apply feedback and adjust their study strategies.

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