Uluslararası Eğitimde Yenilikçi Yaklaşımlar Dergisi
International Journal of Innovative Approaches in Education 2024, Vol. 8 (1), 51-69
https://doi.org/10.29329/ijiape.2024.662.4

Original article

Student Experiences on the Use of Artificial Intelligence-Based Chatbots in Programming Education

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Abstract

The aim of the study is to examine student opinions about the artificial intelligence-based chatbot developed to support programming learning. For this purpose, a case study from qualitative research methods was used. The study group consisted of 42 6th grade students attending a public school in Keçiören district of Ankara province. In order to obtain opinions on the use of the chatbot, a form consisting of open-ended questions was developed by the researcher and sent to the participants via Google Forms, and the opinions of the participants were obtained with the questions in the form. Descriptive analysis technique was used to analyze the qualitative data obtained.

While analyzing the students' answers, the frequency of occurrence of codes and their relationship with each other were examined. Repetitive expressions were grouped under appropriate codes, and necessary interpretations were made according to the intensity of these groupings. When the students were asked how they did their activities, it was seen that most of them did it by asking the chatbot, reached the desired result, did not have much difficulty, the chatbot facilitated their work, directed their questions whenever they needed, understood the answers given, and that the students thought it was effective for them to learn by asking questions and discovering themselves with the answers given to the questions. In addition to positive opinions about the environment such as "excellent, beautiful, good, enjoyable, fun, useful, interesting, conveys information to us accurately, we learn what we do not know without needing anyone, it is a very good explanatory and really useful environment, we learn things we cannot do from there, it is useful, facilitating, very useful for those who want to learn coding", negative features such as "it responds according to the old version of the coding environment and it is difficult to understand some answers" were also mentioned, although very few in number.

Keywords: Artificial Intelligence, Chatbots, Programming Education.

Received: 09 March 2024 * **Accepted:** 31 March 2024 * **DOI:** https://doi.org/10.29329/ijiape.2024.662.4

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INTRODUCTION

Nowadays, the development of technology and its intense involvement in our lives has brought about changes in our learning and teaching methods as well as the way we do business in our daily and professional lives. In this process, which is defined as the age of information and technology, the information and human profiles that societies need are also changing rapidly, and innovative and creative individuals who can keep up with themselves, contribute, change and transform are expected (Kandemir, 2011). Therefore, it is considered very important to provide learners with 21st century skills that consist of three main skill areas: learning and innovation skills, information, media and technology skills, and life and career skills (Kylonen, 2012; "Partnership for 21st Century Learning", 2007). Apart from these skills, coding, which is seen as an academic skill, is also seen as a part of logical reasoning and is accepted as one of the skills called "21st century skills" (Sayın & Seferoğlu, 2016; European Commission, 2018). It is also seen that there are researches and practices that show that teaching programming to students is meaningful to develop their 21st century learning skills (Akpınar & Altun, 2014; Shin, Park, & Bae, 2013; Çakıroğlu, Sarı, & Akkan, 2011, Monroy-Hernandez & Resnick, 2008).

The development of digital skills is seen as a prerequisite for digital transformation in the world, that is, economic growth, increasing the welfare level of citizens and the realization of digital technology market strategy. Therefore, it is seen that a close relationship has begun to be established between the development plans of countries and education policies and coding education in this context. Coding is seen as a new way of "thinking" and "producing" according to Resnick (2013) and as a new way of achieving literacy in the 21st century like reading and writing according to Bers (2018). Due to its importance, coding draws attention as one of the new trends in curricula (Park, Kim, Oh, Jang, & Lim, 2015).

Coding is one of the most important skills emphasized today. It is thought that children who will make a difference in every subject in the future will be at the forefront with these competencies. However, according to Passier (2017), the creative process of writing software code seems to be challenging for beginners, especially if no guidance is available. For these reasons, learners become discouraged and unable to progress when they are unable to learn coding either under the guidance of the instructor or individually. In such moments, when learners want to learn coding individually, when they have difficulties while learning, when the instructor cannot keep up with everyone in the classroom environment, or when it is necessary to stay away from the teacher-teaching environment, there is a need for a support that can be applied. It is believed that chatbots can be useful, effective and helpful as educational assistants in such moments (Molnár & Szűts, 2018).

Chatbot is an application in which users communicate with the computer by voice or in writing. Chatbots are artificial intelligence software created to perform many tasks on their own and without the

need for human assistance, interacting with users via text or voice (İşeri, Aydın, & Tutuk, 2021). Chatbots are used on many platforms to answer frequently asked questions, provide assistance and even make suggestions. Chatbots have been adopted in sectors such as medical consultation, personalized travel advice, providing real estate information, resource recommendation in e-learning (Souali, Rahmaoui, Ouzzif, & El Haddioui, 2019), healthcare, marketing, education, support systems, cultural heritage, entertainment (Clarizia, Colace, Lombardi, Pascale, & Santaniello, 2018), food delivery business, finance and e-commerce industry (Sandu & Gide, 2019). The use of chatbots to provide effective interaction with the user is increasing day by day (Souali et al., 2019).

Chatbot technology can be used in a wide range of fields thanks to its flexibility and ability to be used at a pace that each individual feels comfortable with (Fernoagă, Stelea, & Gavrila, 2017). Chatbots have been used for educational purposes for some time. These chatbots can be categorized as educational and non-educational. Non-educational chatbots are used for administrative tasks such as student guidance and assistance (Fernoagă et al., 2017). Educational chatbots are used in teaching and promoting learning. This category includes chatbots that provide the framework for the learning process, i.e. selecting and organizing content to suit students' needs and pace, and helping with thinking and motivation to learn. These bots act as a learning companion that enables dialog, collaboration and reflection (Molnár & Szűts, 2018). Chatbots are seen as a useful technology to facilitate learning in an educational context (Clarizia et al., 2018). The results can be examined by using the learning facilitating effect of chatbots in programming learning.

Despite the increasing importance given to programming education in our country, it is pointed out that there are very few academic studies (Sayın & Seferoğlu, 2016). However, students are often not skilled enough in programming and see it as a difficult and complex task (Aşkar & Davenport, 2009; Goel & Polepeddi, 2018; Daradoumis, Puig, Arguedas, & Liñan, 2019). One of the main reasons why learning coding is difficult for many students is that it requires multiple dimensions of knowledge (such as conceptual and procedural knowledge) (Passier, 2017) and involves various cognitive processes (such as understanding, analyzing, and evaluating) according to Bloom's taxonomy (Anderson & Krathwohl 2001; Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956; cited in Hobert, 2019). Hobert, 2019). For these reasons, it is thought that individual support to learners is important to be successful in programming education and to change learners' perspectives on the course. Chatbot-based learning systems are particularly suitable for providing interactive and individualized interaction. According to Hobert (2019), to solve the problem of personalized support (e.g. answering questions that arise when trying to solve homework assignments) and incomplete guidance for novice programmers in the absence of a lecturer or teaching assistant, more complex solutions that focus specifically on learners' needs may be required. Moreover, chatbots as an online learning environment do not waste time as they provide quick answers to students' questions (Uzun, Tümtürk, & Öztürk, 2021).

Several studies have explored the effectiveness of chatbots in various educational contexts, including language learning, science courses, and English language teaching. For instance, Chen et al. (2020) found that chatbots were effective in stimulating students' learning interest in language teaching. Furthermore, Kumar (2021) highlighted the potential of educational chatbots as a pedagogical tool to revolutionize teaching and learning. In addition to language and science education, chatbots have been studied in the context of higher education, with Essel et al. (2022) focusing on the impact of a virtual teaching assistant (chatbot) on students' learning in Ghanaian higher education. The study revealed valuable insights into the learning experiences and interactions with the chatbot. Moreover, the potential of chatbots in improving digital literacy and supporting senior citizens in learning has been explored by (Sriwisathiyakun & Dhamanitayakul, 2022). Moreover, the integration of chatbots in the classroom environment has been studied, with Leavitt et al. (2022) demonstrating how a chatbot tutor can lessen the gender confidence gap in information systems learning. Overall, the research indicates that chatbots have the potential to enhance learning outcomes, stimulate interest, and provide personalized support in various educational settings, including language learning, science courses, higher education, and health-related education.

A small number of studies, however, have taught coding and programming using chatbots (Artificial Intelligence Based Interaction Tool) that can be used as a learning tool when necessary (Mikic, Burguillo, Llamas, Rodriguez, & Rodriguez, 2009; Goel & Polepeddi, 2018; Müller, Bergande, & Brune, 2018; Hobert, 2019; Yin, Goh, Yang, & Xiaobin, 2021). It is curious how to teach coding through chatbots in younger age groups and in an applied course and how the learner experiences will be realized.

In the context of computer programming, the analysis of students' learning experiences in a computer laboratory setting has provided valuable insights into the practical implications of AI chatbots in programming education (Thuné & Eckerdal, 2018). Additionally, the study of a web-based blended learning environment for programming languages has focused on students' opinions, emphasizing the importance of student feedback in shaping effective learning environments (Yağcı, 2017). All of these research highlight how important it is to consider the perspectives and experiences of students when assessing the viability and adoption of AI chatbots in programming instruction. Considering all of this, the purpose of this study is to investigate student perceptions and experiences with the AI-powered chatbot designed to enhance programming education.

METHOD

In this section; information about the research design, study group, data collection tools and data analysis are given.

Research Design

In the study, a case study, one of the qualitative research methods, was used to determine how students found the chatbot and learning through the chatbot when 6th grade middle school students were taught coding through the chatbot. Case study is used to identify and see the details that make up an event, to develop possible explanations for the event, or to evaluate an event (Gall, Borg, & Gall, 1996). According to Merriam (2013), case study is an in-depth description and examination of a limited system. According to Creswell (2007), case study is a qualitative research approach in which the researcher examines one or more situations limited in time in depth with data collection tools (observations, interviews, audiovisuals, documents, reports) involving multiple sources, and defines situations and themes related to the situation. Deciding to use a case study in a research is not a choice of method, but a choice of what to explore (Flyvbjerg, 2011). In qualitative research, the situation that is decided to be examined also functions as the basic unit of analysis of the research (Yin, 2009). In this study, the basic unit of analysis was defined as the chatbot-based e-learning environment and the data sources were defined as the students in this environment. An Exploratory Case Study was adopted in this study. Explanatory Case Study is used to provide information about a situation, to make unfamiliar situations familiar and to explain the connections with real life situations (Yılmaz, 2014).

For this purpose, in order to carry out this study, a chatbot was first prepared. The chatbot used is developed in PHP and leverages ChatGPT's powerful language processing capability to answer questions. Therefore, the system works quickly and safely. The bot uses MySQL database to store questions and answers. The database contains questions and answers in various Scratch-related categories (e.g., coding blocks, animations, games). To integrate the ChatGPT API, the API key and necessary codes to send queries and receive responses are added to PHP. The API sends and receives data in JSON format. The bot takes the question entered by the user and compares it with previously processed queries. If a match is found, it takes the relevant response from the database and shows it to the user. If no match is found, the ChatGPT API is queried and the API's response is displayed to the user. After preparing the environment, weekly block-based programming acquisitions were created in accordance with the learning outcomes. Then, students were tried to gain algorithm logic. In line with the learning outcomes, weekly learning activities were planned. During the lesson, students were given information about the weekly topic and what they needed to do. In a face- to-face applied lesson environment where the teacher was only a guide, the learning activity to be realized by the students was completed by the students themselves by compiling the questions they would ask to the chatbot individually, in accordance with their needs and the answers they received. At the end of the study, the students were asked open-ended questions were prepared and presented to students via Google Forms about the chatbot and its use in the lesson to understand their experiences and thoughts about the robot.

Working Group

This study will be conducted with 6th grade students attending a public school in the Keçiören district of Ankara province. Convenience sampling method was chosen due to the fact that it is the school where the researcher works, access to the study group, the environment is suitable in terms of organizing the study environment and the study will gain speed in this way. This sampling method involves selecting the closest people to serve as respondents and continuing this process until the required sample size is obtained or until those who are available and accessible at the time are obtained. Researchers select the sample from among those they can easily access. A convenience sample can be the sampling strategy chosen for a case study or a series of case studies (Cohen, Manion, & Morrison, 2007).

Table 1. Distribution of the study group according to gender

Girl	21
Male	21
Total	42

Forty-two 6th grade students participated in the study. The distribution of the study group according to gender is given in Table 1.

Data Collection

In order to obtain opinions on the use of the chatbot, a form consisting of open-ended questions was developed by the researcher and sent to the participants via Google Forms. The form includes eight questions about the use of the environment. The questions were prepared by the researcher to reveal student opinions and experiences in the environment. These questions are as follows:

1. How did you do your event with an AI-based chatbot?
2. Did you achieve the result of your activity?
3. How difficult was it for you to organize your event?
4. How easy were the questions you asked the chatbot during your event?
5. At which moments did you use the chatbot in the production of the event?
6. Were you able to understand the answers given by the chatbot?
7. To what extent was it effective to ask questions about a topic and learn by exploring through answers to questions?
8. How would you rate the chatbot?

For the content validity and reliability of the questions, a preliminary application was made with 10 students, and then two teachers from the field and two Turkish teachers were examined to eliminate language-related problems, and the necessary arrangements were made and the questions were finalized. After the experience gained in the lesson with the chatbot, the form was sent to the students participating in the lesson and they were asked to fill it out.

Data Analysis

For the reliability of the analysis of the answers given by the students to the questions prepared by the researcher regarding the use of the chatbot, the reliability formula developed by Miles and Huberman (2015) [Reliability=Number of consensus / (Total number of consensus + Number of disagreements)] was used and reliability=.82 was found. This result shows that the coding was reliable (Miles & Huberman, 1994). Students were asked 8 open- ended questions and the qualitative data obtained were analyzed. Descriptive analysis technique was used to analyze qualitative data. Descriptive analysis is a type of qualitative data analysis that involves summarizing and interpreting the data obtained through various data collection techniques according to predetermined themes. In this type of analysis, the findings are presented to the reader in a summarized and interpreted form, although the researcher often includes direct quotations in order to reflect the views of the individuals he/she has interviewed or observed in a striking way (Yıldırım & Şimşek, 2003). While analyzing the students' answers, the frequency of occurrence of the codes and their relationship with each other were examined. Repetitive expressions were grouped under appropriate codes and necessary interpretations were made according to the intensity of these groupings. The results obtained from the open-ended questions were presented with unchanged quotations. During the quotations, student names were abbreviated and coded as student 1 (T1), student 2 (T2), etc. instead of student names. For the reliability of the codes, two people coded and Cohen's Kappa (k) coefficient was found to be 0.65. The Kappa statistic takes values between 0 and 1, and values of .40 and above are generally accepted (Wynd, Schmidt, & Schaefer, 2003). It is seen that an acceptable value emerged in this study.

Findings

In this section, students' opinions about the artificial intelligence-based chatbot are tabulated and explanations and comments about the tables are given.

When the students were asked how they did their activities, it was seen that more than half of them did their activities by asking the chatbot. The findings on how the students did their activities are presented in Table 2 as frequency and percentage distribution.

Table 2. Distribution of Students' Answers to the Question "How did you do your activity?"

Answers	***f***	**%**
I did it by asking questions to the chatbot	24	57,1
I did it by trying the codes	7	16,6
I did it a little bit by asking the chatbot and a little bit by trying it myself	2	4,7
Other	9	21,4
Total	42	100

Analysing the answers of the students, 57.1% of them completed the activity by asking the chatbot and taking the answers into consideration, 16.6% by trying the codes, and 4.7% by asking the chatbot a little and trying a little by themselves. Since the answers given by 21.4% of the students were not clear enough, these answers were grouped within themselves. When these answers are examined, S12 "I did it by myself", S17 "I completed the work I started in the informatics course at school from my own computer at home", S18 "I did my activity by downloading the scratch program to my computer", S22 "I had some difficulty", S23 "I did it logically by reading and understanding", S26 "I did it from the computer", S30 "I did it by following the steps", S34 "I had done it in the past and it was in my mind from there" and S45 "I opened a city, put a car on the road and moved it forward". From these answers, it is thought that the activity was done, but it is not clear how it was done. In addition, the fact that more than half of the students did the activity by asking the chatbot can be interpreted as students' quick adaptation to a new technology used in the lesson.

When the students were asked whether they reached the desired result while doing their activities, it was seen that almost all of them reached the desired result in their activities. The findings regarding whether the students achieved the desired result in their activities are presented in Table 3 as frequency and percentage distribution.

Table 3. Distribution of Students' Responses to the Question "Did You Achieve the Desired Result While Doing Your Activity?"

Answers	***f***	**%**
Yes, I did.	41	97,6
I made half of it	1	2,3
Total	42	100

The answers of the students are analyzed, it is seen that 97.6% of them completed the activities in some way and reached the desired result and 2.3% of them were able to complete half of the activity. It was observed that the student who could not complete the activity completed half of the activity because he could not complete the activity within the course time. Almost all of the participants

completed the activity without the help of the teacher. This shows that with good guidance at the beginning of the lesson, students can reach the desired result on their own with the support of the chatbot when they feel the need.

When the students were asked to what extent the activity challenged them, it is noteworthy that more than half of them had moderate difficulty. The findings regarding the degree to which the students had difficulty in doing the activities are presented in Table 4 as frequency and percentage distribution.

Table 4. Distribution of Students' Responses to the Question "To what Extent Did Doing the Activity Challenge You?"

Answers	***f***	***%***
No difficulty at all	11	26,1
I had moderate difficulty	25	59,5
I had a hard time	6	14,2
Total	42	100

Considering the students' responses, it is seen that 59.5% of them had moderate difficulty in doing the activities, 26.1% had no difficulty at all, and 14.2% had a lot of difficulty. When we look at the statements of some of the students who stated that they had moderate difficulty, S12 stated that they had difficulty as "It was not very difficult, it was fun", S26 stated that "It was not very difficult at moderate level" and S42 stated that they had difficulty as "Moderate". S18 "Thanks to the education I received before about coding, I was able to prepare it without much difficulty." and S26 "It was not very difficult because we had seen this subject in my old school" and they stated that they had moderate difficulty with the effect of their prior knowledge. S6 "I did not have any difficulty at all, I even enjoyed it", S10 "it was easy when I did it by asking questions" and S3 "I did not have any difficulty" and it was seen that they adapted to the process faster. Among the students who stated that they had difficulty, S18 said "Sometimes I did not know what to do and how to do it, and it was very difficult for me to be honest." and S22 stated that they had difficulty as "it was very difficult", while the others stated that they had difficulty at first and then they did not have any problems. For example, S22 "I had difficulty 1 or 2 times, but then I managed to do it", S27 "I had difficulty in the moving part, but then I solved it", S29 "It was difficult at first, but then it became easier", S34 "I had some difficulty, but I was able to do it", it is noteworthy that they were able to do their activities with the support of the chatbot even though they had difficulties. As can be understood from these statements, it is seen that the students somehow reached the result even if they had difficulties.

When the students were asked to what extent the questions they asked to the chatbot facilitated their work, it is noteworthy that half of the students stated that it made their work very easy. The findings

regarding the students' answers to the questions they asked to the chatbot while doing their activities are presented in Table 5 as frequency and percentage distribution.

Table 5. Distribution of Students' Answers to the Question "To what Extent Did the Questions You Asked the Chatbot While Doing Your Activity Make Your Work Easier?"

Answers	***f***	***%***
Made it very easy	21	50
Moderately facilitated	19	45,2
I didn't use the chatbot	2	4,7
Total	42	100

Considering the answers of the students, it is noteworthy that 50% of them stated that the questions asked to the chatbot made their work very easy. For example, S2 "It helped me to do my job very easily, I asked things I didn't know.", S8 "I understood the activity, but I did it easier thanks to the questions I asked.", S13 "I couldn't have done it without the site, it made my job very easy.", S17 "Actually, I can say that it made it very easy because I almost didn't know anything about the scratch program and this made the activity easier". It is seen that 45.2% of the students stated that the questions asked to the chatbot moderately facilitated the construction of the activity, while 4.7% stated that they did not use the chatbot. Those who said that it made it moderately easier stated that although they had difficulty at first, they were still able to complete their activities with the support of the chatbot. These results show us that the chatbot had positive effects on almost all participants.

When we look at the times when the students asked questions to the chatbot, it is seen that the majority of them directed their questions whenever they needed. The frequency and percentage distribution of the answers given by the students regarding the moments of asking questions to the chatbot while doing their activities are presented in Table 6.

Table 6. Distribution of Students' Answers to the Question "At Which Moments Did You Apply to the Chatbot in the Production of the Activity?

Answers	***f***	***%***
I needed it moderately often	5	11,9
I often needed it	35	83,3
Didn't feel the need	2	4,7
Total	42	100

Depending on the anwers of the students, it is seen that 83.3% of them used the chatbot whenever they needed it while doing their activities. This result shows us that the chatbot enables us to progress

more easily in the activity and that most of the students refer to the chatbot both frequently and when needed. While doing the activity, 11.9% of the students received help from the chatbot at some points where they got stuck, even if not at every stage. For example, S23 stated that he did not need the environment constantly by saying "I did not ask at every stage, I only asked questions where I could not do it". For example, S2 expressed why he did not need the chatbot frequently by saying "The answer to a question I applied has already contributed to other questions". 4.7% of the students stated that they never used the chatbot. It is thought that the fact that the chatbot has never been used is related to the previous use of the programming environment or the fact that the students easily adapt to the environment and use the trial and error method in their activities.

The answers given by the students to the question "Did you understand the answers given by the chatbot?" are analyzed, it is seen that the majority of them understood the answers given. Table 7 presents the frequency and percentage distribution of the students' answers about whether they understood the answers given by the chatbot.

Table 7. Distribution of students' answers to the question "Were you able to understand the answers given by the chatbot?

Answers	***f***	***%***
I understood perfectly.	38	90,4
I understood most of it	2	4,7
I never asked any questions	2	4,7
Total	42	100

After analysing the answers, it is seen that 90.4% of them understood the answers given by the chatbot. Although the majority of the students stated that they understood the answers of the chatbot, it is seen that some students made an effort to understand. For example, S9 answered this question as "They were long answers, but I understood.", S13 "Even if I got stuck in some places, yes, I understood.", S14 "I had some difficulty, but I understood." and S37 "I understood, but I had difficulty.". Among the remaining students, 4.7% stated that they understood most of the answers and 4.7% did not ask any questions.

The answers given by the students to the question about how effective they think it is to learn a subject by asking questions and exploring themselves with the answers given to the questions, it is seen that almost all of the students expressed positive opinions. Table 8 presents the frequency and percentage distribution of the students' answers to the question about how effective they think learning by asking questions and exploring themselves in a subject is.

Table 8. Distribution of Students' Responses to the Question "To what extent was it effective to ask questions about a subject and learn by exploring with the answers to the questions?

Answers	***f***	***%***
Those who expressed a positive opinion	40	95,2
Those with a negative opinion	2	4,7
Total	42	100

The question about learning by asking questions to the chatbot and based on the answers given by the robot are examined, it is seen that 95.2% of them expressed positive opinions. When these opinions are examined, the answers other than the answers such as "it was very effective, it was very effective" are as follows: S3 "I think it is more effective than someone explaining because we research and learn what we are curious about", S4 "It improved me to do a better activity from now on.", S9 "Being able to do something on your own is both very fun and instructive. When doing something, we should do what we can do ourselves and learn by asking questions for what we don't understand.", S10 "It was very effective, I reached what I didn't know", S11 "Getting help on a subject I had difficulty with made it easier for me in terms of learning", S17 "Since I learned by researching myself, I think that it entered my mind more and thus what I learned will stay in my mind for a long time", S18 "In this way, I discovered the aspects I did not know and it was effective in learning more information.", S19 "I think it was very effective. Getting help by asking questions made it easier to learn what I did not know.", S29 "I learned new information and had fun.", S33 "I enjoyed it, it felt like a game, so it was nice.", S35 "It was very effective to get more information." As can be understood from the statements, the students think that it is a different way of learning and that what they learn is more effective because they learn by exploring themselves according to the answers they receive. It is seen that 4.7% of the students gave negative opinions to the question about learning by asking questions to the chatbot and based on the answers given by the robot. When these opinions were analyzed, S23 stated "It did not have much effect" and S31 stated "It is not effective at all". Although S23 stated that he knew the environment before, S31 stated that the environment was not effective at all, although he stated that he did not use the environment without difficulty, that the environment helped him to do his activity, and that he used it when he needed it.

In additon, the question about how they evaluated the chatbot, it is seen that all of them expressed positive opinions. When different opinions about the environment other than the answers given in common by everyone such as "excellent, beautiful, good" are examined, S2 "It is very good, it does not have a muscle or a problem.", S3 "I like it, it delivers very good information to us in a correct way", S4 "It is a great platform for me to do a fun activity.", S6 "10/10 because it is very enjoyable", S7 "I really like it very much", S8 "It helped me to make a different character.", S9 "I think it is a very nice site, it

is useful and interesting.", S12 "It is very nice, you ask what you want and it answers.", S13 "I think it is a very nice application, we learn what we don't know without needing anyone.", S14 "It is a very nice, explanatory and really useful environment.", S16 "We learn things we cannot do from there. It is a useful application.", S18 "It is a useful environment for me because I can find answers to the questions I ask.", S19 "I think it is very useful for those who want to learn coding.", S26 "It made my job easier, I evaluate it well." and S30 "It is a nice and useful environment." A few students also mentioned some deficiencies despite their positive opinions. For example, S17 "It is very nice to have such an environment where we can get support even though there are problems arising from the fact that it gives answers according to the old version." and S23 "It was difficult to understand the answers, but I did it." and emphasized the necessity of reviewing the answers produced by the system.

DISCUSSION AND CONCLUSION

Today, the rapid change and development in information technologies has affected and continues to affect the field of education as well as every field. The power of technology can be utilized to make what is learned in education more understandable, permanent and effective. In this sense, support can be obtained from tools that facilitate the work of both educators and students. One of these tools is chatbots. Chatbots are preferred in different fields with different usage purposes, and in the field of education, according to Thomas (2020), it is accepted as a branch of technology-mediated learning by reducing the monotonous tasks of educators, creating a personalized learning atmosphere and structuring it in a way to cognitively answer the questions that learners are curious about. In this context, the opinions of the students about the environment as a result of the use of chatbot in programming education in the information technologies course, which is an applied course, were examined.

According to the results of the study, more than half of the students (57.1%) stated that they only asked questions to the chatbot when asked how they did their activities. This result shows that students quickly adapt to a new application. Rogers (2003) defines innovation as "an idea, practice, or object that is perceived as new by an individual or organization". As stated in Rogers' Diffusion of Innovation Theory, some students accepted the innovation while others tried other ways to reach the result. According to Meyer von Wolff, Heuzeroth, Hobert, and Schumann (2020), systems perceived as new can be associated with increased learning effort, and users who have used them at least once look at chatbots more critically.

Almost all of the students (97.6%) stated that they achieved the desired result while doing the activities. This result shows that almost all of the students completed the activity in some way. It is also in line with the result of Hobert (2019)'s study that although successful completion of the programming task was not required, the majority successfully solved the task. The proportion of students who stated that they had no difficulty (26.1%) and moderate difficulty (59.5%) while doing their activities through the chatbot is quite high. In total, it is important that 85.6% of the students reached the result without

much difficulty. This high rate may be related to the provision of a sufficient knowledge base. The opposite situation may cause students to reject chatbot-based support (Meyer von Wolff et al., 2020). In addition, this high rate may also be related to solving the programming task. Because by doing this analysis, it is thought that using the chatbot to select and sort the appropriate codes in the programming environment and to ask questions about the environment facilitates the process instead of making it difficult. In Hobert's (2019) study, it is mentioned that the programming task may be difficult in the first place, so it should have a lot of support, but as coding skills improve, this support can be reduced over time.

About half of the students (50%) stated that the questions they asked to the chatbot made their work very easy. This facilitation may be related to the fact that chatbots provide the right solution, appropriate, clear and understandable answers, as well as finding quick solutions, as Meyer von Wolff et al. In addition, Hobert (2019) stated that students cannot always find the right answers to their questions on the internet when a problem arises, and chatbots are very useful both in such a situation and as a way of learning. 83.3% of the students stated that they used the chatbot whenever they needed it in the construction of the activity. However, S7, who had prior programming knowledge, said "I did not apply because I did not need it", indicating that prior knowledge reduces the need for a chatbot. In Hobert's (2019) study, approximately 72% of the students supported the concept of "Coding Teacher", but 9% of the students preferred not to use it. In particular, students who rated their programming skills as high stated that chatbots would not help them and that they could solve tasks on their own without any problems. In another study, it is mentioned that chatbots can be useful for those who have no knowledge of the subject or for reviewing previously learned topics (Hobert, Følstad, & Law, 2023).

The majority of the students (90.4%) stated that they understood the answers given by the chatbot very well. However, although the number is small, it is seen that there are those who do not ask questions to the chatbot, have difficulty understanding the answers given by the chatbot, understand most of them and do not understand them. In the study by Meyer von Wolff et al. (2020), participants similarly stated that they often had problems understanding the answers given by the chatbot, and that the chatbot sometimes did not understand or misinterpreted what was said. They also suggested that the answers should keep the context of the topic, that the answers should not be long, that the visual design of the chatbot should be paid attention to, and that there could be button control for dialog control. In Hobert et al.'s (2023) study, 91% of the participants expressed positive opinions about chatbots "in the sense that they provide answers that are fast, easy to understand, clear, concise and written in a good format". In this context, but this time in relation to whether the chatbot understands the questions or not, in another study by Hobert (2019), a few of the students were concerned about whether the chatbots would be able to understand the questions correctly and answer all the questions. However, as a solution to this situation, one participant described chatbots as "a brilliant idea with the problem of an adequate

knowledge base". In this context, increasing language understanding, continuous retraining from the beginning to provide increasingly better solutions, and repair mechanisms when interpretation errors occur could be useful. Due to the complexity of natural language, chatbots are prone to misinterpret user requests. Such misinterpretations can lead to the chatbot failing to provide adequate responses to the user request, potentially leading to conversation disruption (Følstad and Taylor 2020).

Most of the students (95.2%) expressed positive opinions about the effectiveness of learning by discovery through asking questions and answering questions on a topic. Of course, most people are capable of learning some knowledge and some skills on their own (Goel & Polepeddi, 2018). However, in Hobert's (2019) study, while some of the students evaluated step-by-step guidance as very useful, on the other hand, some students were concerned about whether the guidance would reduce the learning effectiveness and whether too much guidance did not require students to think for themselves. According to Winkler and Soellner (2018), it is seen that students are competent enough to learn independently due to the fact that perceived choice and perceived value increase their intrinsic motivation in the chatbot-based learning environment without requiring constant face-to-face communication. It was observed that students who learned with the chatbot achieved significantly higher intrinsic motivation than the traditional learning group. This result may help teachers to incorporate chatbot learning into the classroom. Individual student differences, chatbot design and chatbot-mediated learning environment affect chatbot adoption in education.

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