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Research Article

Design and Use of Chatbots for Educational Purposes: A Study on Student Opinions

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Abstract: Rapid developments in information and communication technologies have caused significant changes in the field of education. Among these changes, the role of artificial intelligence-based chatbots in education is increasing. In this study, it is aimed to reveal the issues that need to be taken into consideration in the design of chatbots used for educational purposes by discussing student opinions and experiences about the design and use of chatbots. In the study, case study research method, one of the qualitative designs, was used. The sample of the research was selected by purposeful sampling method, and the experimental period was determined as two course weeks. The data of the participants were collected using the focus group interview technique. Content analysis method was applied to the data obtained. As a result of the study, it was revealed that chatbots were generally easy to use by students and their interface design was evaluated positively. Positive features such as ease of use, quick answers and clarity contribute to students developing a positive attitude towards this technology. The lack of naturalness of the chatbots' answers, the inability to understand spelling errors, and the failure to indicate the sources of the answers caused students to develop negative opinions about the answers given by the chatbots on extracurricular topics. Additionally, some of the students wanted chatbots to be usable outside the course content

Keywords: chatbot, qualitative design, student opinions, artificial intelligence, distance learning

Araştırma Makalesi

Eğitim Amaçlı Sohbet Robotlarının Tasarımı ve Kullanımı: Öğrenci Görüşleri Üzerine Bir Çalışma

Öz: Bilgi ve iletişim teknolojilerindeki hızlı gelişmeler arasında yapay zekâ temelli sohbet robotlarının eğitimdeki rolü giderek artmaktadır. Bu çalışmada sohbet robotlarının tasarımı ve kullanımı hakkında öğrenci görüşleri ve deneyimlerinin ele alınarak eğitim amaçlı kullanılan sohbet robotlarının tasarımında dikkat edilmesi gerekilen hususların ortaya çıkarılması amaçlanmaktadır. Çalışmada, nitel desenlerden biri olan örnek olay araştırması yönteminden faydalanılmıştır. Araştırmanın örneklemi amaçlı örnekleme yöntemiyle seçilmiş olup, deney süresi iki ders haftası olarak belirlenmiştir. Katılımcılara ait veriler odak grup görüşme tekniği kullanılarak toplanmıştır. Elde edilen verilere içerik analizi yöntemi uygulanmıştır. Çalışmanın sonucunda, sohbet robotlarının öğrenciler tarafından genel olarak kullanımının kolay ve arayüz tasarımının olumlu olarak değerlendirildiği ortaya çıkmıştır. Kullanım kolaylığı, hızlı cevaplar ve netlik gibi pozitif özellikler, öğrencilerin bu teknolojiye olumlu bir tutum geliştirmesine katkıda bulunmaktadır. Sohbet robotlarının cevapların doğallığının eksikliği, yazım hatalarını anlayamama ve cevapların kaynaklarını belirtmeme nedeniyle öğrencilerin ders dışı konularda sohbet robotlarının verdiği cevaplar konusunda olumsuz görüş geliştirmelerine neden olmuştur. Ayrıca, öğrencilerin bir kısmı, sohbet robotlarının ders içeriği dışında da kullanılabilir olmasını istemişlerdir.

Anahtar Kelimeler: sohbet robotu, nitel desen, öğrenci görüşleri, yapay zeka, uzaktan öğrenme

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1. Introduction

Rapid and significant developments in information and communication technologies have led to the transformation of many disciplinary fields. One of the fields most affected by these developments is educational sciences. Educational researchers aim to integrate technology into educational environments in order to make education more meaningful, efficient and effective. Recently, artificial intelligence technology has emerged in almost every sector. ChatGPT, developed as an artificial intelligence product, draws the attention of practitioners and researchers to chatbots created based on artificial intelligence [1]. The use of chatbots for educational purposes is becoming increasingly popular [2]. These robots attract attention as teaching tools that can interact with students and enrich the learning process.

Chatbots belong to the natural language processing sub-branch of artificial intelligence, which includes various sub-branches such as artificial neural networks, expert systems, pattern recognition and genetic algorithms [3]. Nuruzzaman and Hussain [4] defined chatbots as conversational software systems that mimic human communication abilities by communicating with users. The architecture of a standard chatbot is shown in Figure 1 [5].

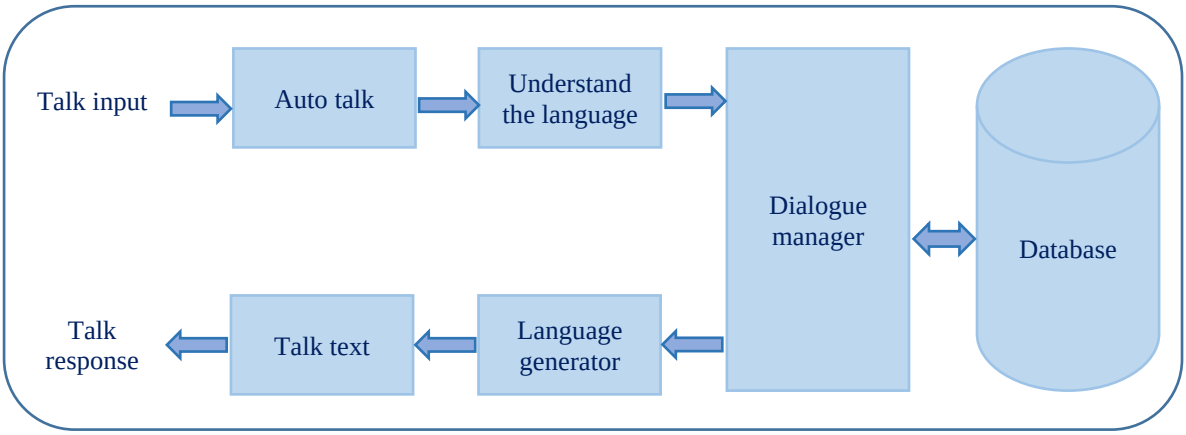

Figure 1. Chatbot Architecture

In this architecture, the automatic speech recognizer receives input from the user, converts it into lexical rules and then initiates the process by passing it to the language understanding module. The language understanding module receives the user's utterances and forwards them to the dialog manager. The dialog manager extracts meaning from these utterances using the natural language processing module and accesses them to pull information from the database when needed. Once the information is obtained, the dialog manager decides on the processing flow. Then it moves to the spoken language generation module and the words or phrases are converted into a form that the user can understand and transmitted.

In the literature, chatbots are categorized into four main groups based on their intended use: goal (task), information, service, and response generation [4], [6]. These classifications help us understand the design and use of different types of chatbots by focusing on their functions and purposes.

1. **Task-based Chatbots:** Goal-based chatbots are designed to fulfill specific tasks. These robots aim to meet the needs of users by having short conversations. For example, they are tasked with responding quickly to customers' questions on company websites.
2. **Informative Chatbots:** Informative chatbots work based on the information they collect from accessible sources. According to these sources, they can be classified as open and closed spaces. In open domains, it can access resources without limitations and provide the most appropriate responses. Closed domains collect information from sources that are limited to a specific data set. Examples include Allen AI Science and Quiz Bowl open domain robots, and closed domain examples such as Daily Mail, MCTest and bAbI.
3. **Service-based Chatbots:** Service-based chatbots are designed to provide services to users in a specific domain. These services can be personal or commercial and can be categorized according to the possibilities offered to users. For example, service-based chatbots can be used to order food from a restaurant.

4. **Chat-based Chatbots:** Response generation-based chatbots can be classified into four different groups according to the methods they use to generate responses: template-based model, generative model, access-based model, and search engine model. These models generate responses in accordance with the natural language inputs they receive from users.

In chatbot studies in the literature, it has been stated that chatbots provide personalized information with instant guidance and support personal and collaborative learning environments [7]. Chatbots used for instructional purposes have generally been used in language education for language learning and speaking practice [8]-[11]. In addition, educational chatbots have been used in prototype design and implementation studies in computer science [9] and health [11], and their effects have been observed [12]. There are studies showing that chatbots for educational purposes contribute positively to students' learning processes. Baylor [13], found that motivational chatbots and avatars positively affect student motivation. In their study, Belpaeme et al. [14] discussed the use of chatbots in L2 education and provided guidance for the design of chatbots to be used in language learning. Vázquez Cano, Mengual Andrés, and López Meneses [15] observed the effects of using chatbots for educational purposes. At the end of this study, it was concluded that chatbots positively affected academic achievement and students had positive perceptions about the use of chatbots. Jeon, in his study conducted to examine the effects of chatbots in the language learning process, stated that chatbots increase interest in the course, positively affect students' motivation, and cause students to develop positive attitudes towards the course [16].

When the literature is examined, although research on the design and use of chatbots for educational purposes has recently become popular, studies on this subject are still in the minority [17], [18]. In the studies conducted in the literature on the use of chatbots in education, there are suggestions for future researchers to reveal the potentials of the subject and to increase studies to reduce the risks associated with the subject [19]. Therefore, it is considered important for the literature to increase the number of studies in which the issues to be considered in the design of chatbots for educational purposes, in other words, chatbots used for educational purposes, and the effects of these robots are observed.

In this study, it is aimed to reveal the issues that need to be considered in the design of chatbots used for educational purposes by addressing student opinions about the design and use of chatbots. In line with these objectives, the research questions of the study are as follows:

1- What are the students' views on receiving instructional support using a chatbot?
   i. What do students like about the chatbot?
   ii. What do students dislike about the chatbot?
   iii. What are the students' suggestions and opinions on improving the chatbot?

2. Materials and Methods

In this study, which was conducted to reveal the issues that require attention in the design of chatbots used for educational purposes, case study research method, which is one of the qualitative designs, was used as a research method. Qualitative research designs provide the researcher with a more flexible perspective, keeping the research in a specific focus and ensuring the consistency of the various steps of the research. The case study research design is a particularly effective research method for understanding and explaining complex or unique situations. It offers researchers rich and in-depth insights and can contribute to the application of theoretical knowledge to practical situations [20]. The sample of the study was selected by purposive sampling method and the study group consisted of students taking the English Culture II course at Ardahan University, Faculty of Humanities and Literature, Department of Western Languages and Literatures, Department of English Language and Literature. At the end of the experiment period determined for two course weeks, eight of the students (2 males, 6 females) volunteered to participate in the focus group interview.

The data of the participants were collected using the focus group interview technique. Considering the analysis of the data recorded in individual interviews and the size of the resulting data set, it is known that this situation will become more complex and challenging as the number of interviewees increases. With focus group interviews, researchers can reach more participants and obtain more systematic data [20].

Content analysis method was applied to the data obtained. Content analysis is the technique of systematically summarizing a text under smaller content categories with codes created under certain rules [21]. In the pilot study, the categories were checked by the researchers and made consistent by different researchers placing similar data in the same category.

The chatbot used in the implementation process provides informative pedagogical support to the users about a topic with defined boundaries in a complementary/supportive way to the extracurricular learning process. The user interface of the chatbot is given in Figure 2.

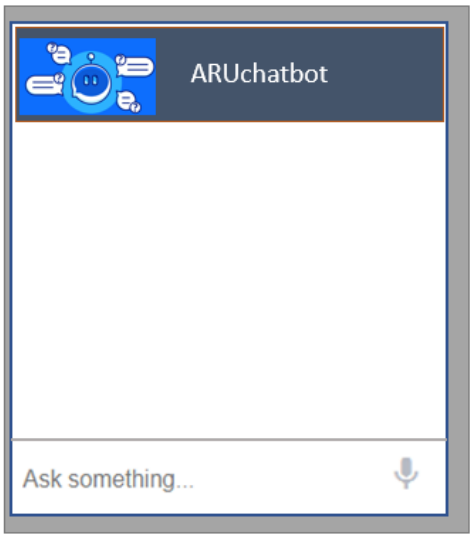

Figure 2. Chatbot User Interface

The chatbot designed using Dialogflow is an artificial intelligence-based chatbot with comprehension and response features that can be used over the Telegram messaging platform that allows both voice and text input. Documents belonging to the course unit determined by the educator are uploaded to this robot. The questions asked by the students about the course content are answered by utilizing these documents. Pre-determined answers are directed to the questions asked outside the course.

3. Findings

The findings of this study are presented in parallel with the research questions. The frequency of using categories in the findings is expressed as "*f*" and the research questions are expressed as RQ (Resarch Question).

RQ1-i. Findings Related to the Research Question

The findings related to the first sub-item of the first research question of the study are summarized in Table 1.

Table 1. RQ1-i positive views

	f	***Student***
Easy to access (via Telegram)	6	S3, S4, S5, S6, S7, S8
Easy to use	8	S1, S2, S3, S4, S5, S6, S7, S8
Interface design		
Design is sufficient	5	S2, S4, S5, S6, S7
Appropriate placement of elements	7	S1, S2, S3, S4, S5, S6, S7
Color matching	8	S1, S2, S3, S4, S5, S6, S7, S8
Readable	8	S1, S2, S3, S4, S5, S6, S7, S8
Answers		
The answers are comprehensive and detailed	5	S1, S2, S4, S6, S8
Clear and fast response	8	S1, S2, S3, S4, S5, S6, S7, S8
The answers are correct	8	S1, S2, S3, S4, S5, S6, S7, S8

According to the information given in Table 1, all of the students stated that they found the chatbot easy to use. Sample statements of the students regarding ease of use are as follows:

S1: - *... the chatbot was generally easy to use.*

S2: - *... I had no difficulty using the bot, it was simple and easy to use.*

S3: - *... the robot was very easy to use, it was like texting with someone.*

While most of the students thought that the chatbot was easy to access, two students did not mention ease of access. Sample statements of the students regarding ease of access are as follows:

S3: - *... I had easy access to the robot, I was already using the Telegram app, and we started chatting right away.*

S5: - *... it was very easy to access the bot, I clicked on the link and started messaging directly.*

Regarding the interface design of the chatbot, all students stated that the readability was good and the colors were compatible. While the majority of the students found the placement of the elements in the chatbot interface design appropriate, one student did not express an opinion about the placement of the elements. Five students said that the design was sufficient in general. All students stated that the chatbot gave accurate, clear and fast answers to the questions asked about the course content. Five students thought that the answers were comprehensive and detailed, while three students disagreed with this view. Sample statements of the students about the answers given by the chatbot to the questions asked are as follows:

S1: - *... helped me a lot to study for the exam. It was enough to write the title of the subject, I got quick answers.*

S3: - *... I checked the answers to the questions I had asked about the course and they were all correct.*

S7: - *... the answers were efficient and quick.*

RQ1-ii. Findings Related to the Research Question

The findings of the second sub-item of the first research question are summarized in Table 2.

Table 2. RQ1-ii negative opinions

	f	***Student***
Answers like definition are unnatural	1	S1
Does not understand spelling mistakes	2	S1, S2
Does not suggest extra sources for more information	3	S3, S5, S7
Does not give the source of the information (no citation)	3	S3, S5, S7
He does not answer extracurricular questions,	5	S1, S3, S5, S6, S7

When Table 2 is examined, it is understood that the majority of the students (*f=5*) had the opinion that the chatbot could not provide good answers in extracurricular subjects. Some students (S3, S5, S7) stated that they were not satisfied with the details of the answers and needed different sources to reach more information. They also stated that they wanted to know from which source or sources the information given by the chatbot was given. Another negative opinion about the use of the chatbot was that the robot could not understand the spelling mistakes in the text written by the students to the chatbot and could not respond. One student (S1) stated that the chatbot responded to the questions he asked about the course content as if it was making a definition with a very formal language. Sample expressions of students regarding negative opinions about the chatbot are as follows:

S1: - *... gives ready-made answers like a definition to the questions I ask about the course.*

S3: - *... sometimes he didn't understand me. He couldn't answer me when I made a spelling mistake.*

S5: - *... the quality of the answers is good, but I would like to know from which source the information comes.*

S7: - *... should also give a bibliography of their answers. They should also suggest different sources for those who want more information.*

RQ1-iii. Findings Related to the Research Question

The findings of the third sub-item of the first research question of the study are summarized in Table 3.

Table 3. RQ1-iii development proposals

	f	***Student***
Must be both web interface and mobile	1	S3
Whatsapp support (in addition to Telegram)	2	S1, S2
Must register with the name of K. Previous correspondence must be kept confidential	2	S1, S3
Should be informative	2	S3, S7
Can be customizable (Color, font, size, color, background, bot name)	3	S1, S3, S8
Provide information with its source	3	S3, S5, S7
Suggest extra resources for those who want extra information	3	S3, S5, S7
Must be chat-based	5	S1, S2, S4, S5, S6, S8
It only needs to work with mobile support	7	S1, S2, S4, S5, S6, S7, S8

According to the information in Table 3, students mostly suggested that the chatbot should work on mobile platforms. Two students even wanted the chatbot to be used in Whatsapp application in addition to the mobile Telegram application. Some students wanted to personalize the chatbot according to their preferences. Two students stated that their correspondence with the chatbot should be kept private for later access. While most of the students (*f=5*) stated that they wanted to chat with the chatbot not only about the course content but also about everything, two students stated that they wanted to use it only for information purposes and did not want to chat outside the course. Sample expressions of students' suggestions for the chatbot are as follows:

S1: - *... I want to name my chatbot and call it by the name I gave it...*

S4: - *... I don't just want to talk to the robot about the course content. I want it to answer every question I ask...*

S8: - *... the readability of the robot's writing is very good, but I would still like to create my own font...*

4. Conclusion

The role of chatbots in education is increasing and they are seen as potential learning tools for students. In this study, the experiences and opinions of students were examined in order to reveal the issues that should be considered in the design of chatbots used for educational purposes. The findings of this study show that chatbots are generally considered easy to use and the interface design is evaluated positively by students. Students stated that the answers were fast, clear and accurate. Students see chatbots as an effective tool for answering questions about course content. Positive features such as ease of use, quick answers, and clarity contribute to students' positive attitude towards this technology. Deveci Topal, Eren & Geçer [21], in their study of student opinions on chatbots, stated that students have a positive attitude towards chatbots, that students find chatbots fun and useful, and that they even want to use them in other courses. Kohnke [22] emphasized in his study that students enjoyed interacting with chatbots in and out of class and that chatbots contributed to students' learning. Chiu, Moorhouse, Chai, and Ismailov [23] stated in their study that learning with chatbots supports students' intrinsic motivation to learn, especially it meets the need for teacher-student interaction support well, but it meets the need for learning less. It was observed that chatbots lacked the ability

to respond to extracurricular issues and to indicate the sources of the answers. Students have negative opinions about the answers given by chatbots on extracurricular topics. Lack of naturalness of the answers, not being able to understand spelling mistakes and not specifying the sources of the answers are the main reasons for these negative opinions. Students think that chatbots should strengthen their knowledge base with more sources and citations. Also, some of the students wanted chatbots to be usable outside the course content. This shows that students see this technology as a more general communication tool and should not be limited to education. However, other students prefer a more specific and course-oriented use. In their study, Lee and Yeo [24] stated that chatbots with personalized feedback are more effective than closed-circuit simulations. They also stated that the use of emotional responses such as emojis in the answers given by chatbots makes chatbots more humanoid and they are perceived more realistic.

This study provides valuable insights into the design and use of chatbots for educational purposes. In the future, developers of such technologies could take student opinions into account to design chatbots with more natural language processing capabilities and resource citation. They should also consider developing these robots in ways that meet the needs for more general or course-oriented uses. In conclusion, this study provides valuable insights for researchers and developers interested in the design and use of chatbots in education. Student opinions can guide the development and improvement of future educational technologies.

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