

Integration of Chatbots into the Education System: Utilizing Them for Knowledge Management



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Abstract The last few years have seen a rapid increase in the use of chatbots in various fields, including marketing, culture, entertainment, healthcare, education and more. Implement an automated chat communication allows users to implement virtual communication. The convenience and versatility of this program allows you to automate a number of learning processes and quickly interact with users. The article presents the results of a study on the possibilities of using chatbots in education. Awareness of teachers of higher education institutions with chatbot technology was stated. There is a positive indicator of the use of chatbots by teachers ever. The functions that a chatbot can perform in the educational process of educational institutions are described. The chatbot is classified according to the parameters in terms of application in various fields and technical characteristics. The use of chatbots for various educational purposes provides, above all, constant access of students to important information. In addition, answering simple questions from students, the chatbot acts as their consultant. The variety of functions performed by the chatbot in the educational process makes it possible to provide communication between teacher and student, and receive useful information. This confirms that chatbot technology can be integrated into the educational process of higher education institutions. It has been identified that the integration of chatbots into the education system is used to support knowledge management, facilitate learning, and enhance the effectiveness

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of the educational process. This innovative approach ensures accessibility, personalization, and improvement of the educational experience for all participants in the education system.

Keywords Technology · Chatbot · Artificial intelligence · Knowledge management · Education

1 Introduction

Progressive development of technology has increased the number of organizations that are moving to the use of online services. Today, the trend toward the use of digital technologies in all industries is spreading around the world. One such technology that is increasingly being used for knowledge management is the chatbot.

Chatbot, a modern communication tool, is used in many areas of human life activities to establish contact with users.

According to forecasts, the chatbot market is expected to grow from 2.6 billion US dollars in 2019 to 9.4 billion US dollars by 2024. Growing customer demand for self-service encourages organizations to use chatbots. This is due to the fact that with the help of chatbots, round-the-clock customer support is available, which allows reducing operational resources and being competitive in the market [1]. The availability of a chatbot is that one does not need any additional software to use it. The interface of a chatbot is intuitive.

An automated chatbot program can implement virtual communication with users through messages, both for sending information and for its collection. It can communicate with users at any time and is not limited by its physical location.

A chatbot can work both only according to clearly written instructions, i.e., answer only those requests that are added to the system, and with the help of artificial intelligence and recognize commands in any language.

Modern education should focus on the prospects of the development of society [2, 3]. As a self-organized system, education adapts to constant changes based on the priority of simple assimilation and reproduction of information [4, 5]. At educational organizations, chatbots are known as intelligent systems that are used to enhance and personalize learning [6]. Recently, researchers have been studying various aspects of the introduction of chatbots in the process of interaction, namely, their use for learning to ensure instant accessibility and interaction with users [7]; the use as a communication tool for online and offline learning [8].

Chatbots combine two important components:

1. multitasking—allows to automate a number of processes (conducting consultations, tests and exams, verification of test results, conducting surveys of students, etc.);
2. convenience—interaction with the user due to a comfortable communication format that simulates a conversation with an interlocutor.

These characteristics of chatbot applications make them an indispensable tool in the educational process and take the quality of education to a new level.

The importance of artificial intelligence in education is growing; various studies are being conducted in this area. However, chatbot technology has not yet been widely used [9].

2 Reserch Methodology

In order to study the opinion of teachers of higher education institutions on the feasibility of using chatbots in the educational process, a survey was conducted using an author's questionnaire "Using Chatbots in the Educational Process."

In particular, the respondents answered the following questions:

1. Do you know what a chatbot is?
2. What do you mean by "chatbot"?
3. Have you ever used a chatbot?
4. Can chatbots be useful in the educational process?
5. What functions can a chatbot perform in the educational process?

The sample of the respondents. The survey involved 139 teachers from 12 institutions of higher education in Ukraine. By type of higher education institutions: 53.9% of teachers were from humanitarian institutions and 46.1%—from technical institutions. As for gender, 19.9% of the respondents were men and 80.1% were women. By age, the sample included 9.7% of persons under 30 years of age; 25.0% of the respondents were aged 31–40; 33.0%—41–50 years; 22.4% of those people were aged 51–60, and 10.9% were over 60 years old.

3 Results

When asked how much they were aware of what a chatbot is, the vast majority of the respondents gave positive answers (Fig. 1).

The data in Fig. 1 show that the majority of teachers in higher education (93.3%) are familiar with the concept of chatbot, and only 6.7% of the respondents do not know or have not heard what a chatbot is.

As for the question about the teachers' use of chatbots, it was found that 76.7% of the respondents have used chatbots in their lives, and more than a fifth of respondents (23.3%) have never used chatbots (Fig. 2). The teachers used chatbot programs for various purposes: search, technical, entertainment, educational ones, etc.

The next question was to assess the usefulness of using chatbots in the educational process. It was found that the vast majority of the respondents (90.0%) had positive views on that, 3.3% of the respondents believed that this technology was not

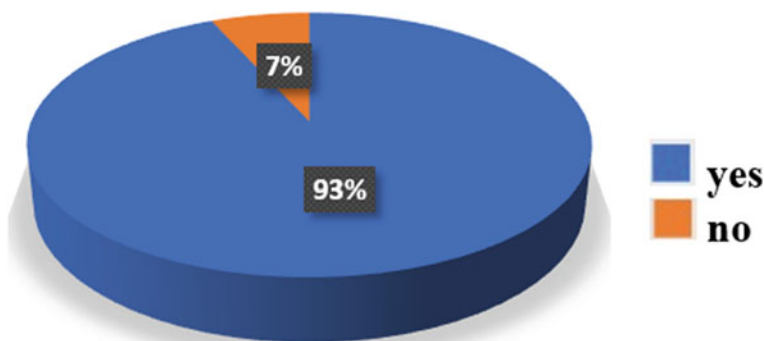


Fig. 1 The respondents' assessment of the awareness of the concept of chatbot (in % of the total number of the respondents)

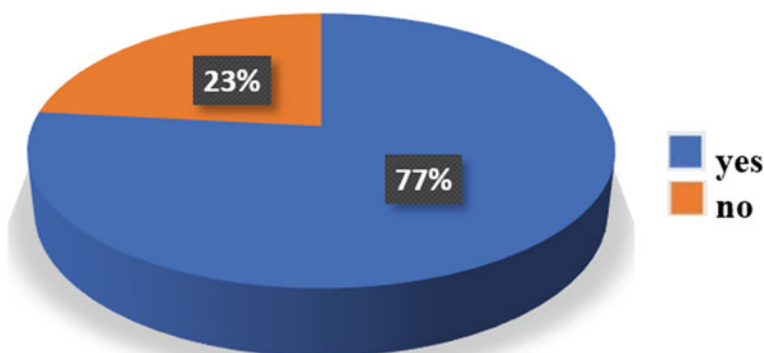


Fig. 2 The respondents' assessment of the use of chatbots (in % of the total number of the respondents)

appropriate for use in the educational process, and 6.7% noted a partial need to use this tool (Fig. 3).

The question of the questionnaire on the performance of chatbot functions in the educational process was open and provided for opinions of the respondents in case its use was considered appropriate. The respondents mentioned the following functions of chatbots in the educational process: “administrative support of teachers”—63.3%, “involvement of students into work”—33.3%, “teaching”—16.7%, “feedback”—80.0%, “application of knowledge”—13.3%, “development of critical thinking”—16.7%, “universal teacher”—26.7%. As we can see, the functions focused on active interaction and communication between participants in the educational process were assessed highest (Fig. 4).

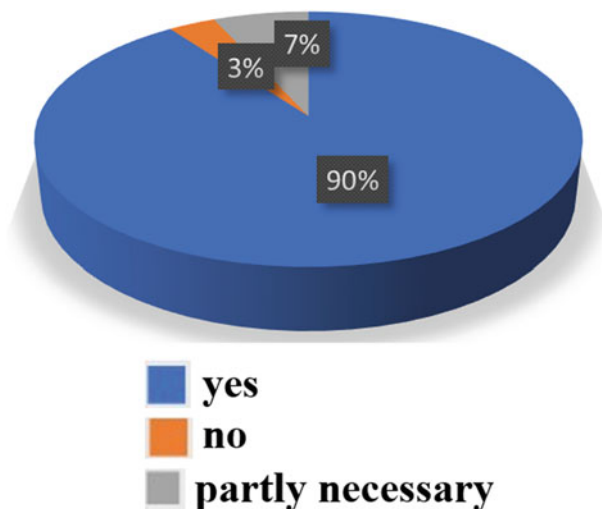


Fig. 3 The respondents' assessment of the usefulness of using chatbots in the educational process (in % of the total number of the respondents)

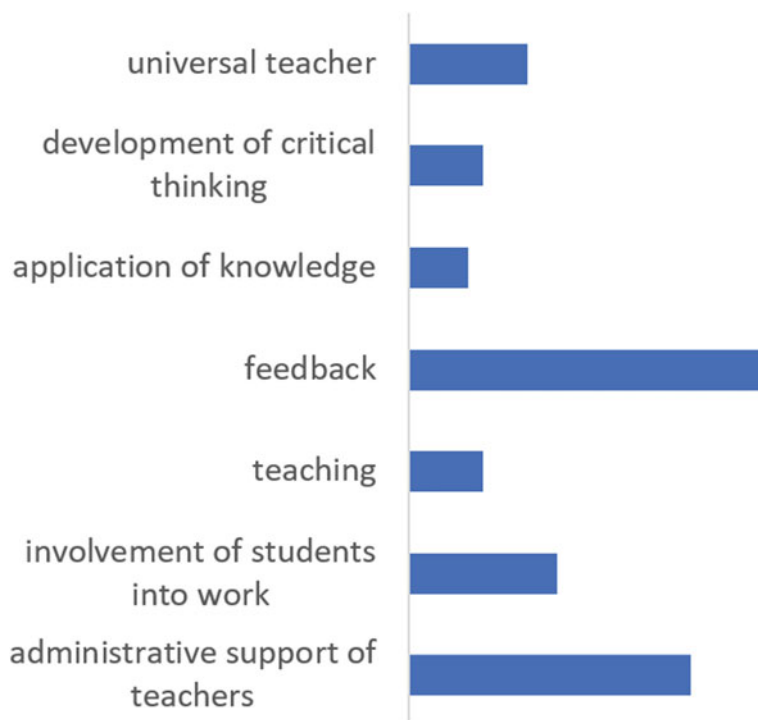


Fig. 4 The survey results as for the functions of chatbots in the educational process (in % of the total number of respondents)

4 Discussion

Chatbots can be classified according to various parameters.

Figure 5 presents a classification of chatbots in terms of their use in various fields.

Let us consider the functions that can be perform by chatbots in different areas [10].

In the field of sales, chatbots help customers choose the right products and answer questions about discounts or making the right purchases.

Chatbots as assistants allows integration with analytics systems, helps in compiling reports, data analysis, compiling forms.

With the help of chatbots in the service area, one can arrange delivery of products, book tickets, hotel rooms and more.

In the media space, chatbot allow users to receive the latest news or to choose interesting sections to read.

As personal virtual assistants, chatbots remind about meetings, find recipes for favorite dishes, prompt weather forecast.

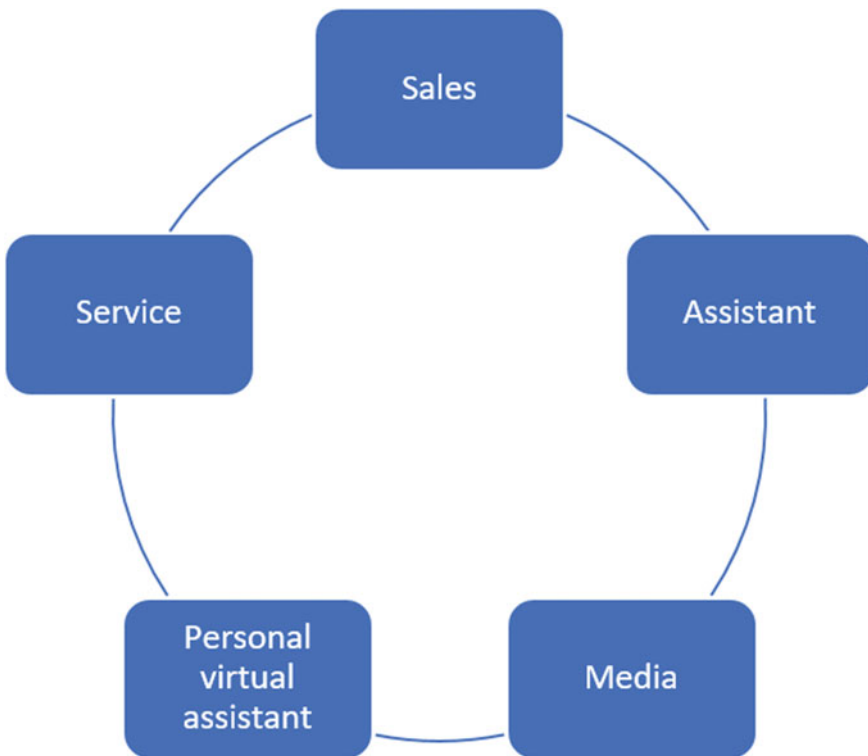


Fig. 5 Areas of application of chatbots

Research has confirmed that the use of chatbots in various fields to answer questions from users with 24/7 availability increases productivity at organizations and reduces the cost of customer support [11]. Individual nature and diversity of responses improve the interaction and increase the sense of connection between consumers and agents who communicate [12].

In addition, chatbot technology has a number of advantages for organizations: one-time investment which reduces staff costs and the cost of attracting users; the ability to actively communicate with users initiating conversations; data monitoring and analysis helps improve services; the process of attracting customers becomes interactive and round the clock.

In addition, chatbots can be classified according to the technical parameters of creation. According to a technical classification, chatbots are divided into simple (using machine learning) and smart (with the support of artificial intelligence) ones (Table 1).

An algorithm of programmed actions based on a specific set of rules or machine learning provides maximum control and flexibility in the use of a chatbot, as you can decide in advance, for example, what the correct answer to a question is and develop automated tests to check the system quality. However, when using this type of bots, a lot depends on the data entered by the user. If it is not present in the rules, this can lead to incorrect results or to a crash of the chatbot. A simple chatbot usually does not draw any conclusions from previous interactions and is best suited to straightforward dialogues.

A smart chatbot based on artificial intelligence does not have any pre-defined rules, i.e., it does not have a clear path of communication with the user. This type of chatbot is usually more complex and at the same time more user-oriented than a bot programmed to follow some pre-specified rules. After some time, working with user-entered data, such a chatbot becomes more aware of the context and uses predictive intelligence to personalize user interaction. Natural language processing technology is used for conducting free conversations. This allows the chatbot to analyze and understand human language. This increases its functionality, as it is able to identify hundreds of different questions.

A chatbot uses an algorithm to understand unstructured information to interact with the user and provide response results [13].

A chatbot is able to interact with users to provide answers to questions asked [14]. A chatbot is a computer program that simulates and processes human communication,

Table 1 Technical classification of chatbots

Type	Abilities
Simple (using machine learning)	Answers questions based on a predetermined choice of integrated answers
Smart (with the support of artificial intelligence)	Simulates human interaction with users

allowing people to interact through digital devices as if they were talking to a real person [15]. It is a mechanism of dialogue that encourages joint learning [16].

The cycle of the work of a chatbot is as follows:

1. Receiving a request.
2. Recognition of request input data. The chatbot analyzes the input text (audio) and translates the data into machine-readable code.
3. Data analysis. An algorithm is used to process data to find instructions.
4. Decision making. After analyzing the data, the chatbot must respond to the user. The answer is generated in natural language.
5. Sending a response to the user.

A chatbot is a system that automatically responds to human requests [17] and does not require additional technical knowledge or programming skills.

Some chatbots have limitations in their work. They will not be able to respond to a request if they are unable to analyze the message or if there is no pre-programmed answer. Generative bots can create their own answers and do not always respond with one of the proposed options. This makes them intelligent, as such bots examine each word in the query and generate a response [18].

Chatbot technology has also been widely integrated into the educational space. Research shows that chatbots are increasingly being utilized for knowledge management and the preparation of professionals in various fields of knowledge [19, 20].

Teachers see the value of using chatbots at educational institutions to personalize online learning and make learning materials available to students anywhere, anytime. Chatbot technology is a convenient tool to support student learning in the distance format [21].

According to Wartman and Combs [22], education is developing synchronously and requires the use of artificial intelligence in teaching and learning.

According to research by Lin and Chang [23], chatbot is a technological innovation that can improve students' interest in learning and help them acquire cognitive skills.

Chatbots are implemented at universities specifically to improve the existing services or introduce new ones, which is an example of solutions based on artificial intelligence [24].

One of the key areas in education that can be influenced by chatbots is the performance of various administrative tasks in the educational process, such as assessing student tasks, providing feedback to students to ensure continuous improvement of learning [25]. Using chatbots for administrative matters gives students easy access to important information such as admission to education, scholarships and tuition fees [26], information on class schedules [27], and information on the university location [28].

Boston University has developed a chatbot that helps entrants from around the world to enter the institution. This chatbot answers simple questions of entrants about the academic rules of admission, the location of the hostel. The chatbot helps students of the institution understand the university life, register for selected courses, etc.

Chatbots can be used to create automated and intelligent learning systems that allow teachers to analyze and evaluate students' abilities. Such chatbots help teachers

assess students' understanding of subjects by recording their answers. The chatbots can also provide students with study materials, tests and quizzes. After completing the tests, the chatbots collect the results and sends them to the teachers, allowing them to track the students' progress and accelerate their activities [29, 30].

Another aspect of education where chatbot technology can be used is student counseling. Chatbots can be used to provide advice to students on academic issues, helping them to make important decisions about choosing various academic programs [31].

Research is part of the graduate curriculum, and chatbot technology can be used to provide the necessary guidance for a successful research outcome. Thus, chatbot provide students with assistance in research, answering questions related to it [32].

Thus, the functions of chatbots, which are used in the educational process, can be quite broad: activation of students through possible feedback; support and unloading of teachers during control classes [33]; acquainting students with structured materials of a particular discipline; automated intermediate control and final assessment of students [34, 35]; the possibility of constructing individual educational trajectories of students on the basis of, on the one hand, the analysis of the available amount of knowledge, and on the other hand—the analysis of students' behavior during testing; group and individual consultations, information support, etc.

5 Conclusions

Depending on the purpose of use, chatbots have a certain classification.

Based on an empirical study, the possibility of integrating chatbots into the educational process of higher education institutions has been established. This will help to establish communication between the teacher and students and can be a convenient way to obtain information from students. This tool is useful for both teachers and students.

Therefore, we believe that the integration of chatbots into the education system opens up broad possibilities for knowledge management and enhancing the efficiency of the educational process. The results of the conducted research have identified the following features of such integration: interactivity, 24/7 access to information, automated support, improvement of educational process efficiency, personalization, support for self-learning, monitoring of educational progress, data collection and analysis, and reducing the workload on teachers.

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