

An Evaluation on the Use of Artificial Intelligence in Education Specific to ChatGPT¹

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Abstract

The use of artificial intelligence in education is accepted as one of the important discussion topics of the recent period. Artificial intelligence, which can be used actively in all areas of social life, can also be actively used in education. At this point, the relationship between artificial intelligence and education should be evaluated in the context of current and historical debates. Artificial intelligence technologies can offer many advantages in educational activities and also increase the quality of education. From this point of view, the aim of this study is to reveal the use of artificial intelligence in education in particular ChatGPT. Although ChatGPT is an up-to-date technology, there are significant discussions about its advantages in education. ChatGPT is a language-based artificial intelligence robot, it has started to be used in many fields, especially in education. In the study conducted on this axis, the use of artificial intelligence in education was evaluated in particular ChatGPT by using the literature review method. ChatGPT has created important opportunities in education with its advantages. As a matter of fact, this situation is also observed in the literature. ChatGPT modernizes education by offering different forms of convenience and advantages in different areas of education.

Keywords: Artificial Intelligence, Education, Teaching, ChatGPT, Technology

Introduction

Technological developments are effective in all areas of social life. Many areas, especially education, can benefit from the opportunities offered by technological developments. At this point, it is possible to state that there is a close relationship between technological developments and education. This close relationship has also manifested itself in the COVID-19 outbreak, which has recently shown its effect worldwide. Thanks to technological opportunities, education has been tried to be continued in online environments. In fact, this situation has paved the way for some changes and transformations in the course of the relationship between education and technology. It is necessary to evaluate artificial intelligence discussions within this framework. Artificial intelligence discussions have been handled and evaluated on the axis of education since the first day they started. Therefore, it should be noted that the issue of the usability of artificial intelligence technologies in education is extremely important. Artificial intelligence is the realization of human actions through robots or various machines. By using artificial intelligence technologies, many jobs can be performed in the social field. In education, many jobs and actions are performed using artificial intelligence.

¹ This study was presented as an oral presentation at the “III. International Artificial Intelligence and Data Science Congress” on July 28, 2023.

Therefore, the use of artificial intelligence in education has opened many new areas in educational activities.

In the related literature, [Gebhard and Oprandy \(1999\)](#) come to the fore as primary researchers who studied the significance of attending professional conferences. They asserted that people might develop a sense of membership by attending professional conferences. In the same vein, [Borg \(2015\)](#) states Although the use of artificial intelligence in education is not a new issue, artificial intelligence technologies are frequently used in the field of education today. Artificial intelligence technologies, which offer many advantages for both the educator and the student, are diversifying and becoming widespread. In this axis, it should be emphasized that ChatGPT can also be used in education. The aim of this study is to explain and elaborate on the use of artificial intelligence in education specifically ChatGPT. Literature review method was used as a method in the study and the literature on ChatGPT was examined and evaluations were made regarding the usability of ChatGPT in education. Firstly, artificial intelligence is emphasized in the study. Evaluations were made on what artificial intelligence is, its history, and its functionality. Afterwards, the issue of artificial intelligence in education was discussed and the use of artificial intelligence in education was emphasized. In this section, the historical process is also evaluated, and the possibilities/advantages offered by artificial intelligence in educational activities are emphasized. In the next stage, information about ChatGPT technology was given. At this stage, the development stages and usage areas of ChatGPT were emphasized and information was given specifically about ChatGPT. In the last stage, the use of ChatGPT in education is emphasized. Here, an original idea was tried to be developed by compiling the studies in the current literature. ChatGPT is seen as the initiator of a series of changes and transformations in education thanks to its potential.

As can be seen in this study, ChatGPT can be used functionally in many areas of education through its language-based robot. ChatGPT, which has many advantages for both instructors and students, has important potential to increase the quality of

education. ChatGPT can be actively used in many areas such as creating course syllabuses, preparing personalized course content, preparing exam questions, and career development procedures. In addition, ChatGPT can offer different advantages in different areas of education. At this point, it is necessary to state that ChatGPT can provide different contributions in different branches.

Artificial Intelligence

Several important changes and transformations have been effective in shaping the history of civilization. Important leaps such as the invention of fire, the invention of writing, and the transition to settled life are extremely important in understanding the history of civilization and the current point we have reached ([Watson, 2019](#)). However, revealing the course of technological developments in the history of civilization draws attention to the point of marking the boundaries of today's developments. Technological developments also take place in the background of the conceptualizations of agricultural society, industrial society, and information society. In this context, it is necessary to evaluate artificial intelligence technologies, which are considered one of the important discussion areas of the modern period. Artificial intelligence, in its most general form, defines the systems that are deemed necessary for the realization of actions as a result of human characteristics with the help of computer-based tools ([Zhang & Lu, 2021](#)). At this point, a relationship is established between humans and technology. The transfer of human characteristics to computer-based devices and the creation of human actions as a result of these devices are among the main motivations of artificial intelligence applications. Therefore, it should be underlined that computer-based technological developments are at the basis of artificial intelligence discussions. At this point, it is necessary to mention Alan Mathison Turing, who is considered the father of artificial intelligence technologies.

Turing, an English mathematician and computer scientist, also sparked the debate on artificial intelligence by raising the question of whether machines can think ([Pirim, 2006](#)). However, the place of interest in artificial intelligence in the

historical process should not be limited to Turing. In the Middle Ages, artificial human beings were mentioned, it was emphasized that automata could exist, and ultimately a conceptual field was created for artificial intelligence by focusing on abstract computers and the word robot (Nilsson, 2018). It can be stated that Turing's question gains importance at the point where the historical interest in artificial intelligence materializes. Turing's question "Can machines think?" is essentially directed at whether machines or robots can think and act instead of humans, which explains the essence of the issue of artificial intelligence. As a matter of fact, several pioneering studies have been carried out to give machines or robots human characteristics and to push them to be able to perform human actions. In the 1950s, researchers such as Allen Newell and John McCarthy tried to give intelligence to robots by designing various programs (Öztemel, 2020, p. 101). These experiments can be considered the predecessors of artificial intelligence applications. At this point, it should be kept in mind that the basic debates on the approach between humans and robots are on the rise in the field of artificial intelligence.

It should be emphasized that the main important point in the artificial intelligence discussions, which are carried out in the context of transferring human actions to robots or various machines through various programs and software, is learning. At this point, it can be stated that the human brain is modeled. Based on the cells in the human brain, artificial neural networks were created, and the act of learning was simulated (Yılmaz & Kaya, 2021). Therefore, artificial intelligence has emerged as a result of the imitation of the human mind with the help of computer-based technologies. While artificial intelligence is designed to operate as a kind of modeling of the human brain, it also incorporates some basic features. Fast and permanent learning can be shown among these features (Öztürk & Şahin, 2018). These features are shown among the most basic distinguishing features of artificial intelligence. The development of artificial intelligence technologies continues day by day. As of the point reached it should be stated that some important thresholds have been exceeded in artificial intelligence technologies. Artificial intelligence applications can fulfill features

such as identification, classification, discrimination, problem-solving, calculation, and decision-making, which are among the basic features of the human brain (Coşkun & Gülleroğlu, 2021, p. 952). In this context, the issue of machine learning should also be emphasized. While trying to keep the human brain alive in robots with artificial intelligence, a form of learning is also developed. Therefore, artificial intelligence technologies should not be considered separately from the issue of machine learning. When it comes to artificial intelligence, a number of sub-branches such as machine learning come to the fore. Natural language processing, speech synthesis, artificial neural networks, and expert systems are considered subfields of artificial intelligence technologies (Kirpınar, 2019).

The sub-branches on which artificial intelligence technologies are based are important for the development of artificial intelligence technologies on a holistic plane. The development and dissemination of language and thought systems specific to artificial intelligence technologies is important in understanding and making sense of the development momentum of artificial intelligence technologies. Today, the point reached by artificial intelligence technologies is extremely remarkable. It should be noted that especially transhumanism discussions are united at this point. Therefore, artificial intelligence has not only simulated the human brain today but has also become a means of "overcoming" the human brain. From this point of view, it should be stated that it is possible to characterize studies on artificial intelligence as systems aimed at high-level cognitive skills (Kutlusoy, 2019). The design of artificial intelligence technologies has brought along different sectoral application areas. At this stage, it is necessary to underline that artificial intelligence technologies are used in extremely different fields. Education is one of these fields and the issue of education occupies an important place in artificial intelligence discussions. From this point of view, it is important to look closely at the relationship between education and artificial intelligence to understand and make sense of artificial intelligence.

Use of Artificial Intelligence in Education

It can be stated that artificial intelligence

technologies are used in many different fields. Artificial intelligence technologies are widely used in many fields such as health, energy, finance, logistics, education, etc. ([Osaba & Welser, 2017](#)). However, it should be underlined that artificial intelligence technologies are not used equally widely and effectively in every field. While artificial intelligence technologies have a more widespread impact in some areas, it is observed that this impact is limited in some areas. Education can be shown among the areas where artificial intelligence technologies are used in a limited way ([İşler & Kılıç, 2021](#), p. 4). However, despite everything, it should be underlined that there is an increase in the use of artificial intelligence technologies in the field of education. The use of artificial intelligence in the field of education aims to make education inclusive, egalitarian, and of high quality, while at the same time aiming to bring education to a lifelong uninterrupted basis ([Pedro et al., 2019](#)).

The first use of artificial intelligence in education was by Sidney L. Pressey. Pressey demonstrated the pioneering approach to the use of artificial intelligence in education by talking about machines that give students instant feedback on test results and guide them on the correct answer ([Pressey, 1950](#); [Holmes et al., 2019](#)). Pressey mentions a mutual benefit by emphasizing that by using artificial intelligence in education, teachers will also be relieved of their workload. It should be noted that another pioneering name regarding the use of artificial intelligence in education is the psychologist Burrhus Frederic Skinner. Skinner designed “teaching machines” for programmed teaching in 1958. In Skinner’s design, there is a wooden box with two eyes. In one of the eyes, students could see the questions while in the other one they could write the answers. When the student writes the answer on a piece of paper on a rotating platform and turns it, he/she can see the answer to the question. If the student’s answer was correct, the student could move on to the next question ([Arslan, 2020](#), p. 81). The teaching machine developed by Skinner was not only one of the predecessors of the use of artificial intelligence in education but also an important threshold for the contexts in which artificial intelligence can be used in educational technologies. As can be seen in the previous approaches to the

use of artificial intelligence in education, it can be said that the intended contribution of artificial intelligence to education is based on timeliness and efficiency. It should also be noted that the use of artificial intelligence can be used in every field with this objective.

The breakthroughs initiated by Pressey and Skinner regarding the use of artificial intelligence in education have been fed by a series of approaches in the historical process. It should be underlined that the use of artificial intelligence in education has two dimensions. At this point, it can be stated that the teacher and student relationship plays a fundamental role. The use of artificial intelligence in education offers advantages to both teachers and students ([Arslan, 2020](#)). On the axis of advantages and goals, the use of artificial intelligence in education has the potential to provide students with effective learning experiences, enable students to discover their talents, develop their creativity, and reduce the workload of teachers ([Gocen & Aydemir, 2020](#), p. 14). While the use of artificial intelligence in education enables the automation of basic educational activities, it can also be effective in identifying students’ strengths and weaknesses. Another opportunity offered by artificial intelligence in education is the career guidance it offers to students. Thanks to artificial intelligence, students can be followed throughout their education life and can be evaluated in line with their abilities during this follow-up process ([Savaş, 2021](#), p. 19). Therefore, the use of artificial intelligence can lead to the outputs of educational activities in a positive direction.

It can be stated that the use of artificial intelligence in education is in different ways and forms. It should be noted that artificial intelligence in education is primarily used on the basis of automation. Artificial intelligence can increase teacher-student interaction by automating simple tasks such as timing while classifying digital assets. At this point, the automation provided by artificial intelligence draws attention to the framework of effective use of time in education. It can be stated that another basic point in the use of artificial intelligence in education is habituation. Since technology has become an integral part of everyday life today, this situation provides an important integration for artificial intelligence.

Another area where artificial intelligence is based in education is identification. Thanks to artificial intelligence, student needs and curriculum priorities can be determined and changes can be made on this axis in education. Finally, it is necessary to talk about identification. With artificial intelligence, data analysis, and adaptive artificial intelligence solutions in education, areas of importance for students can be identified and understood (Joshi et al., 2021, p. 2). As can be seen, the use of artificial intelligence in education can be used in different planes. It should be underlined that the main purpose of these planes is to bring educational activities to an effective stage. Plagiarism prevention programs should also be mentioned at the point of using artificial intelligence in education. Applications such as Turnitin and iThenticate can detect plagiarism in student work thanks to their artificial intelligence technology. This situation has many positive outcomes. First of all, plagiarism can be prevented and productivity in the studies can increase. In addition, students can avoid plagiarism with the attitude provided by the audit. Another advantage provided by applications such as Turnitin and iThenticate is the opportunity for educators to use time effectively. Plagiarism prevention programs, such as Turnitin and iThenticate, use artificial intelligence to quickly detect plagiarized content. This saves educators time and eliminates the need for them to manually search for potentially plagiarized elements efforts. This, in the end, can lead to an increase in the quality of the content produced by students. It should be noted that the advantages related to the use of artificial intelligence in education cannot be limited to those mentioned above.

It is necessary to underline the importance of distance education at the point of gaining importance and widespread use of artificial intelligence in education. Therefore, it is necessary to evaluate the advantages offered by the use of artificial intelligence in education within the framework of distance education. Looking closely at these advantages, it is necessary to state that it provides important opportunities for the evolution of educational activities to an efficient point in online environments. Artificial intelligence technologies that provide automatic responses to students, publish weekly or

monthly announcements, and respond to routine and frequently asked questions also positively affect the interaction between the instructor and the instructor (Goel & Polepeddi, 2016). In addition, by using artificial intelligence in distance and online education, learning content adapted to the individual needs of students can be designed, and online exams can be designed to support these contents. This increases the motivation and participation of students (Ross, et al., 2018). As can be seen, by using artificial intelligence, educational activities can be made efficient in every field. Recently, the increasing interest in distance education has also increased the interest in artificial intelligence technologies. Therefore, it should be emphasized that the use of artificial intelligence in education should not be evaluated only within the framework of traditional education models. Therefore, it should be emphasized that the use of artificial intelligence in education should not be evaluated only within the framework of traditional education models. The use of artificial intelligence in education is also functional for different forms of education. During the pandemic period, artificial intelligence technologies have made extremely important contributions while conducting education and training activities in educational institutions both around the world and in Turkey.

As a result, it can be stated that the use of artificial intelligence in education takes place in many different contexts. Artificial intelligence technologies are encountered in both traditional methods and current methods of education. While current technological developments expand these areas of use, they also create new areas of discussion. At this stage, the issue of the use of the artificial intelligence robot named ChatGPT in education and training activities draws attention. In order to understand and make sense of the usability of ChatGPT in education, it is first necessary to take a close look at ChatGPT

ChatGPT

ChatGPT was developed by OpenAI, an artificial intelligence company founded in 2015 in the United States. The general purpose of the OpenAI company is to conduct artificial intelligence research that can benefit humanity. Sam Altman, Elon Musk, Greg Brockman, Reid Hoffman, Jessica Livingston and

Peter Thiel, who are among its founders, announced the establishment of OpenAI in 2015 ([Mhlanga, 2023](#)). The company announced that they would present their patents and research publicly and collaborate with other institutions and organizations during this non-profit period. However, it is seen that this perspective was replaced by the search for “limited” profit in 2019. The company stated that it could make a profit up to 100 times the investment made in 2019.

ChatGPT is an artificial intelligence developed by OpenAI and specialized in dialogue. The first appearance of ChatGPT, a language-based artificial intelligence robot, was in November 2022. In version 2022, GPT-3 (Generative Pre-trained Transformer) was used. In its most basic form, GPT is a language model that can produce content similar to the texts written by humans. In the ChatGPT model, which emerged on 14 March 2023, GPT-4 was used. ChatGPT, also described as a chatbot, is a language model structured with both supervised and reinforced learning styles. At this point, it should be noted that ChatGPT is basically a language and communication-based artificial intelligence. ChatGPT can perform many actions such as answering questions, generating thank you letters, and guiding individuals in challenging discussions about productivity issues ([Liu et al., 2021](#)). While performing these actions, ChatGPT makes use of extensive databases. In addition, ChatGPT fulfills these actions by generating responses in accordance with natural human language. ChatGPT has a number of features in terms of language. Firstly, ChatGPT creates a human-like language while processing natural language ([Lund & Wang, 2023](#)). As a matter of fact, ChatGPT performs many human interactional acts on the basis of language in a remarkable way thanks to its technology.

As a result of its possibilities, ChatGPT can program computers, write compositions, write poems, and compose music. Even scientific texts can be produced with the help of ChatGPT. Therefore, ChatGPT can be used effectively in almost all areas of language. In this context, it should be underlined that ChatGPT can also be used in education and training activities. Although it has emerged in a relatively new period, it has been revealed that ChatGPT can offer a

number of advantages in educational activities. From this point of view, in order to understand ChatGPT more closely, it is important to look closely at its uses in educational activities.

ChatGPT Use in Education

The use of current technologies in education and training activities is considered extremely important. Technological developments are effective in every field of society as well as in education. The use of ChatGPT in education should also be evaluated in this axis. Although ChatGPT is a current development, there are important discussions about its use in education. In the background of the intense discussions about ChatGPT, there is the intense interest that ChatGPT has aroused worldwide. Launched in November 2022 for the first time, ChatGPT reached 100 million users within two months ([Milmo, 2023](#)). Such an intense interest has also brought along extensive discussions. Therefore, it should be noted that ChatGPT, a language-based artificial intelligence robot, can be used effectively in many areas, especially in various fields of education. First of all, it should be emphasized that activities such as searching for information, finding answers to specific questions, writing reports and essays, creating software code, providing examples for databases and analyses, and performing mathematical calculations and statistical analyses can be performed using ChatGPT ([Halaweh, 2023](#)). At the same time, ChatGPT can be a resource that can improve text writing due to its linguistic basis and can also make the content understandable by detecting grammatical and grammatical errors ([Atlas, 2023](#)). This situation reveals that ChatGPT can be functional in the production of educational content and academic studies.

While ChatGPT is effective in the production of textual content, it can also open up new areas for students and researchers on the subjects to be researched. While providing students with information and resources on specific topics, it also shows the unexplored aspects of the research topic and many other topics. This situation expands their discussion areas by introducing students to different topics ([Kasneci et al., 2023](#)). Therefore, the use of ChatGPT in education can also be effective on

students' research skills. ChatGPT can work as a kind of student counsellor and mobilise students on certain topics. It should be noted that ChatGPT offers advantages to teachers as well as students. ChatGPT enables teachers to create open-ended questions and design exams in line with the course content and objectives. Thus, ChatGPT is considered to be functional in terms of saving time in exam and question preparation processes, which are considered as a time-consuming process for teachers (Baidoo-Anu & Ansah, 2023; Sok & Heng, 2023). From this point of view, it should be noted that the effects of using ChatGPT in education correspond to a dual scheme. ChatGPT contributes to education by offering significant advantages in different areas for students and teachers, who are considered the main subjects of educational activities.

The use of ChatGPT in education can also pave the way for teachers to use the time created by the opportunities provided by teachers more efficiently. Thus, ChatGPT, which reduces the workload in some areas of the education process such as preparing exams and questions, can also facilitate the use of this time in different areas (Sok & Heng, 2023). From this point of view, it can be argued that ChatGPT, a language-based artificial intelligence robot, has introduced many innovations in the field of education. Another of these innovations is the potential counseling it provides to students. Unlike traditional tutoring methods, ChatGPT provides students with feedback and individualized answers to help them with their homework, projects, and even maths exercises (Mhlanga, 2023). In fact, this situation is important in terms of increasing the success of students in the educational process. Considering the basic goals of technological developments in social life, it should be noted at this point that the relationship between ChatGPT and education can be placed on a very meaningful ground. The use of ChatGPT in education is ultimately to increase the quality of education, to increase the academic achievement of students, and to provide professional satisfaction by opening new areas for teachers/instructors.

It should be noted that while the use of artificial intelligence in education in ChatGPT offers a number of important advantages, it also harbors some negativities that are also emphasised in the literature.

Bracketing the negativities and continuing on the advantages, the use of ChatGPT in education is considered by many experts to be a vital component of education in the near future (McMurtrie, 2022). While ChatGPT has the potential to create new teaching approaches in education, it can also increase student participation and teamwork. Therefore, it should be underlined that ChatGPT opens an important area for modernizing the education system. It can be stated that all these potentials and advantages offered by ChatGPT can be considered a harbinger of a new paradigm transformation in education (Mhlanga, 2023). The use of ChatGPT in education can be considered an innovative approach to pave the way for radical changes and transformations in all areas of the education process. At the last point, ChatGPT, as an artificial intelligence engine, has the potential to be functional at every point of educational activities. Its language-based nature and powerful possibilities make ChatGPT an important tool for education. However, at this point, education should not be evaluated in a singular way. As a matter of fact, training activities are carried out in a branch-specific manner. Therefore, it is seen as an important problem in which educational fields ChatGPT will be more successful and in which ones it will be more disadvantageous.

It can be stated that the use of ChatGPT in education has a special value in different ways for each branch. In the study published by Qadir (2023), the relationship between ChatGPT and engineering education makes this clear. In his study, Qadir emphasizes the rapidly changing and transforming aspect of engineering education and the engineering industry and states that engineering education should keep up with this pace. At this point, he states that ChatGPT can provide students with the advantage of catching up with the age in engineering education and underlines that ChatGPT can provide students with hands-on learning opportunities (Qadir, 2023). It is possible to see the perspective presented by Qadir in the study published by (Khan et al., 2023), which deals with the role of ChatGPT in medical education. Similarly, ChatGPT modernizes and shapes medical education with the various advantages it offers. At this point, it is underlined that ChatGPT can be used functionally in medical education with the help of

tools such as providing fast access to information, creating case scenarios, and creating content that will facilitate learning and personalized learning (Khan, et al., 2023).

It is possible to state that the use of ChatGPT in education provides different conveniences in different educational fields. As seen in the studies in the literature, ChatGPT offers different advantages and possibilities in every field. When evaluated in this context, ChatGPT can be considered as a reformist technology in education. Both in the advantages it offers and in the new perspectives it brings, there is a moderate belief that artificial intelligence can progress in a similar line with educational activities in the near future. In the background of this belief is ChatGPT, a language-based technology.

Conclusion

Technological developments show themselves clearly in every field of social structure. From science to art, from education to economy, every field benefits from technological developments within its own possibilities and limitations. Therefore, it is extremely difficult to think of a social structure independent of the impact of technical possibilities. Artificial intelligence technologies should also be evaluated from this perspective. Artificial intelligence technologies are used for specific purposes in every field. Artificial intelligence, which is gaining more importance day by day, provides important advantages for social life. It should be noted that one of the most important of these advantageous areas is education. Since the first days of the emergence of artificial intelligence technologies, there have been investigations on how artificial intelligence can be used in education. At this point, artificial intelligence has become an important component of educational activities.

The use of artificial intelligence in educational activities, and in particular in ChatGPT, raises a number of current areas of debate. The use of artificial intelligence in education provides distinct advantages for educators and students, those who are important actors of education. While artificial intelligence technologies increase the efficiency of education, they also aim to increase the academic success of students. It should be noted that a similar picture

emerges when it comes to ChatGPT. ChatGPT offers significant advantages to students and educators with its advantages. In particular, the fact that it is language-based and can model language is very striking in terms of students' academic productivity. The fact that ChatGPT is dialogue-based also clearly shows that artificial intelligence can be used as a "consultant" in education. Especially by using ChatGPT, education in many branches of education can be modernized. As mentioned in the study, many fields, especially engineering and medical education, can be modernized with the opportunities offered by ChatGPT. Therefore, it is vital to reconsider artificial intelligence in education in ChatGPT.

It is possible to characterize the opportunities offered by ChatGPT as a reform in traditional education. ChatGPT has the potential to transform the relationship between educator and student with the opportunities it offers. ChatGPT, as a language-based artificial intelligence robot, can guide students in their projects, assignments, etc. in all other studies. It also provides an important convenience for teachers in creating course content, creating exam questions, and creating course syllabus. From this point of view, it should be noted that ChatGPT offers different advantages for different fields in education. Although ChatGPT, which produces different outputs for both students and educators, is still very new, it has managed to create important areas of discussion in the field of education.

As a result, in further studies, the effects of ChatGPT on education can be addressed in more specific planes. The relationship between ChatGPT and education can be deepened by conducting studies on the advantages or disadvantages of ChatGPT in the fields of expertise. In addition, studies can be conducted on the potential risks of ChatGPT in order to contribute to the literature. In the end, no technological development is neither completely positive nor completely negative. Therefore, it is important to consider ChatGPT in all aspects in order to make sense of the relationship between ChatGPT and educational activities in a holistic manner.

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