Ed Process Int J | www.edupij.com
ISSN 2147-0901 | e-ISSN 2564-8020
2023 | ÜNİVERSİTEPARK

EDUCATIONAL PROCESS
INTERNATIONAL JOURNAL

ARTICLE HISTORY
Received *April 12, 2023*
Accepted *June 22, 2023*
Published Online *July 3, 2023*

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How to cite: *İpek, Z.H., Gözüm, A.İ.C., Papadakis, S., & Kallogiannakis, M. (2023). Educational Applications of the ChatGPT AI System: A Systematic Review Research. Educational Process: International Journal, 12(3): 26-55.*

RESEARCH ARTICLE

Educational Applications of the ChatGPT AI System: A Systematic Review Research

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ABSTRACT

Background/purpose – ChatGPT is an artificial intelligence program released in November 2022, but even now, many studies have expressed excitement or concern about its introduction into academia and education. While there are many questions to be asked, the current study reviews the literature in order to reveal the potential effects of ChatGPT on education as a whole. The potential implications, possibilities, and concerns about the use of ChatGPT in education are disclosed as mentioned in the literature.

Materials/methods – The data of the study were collected and then subjected to a systematic review. Research findings were analyzed according to the themes and categories identified.

Results – The results of this research were examined under themes according to the positive and negative aspects of ChatGPT. The positive categories and sub-categories of ChatGPT's integration into education were determined, and the relationship between education and artificial intelligence determined. Similarly, the negative category highlighted the potential negative impact of artificial intelligence on educational processes.

Conclusion – The reviewed research evaluated and discussed the impact of AI on education and training processes. In conclusion, this review revealed the critical applications of ChatGPT for educational settings and the potential negative impact of its application. The findings established how ChatGPT and its derivatives would create a new paradigm in education as a whole.

Keywords – ChatGPT, education, systematic review, ChatGPT and education

To link to this article– https://dx.doi.org/10.22521/edupij.2023.123.2

1. INTRODUCTION

Over the past decade, artificial intelligence (AI) technology has experienced significant development across various fields of education. These technologies have been shown to directly or indirectly affect educational environments and shape educational settings.

In November 2022, a new form of AI technology was introduced that has the potential to impact on social and education sciences. This brand-new AI technology is a chatbot named ChatGPT. Since its launch, ChatGPT has exceeded the expectations both of ordinary people and even those in the AI business. ChatGPT has been revealed to have vast capability in areas such as abstracting, paraphrasing, translation, editing, generating high-level answers to complex questions, and solving mathematical problems. Even now, just months after its release, those working in universities are admitting to be scared and/or amazed at the potential and impact of ChatGPT on the educational sector, and are trying to prepare or take measures against its usage or misuse. The current study aims to provide insight on the current view of ChatGPT according to the current academic literature published in the field, based on reviews of its implementations and the apparent menace it may pose to education as a whole.

2. LITERATURE REVIEW

2.1. The Emergence of AI

The foundation of modern AI was laid by philosophers who tried to explain human thinking as the mechanical manipulation of symbols, ultimately leading to the development of the programmable digital computer in the 1940s. Based on mathematical reasoning, this machine sparked the idea among scientists of building an electronic brain (Kaplan & Haenlein, 2019).

AI research was first established in 1956 at Dartmouth College in the United States, where attendees of a workshop would become the leading AI researchers in the decades that followed. They believed that a machine as intelligent as a human would exist within a generation and were granted appropriate funding in order to make that happen. However, they soon realized that creating such a machine was much more complicated than they first thought, and funding from both the United States and United Kingdom governments was withdrawn in 1974 due to criticism levelled at the venture (Newquist, 1994).

After a period commonly known as the "AI winter," an initiative by the Japanese government in the early 1980s sparked renewed interest in AI, and along with it came funding, although this eventually waned by later that same decade. Twenty years later, the 21st century saw continual new developments in artificial intelligence technology, and AI experienced a surge in investment and interest as machine learning was applied to various academic and industrial problems, mainly using new techniques, powerful computers, and massive datasets (Newquist, 1994).

The rapid advancement of AI technology has resulted in several innovative AI programs appearing in recent years. ALEKS, an adaptive learning system, offers personalized instruction in mathematics and chemistry, enhancing the learning experience of students (ALEKS, n.d.). Carnegie Learning's MATHia, another AI-powered platform, delivers customized math instruction for middle and high school students, ensuring improved comprehension of mathematical concepts (Carnegie Learning, n.d.). Brainly, a social learning platform, employs AI to facilitate peer-to-peer learning, fostering a collaborative educational environment (Brainly, n.d.). Furthermore, Querium Corporation's StepWise provides real-time feedback

and adaptive learning in STEM subjects, which is said to boost student performance (Querium, n.d.). Lastly, Cognii's AI-based educational platform offers personalized tutoring and assessment in various subjects, promoting deeper understanding (Cognii, n.d.). These AI programs have revolutionized the education sector, paving the way for more effective and tailored learning experiences (Luckin et al., 2016).

The use of AI technologies in education is now a growing reality, and ChatGPT is just the latest step in this evolution. With the advancements seen in computing power and data analysis, AI algorithms are becoming more and more sophisticated, and able to learn and improve independently. AI can be said to have made a significantly early impact on the educational system (Tan, 2020), with the technology proving popular at every level of education. For students, AI-powered applications offer the potential for more personalized learning experiences and improved support systems (Zawacki-Richter et al., 2019); whilst for teachers, AI can reduce workload and provide valuable insight into student performance. Using AI in education can help to automate tasks such as assessment and feedback, freeing up teachers to focus on other aspects of the classroom. In conclusion, ChatGPT is just one example of the potential offered by AI in the educational context, with AI technologies set to revolutionize both how we learn and also how we teach (Baker, 2000).

2.2. What is ChatGPT?

Chat Generative Pre-Trained Transformer, or ChatGPT (Roose, 2022), was introduced by OpenAI in November 2022. It is based on OpenAI's GPT-3 language model family and uses supervised and reinforcement learning techniques. Following its release, ChatGPT quickly received recognition for its thorough responses and articulate answers in various subject areas (Quinn et al., 2020; Vincent, 2022a).

As a highly advanced AI language model, ChatGPT has many different potential applications. Its ability to provide detailed and articulate answers across many knowledge domains has already made it a valuable resource for various fields, including education, journalism, and academic research. Additionally, its use of transfer learning and reinforcement learning techniques makes it an effective tool for daily life scenarios in academic and educational environments, as well as in numerous other situations (Jiao et al., 2023; Rudolph et al., 2023; Susnjak, 2022; Zhai, 2022).

ChatGPT was further enhanced through a combination of supervised and reinforcement learning techniques based on GPT-3.5 (Greengard, 2022). This AI technology offers high-tech contributions to human feedback, which can improve user performance through the provision of conversational examples in supervised learning and in ranking its responses in reinforcement learning. Ranked responses have been used to develop reward models, and the model was further optimized through multiple iterations of Proximal Policy Optimization (PPO) (Vincent, 2022b).

The ChatGPT program offers versatile abilities such as being able to mimic human conversation, the writing and debugging of computer programs, creating lyrics for music, answering test questions, writing poetry and other lyrics, as well as game playing (Edwards, 2022; Heilweil, 2022). ChatGPT has access to information about Internet phenomena and programming languages, can remember previous prompts within a conversation, and is monitored in order to prevent offensive output, unlike its processor InstructGPT (Chawla, 2022). However, it does have its limitations, such as producing incorrect answers and having limited knowledge of events beyond 2021. It has also been found to have an algorithmic bias in its training data and a preference for longer answers from human reviewers. As of

December 2022, it has not been allowed to express any political opinion, and research suggests it has a pro-environmental, left-libertarian orientation (Hartmann et al., 2023).

ChatGPT's ability to write computer programs, as well as create music, poetry, and other written works has made it a valuable tool for artists, writers, and programmers (Edwards, 2022; Heilweil, 2022). Similarly, its ability to answer test questions and provide information on various topics has also made it a helpful resource for both students and academic researchers (Jiao et al., 2023; Rudolph et al., 2023). Additionally, its ability to remember previous prompts in a conversation has made it a unique tool for personalized therapy and counselling (Roose, 2022).

Despite these various challenges, the potential benefits of ChatGPT and other advanced AI language models are significant. As technology advances, ChatGPT and similar models will likely play a growing role in education, medicine, and also in art. As such, researchers, developers, and policymakers must work together to address the limitations and challenges of these systems, whilst leveraging their many significant benefits in order to improve human life and the world in which we live (Vincent, 2022a).

ChatGPT caused a stir upon its initial release due to its wide-ranging capabilities, leading to both positive and negative reactions. People from various fields, including journalists, academics, programmers, and business leaders, expressed their various views on the chatbot. Roose (2022) referred to ChatGPT as "the best artificial intelligence chatbot ever released to the public," whilst Lock (2022) praised the chatbot for its ability to produce "detailed" and "human-like" text. It is also found that its generated text was on par with a good student's work and noted that academia would have significant challenges to face in the future (Hern, 2022). The Atlantic Magazine recognized ChatGPT as part of the "generative-AI eruption" in its "Breakthroughs of the Year" for 2022, stating that it could significantly impact upon the way in which we work, think, and understand human creativity (Thompson, 2022).

Concerns have been raised about the tendency of ChatGPT to produce "hallucinated" responses (Lakshmanan, 2022). ChatGPT was also compared to a "stochastic parrot" (Mannix, 2022). As a result, the question-and-answer website Stack Overflow banned the use of ChatGPT for generating answers due to the factually ambiguous nature of its responses (Vincent, 2022b), and the International Conference on Machine Learning also banned the undocumented use of ChatGPT or other large language models in submitted papers (Vincent, 2023). The Guardian news organization questioned the trustworthiness of information on the Internet following the release of ChatGPT and called for government regulation of AI (The Guardian, 2022).

2.3. ChatGPT and Education

Since the release of the ChatGPT chatbot, it has generated both admiration and concern amongst educators. Academics have begun to share their predictions about the capabilities and potential consequences of the program due to its ability to effectively perform tasks such as writing articles, answering complex questions, translating languages with near-perfect accuracy, solving mathematical formulas in the sciences, as well as producing programming code, and summarizing books (Aydın & Karaarslan, 2022; Jiao et al., 2023; Lund & Ting, 2023; Zhai, 2022). As a result, the program has been subjected to exams in fields such as law, pharmacy, medicine, and language education, and overall has received scores better than that of an average student (Choi et al., 2023; Huh, 2023; Nisar & Aslam, 2023; Qadir, 2022). This has led to concerns among academics that students may opt to utilize ChatGPT to plagiarize, engage in fraudulent activities in their assignments, and to pass off generated

academic writing as their own (Baker, 2000; Rudolph et al., 2023). This itself has created another dilemma and sparked debates on whether or not ChatGPT and other chatbots in the future can or should be used for the purposes of creating text. Whether the use of such chatbots is deemed ethically correct or not has also begun to make people think (Rudolph et al., 2023). Legal texts have even been produced regarding whether or not written works sourced from ChatGPT can be considered personal work (Güçlütürk, 2022).

The impact of ChatGPT on academia has also been a topic of significant interest to various scholars and researchers. It is stated that the full extent of ChatGPT's influence on academic writing, particularly in application essays, has yet to be fully understood (Karp, 2023). On the other hand, It is acknowledged that use of ChatGPT by students to outsource their writing may raise concerns among educators (Bushard, 2023).

To address the potential issue of academic plagiarism facilitated by AI writing tools like ChatGPT, Tian, a Princeton University student, developed a program called "GPTZero" to determine the proportion of AI-generated text in any given piece of writing (Mitchell, 2022; Stern, 2022). The New York City Department of Education has taken the precautionary measure of restricting access to ChatGPT on its public school Internet and associated devices (Allen, 2022; Rosalsky & Peaslee, 2023).

As a result, the emergence of artificial intelligence (AI) has brought about a significant transformation across various sectors, with education being no exception. Owing to their capacity to reshape how students acquire knowledge and educators impart instruction, AI-driven tools such as ChatGPT, OpenAI's cutting-edge natural language processing model, have attracted considerable interest in recent times (e.g., Aydın & Karaarslan, 2022; Jiao et al., 2023; Lund & Ting, 2023; Zhai, 2022).

The systematic review undertaken in the current study investigated the consequences and ramifications of incorporating ChatGPT into educational environments, with a focus on the potentially favorable and adverse effects that ChatGPT could cause in education. Furthermore, the review mainly focuses on papers that have the potential of integrating ChatGPT into classrooms, schools, and other education environments, as well as the potential ethical issues and other such challenges stemming from its utilization. To examine the current state of the published literature regarding ChatGPT, following research questions were formulated:

1. What are the possible subject areas that may be affected by ChatGPT's use in education?
2. What are the results and conclusions drawn from the current literature regarding ChatGPT's impact on education?
3. What potential benefits could emerge from the application of ChatGPT in education?
4. What potential ethical concerns and challenges could emerge from the application of ChatGPT in education?

3. METHODOLOGY

A systematic literature review was conducted in order to provide a concrete and detailed understanding and interpretation of artificial intelligence at the time of writing. A systematic review is a rigorous and structured approach to reviewing all relevant literature on a specific research question, and which employs clearly defined methods to identify, select, and

critically appraise relevant research, and then to collect and analyze data from the studies included in the review (Higgins & Green, 2011).

The goal of a systematic literature review is to minimize bias by identifying, appraising, and synthesizing all relevant studies on a particular topic, often focusing on randomized controlled trials (Page et al., 2021). The systematic literature review used education, systematic, and specific methods to determine, select, and collect all relevant research materials directly and where a connection exists (Kitchenham et al., 2010). At this point, the findings of the studies that were systematically examined were then interpreted according to their respective research questions. The systematic literature review was conducted as follows (Kitchenham, 2004):

1. Articles about ChatGPT were searched for in the appropriate databases.
2. Criteria for inclusion and exclusion were determined.
3. Research related to ChatGPT were selected.
4. Data from articles related to ChatGPT were analyzed.
5. Findings were summarized and interpreted to make best sense of them.
6. Findings about ChatGPT were interpreted through meaningful integration.

3.1. Journal Research Methodology

While conducting this systematic review, the Google Scholar web search engine was used to access articles and literature related to ChatGPT. Since the subject of ChatGPT is considered very current, attention was paid to selecting the first publications. In this context, articles were selected for examination from databases of Science Direct, Eric, Wiley Online Library, SpringerLink, Sage Journals, Taylor & Francis Online, MDPI, and JSTOR, which are considered the most accepted in the scientific world (Gusenbauer, 2019).

Artificial intelligence has often been associated with and interpreted in different fields. For example, it can refer to artificial intelligence applications, digital environments, and robot and virtual learning-based application content. The current research investigated the ChatGPT application in its AI search engine mode. Therefore, the terms used in the search string included key concepts compatible with ChatGPT (Cronin et al., 2008).

In listing the studies within the research scope, two keywords were primarily used: GPT and ChatGPT. Synonyms and similar keywords were determined for the central concept. Similar keywords were used to reach the main concept and increase the chance of extensive search. The central concept and its associated meanings were combined using OR. The articles and theses returned from the scans were evaluated following the PRISMA guide as well as the selection criteria determined for the current study. Therefore, only articles and theses that met the inclusion criteria were subjected to further analysis as part of the current study.

3.2. Inclusion/Exclusion Criteria

In order to conduct research about ChatGPT, specific criteria were established and adhered to that were deemed appropriate to the nature of systematic research.

Inclusion:

1. Research on ChatGPT that follows a recognized scientific methodology.
2. Research on ChatGPT discusses different features of the application.
3. Research on ChatGPT that relates to the field of education.

4. Research on ChatGPT that includes discussion that guides education and provides scientific content (mathematics, astrology, biology, chemistry, physics, medicine, health education, etc.).
5. Research on ChatGPT that was published or posted between December 2022 and February 15, 2023.

Exclusion:

1. Research on ChatGPT that was not written in the English language (must at least have an English language abstract).
2. Research on ChatGPT that is not listed in one of the specified databases.
3. Research on ChatGPT that is about subjects other than education.

The results of the searches performed against the databases specified within the scope of the research are presented in Table 1. As can be seen, a total of 40 studies were identified after a total of 115 studies were excluded as having not met the criteria.

The 40 studies were then individually examined so as to identify the detailed data of the study (Kern, 2018). A systematic process was applied in order to identify the thematic meaning and interpretation of the collected data. During the process of understanding and interpreting the details of the included articles, the researchers kept separate anecdotal records, and the research on ChatGPT was read many times over in order to determine the relevance of the themes. The PRISMA (Moher et al., 2009) staged process employed in the systematic analysis of the included research is presented in Figure 1.

Table 1. Data source and systematic review stages

Data Source	1st stage	2nd stage	3rd stage	4th stage	5th stage
Eric	0	0	0	0	0
Wiley Online Library	4	4	0	0	0
Springer Link	5	5	2	2	2
Sage Journals	2	2	1	1	1
Taylor & Francis Online	4	4	4	4	4
Google Scholar	141	141	105	37	31
JSTOR	0	0	0	0	0
Science Direct	5	5	2	2	2

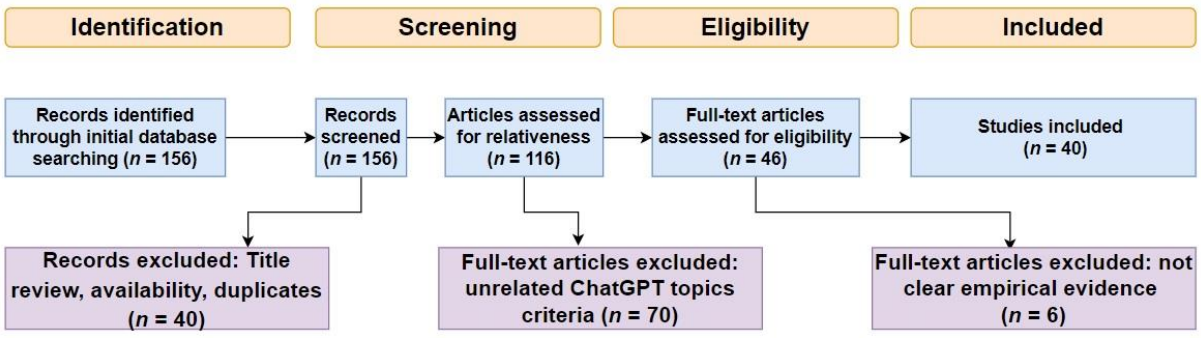

Figure 1. PRISMA review process

3.3. Data Extraction and Analysis

The 40 articles in Table 2 were analyzed to gather information to help answer the current study's research questions. A triangulation method was applied to ensure the validity and reliability of the data obtained from the studies (Kern, 2018). The first step involved conducting a comprehensive examination and evaluating the ChatGPT studies, theories, goals, outcomes, and educational connections.

Table 2. Articles listed in the study

No	Authors / Year	Article topic	Subject area
1	Aljanabi, M., Ghazi, M., Ali, A. H., & Abed, S. A. (2023)	ChatGPT: Open possibilities.	Computers
2	Aydın, Ö., & Karaarslan, E. (2022)	OpenAI ChatGPT generated literature review: Digital twin in healthcare.	Medical education
3	Baidoo-Anu, D., & Owusu Ansah, L. (2023)	Education in the Era of Generative Artificial Intelligence (AI): Understanding the potential benefits of ChatGPT in promoting teaching and earning.	Education
4	Bishop, L. (2023)	A computer wrote this paper: What ChatGPT means for education, research, and writing.	Education
5	Choi, J. H., Hickman, K. E., Monahan, A., & Schwarcz, D. (2023)	ChatGPT goes to law school. (ChatGPT passed tests in law school with a C+).	Law education
6	Cotton, D. R., Cotton, P. A., & Shipway, J. R. (2023)	Chatting and cheating: Ensuring academic integrity in the era of ChatGPT.	Education
7	de Winter, J. C. F. (2023)	Can ChatGPT pass high school exams on English language comprehension?	Language education
8	Deng, J., & Lin, Y. (2022)	The benefits and challenges of ChatGPT: An overview.	Computers & psychology
9	Dowling, M., & Lucey, B. (2023)	ChatGPT for (finance) research: The Bananarama conjecture.	Finance
10	Duong, D., & Solomon, B. D. (2023)	Analysis of large-language model versus human performance for genetics.	Language
11	Firat, M. (2023)	How can ChatGPT transform autodidactic experiences and open education?	Open education
12	Gilson, A., Safranek, C., Huang, T., Socrates, V., Chi, L., Taylor, R. A., & Chartash, D. (2022)	How well does ChatGPT do when taking medical licensing exams? The implications of large language models for medical education and knowledge assessment.	Medical education
13	Gordijn, B., & Have, H. T. (2023)	ChatGPT: Evolution or revolution?	Computers

No	Authors / Year	Article topic	Subject area
14	Gozalo-Brizuela, R., & Garrido-Merchan, E. C. (2023)	ChatGPT is not all you need. A State of the Art Review of large Generative AI Models.	Art education
15	Güçlütürk, Ö. Ü. O. G. (2022)	[The evaluation of the legal status of content generated via ChatGPT as copyrighted work under law no. 5846]	Law
16	Guo, B., Zhang, X., Wang, Z., Jiang, M., Nie, J., Ding, Y., Yue, J., & Wu, Y. (2023)	How close is ChatGPT to human experts? Comparison corpus, evaluation, and detection.	Computers
17	Haque, M. U., Dharmadasa, I., Sworna, Z. T., Rajapakse, R. N., & Ahmad, H. (2022)	"I think this is the most disruptive technology": Exploring sentiments of ChatGPT early adopters using Twitter data.	Social media
18	Hartmann, J., Schwenzow, J., & Witte, M. (2023).	The political ideology of conversational AI: Converging evidence on ChatGPT's pro-environmental, left-libertarian orientation.	Politics
19	Huh, S. (2023)	Are ChatGPT's knowledge and interpretation ability comparable to those of medical students in Korea for taking a parasitology examination? A descriptive study.	Medical education
20	Jiao, W., Wang, W., Huang, J. T., Wang, X., & Tu, Z. (2023)	Is ChatGPT a good translator? A preliminary study.	Language education
21	King, M. R., & ChatGPT. (2023)	A conversation on artificial intelligence, chatbots, and plagiarism in higher education.	Medical education
22	Kutela, B., Msechu, K., Das, S., & Kidando, E. (2023)	ChatGPT's scientific writings: A case study on traffic safety.	Education
23	Lund, B., & Agbaji, D. (2023)	Information literacy, data literacy, privacy literacy, and ChatGPT: Technology literacies align with perspectives on emerging technology adoption within communities.	Education-Communities-Technology
24	Lund, B., & Ting, W. (2023)	Chatting about ChatGPT: how may AI and GPT impact academia and libraries?	Education
25	Alshater, M. M. (2022)	Exploring the role of artificial intelligence in enhancing academic performance: a case study of ChatGPT.	Education
26	Mijwil, M., & Aljanabi, M. (2023)	Towards artificial intelligence-based cybersecurity: The practices and ChatGPT generated ways to combat cybercrime.	Cybersecurity
27	Nisar, S., & Aslam, M. S. (2023)	Is ChatGPT a good tool for T&CM students in studying pharmacology?	Pharmacology education

No	Authors / Year	Article topic	Subject area
28	Pavlik, J. V. (2023)	Collaborating with ChatGPT: Considering the implications of generative artificial intelligence for journalism and media education.	Media education
29	Qadir, J. (2022)	Engineering education in the era of ChatGPT: Promise and pitfalls of generative ai for education.	Engineering
30	Rudolph, J., Tan, S., & Tan, S. (2023)	ChatGPT: Bullshit spewer or the end of traditional assessments in higher education?	Assessments in Education
31	Shijaku, R., & Canhasi, E. (2022)	ChatGPT generated text detection.	Education
32	Sun, F. (2022)	ChatGPT, the start of a new era.	Education
33	Susnjak, T. (2022)	ChatGPT: The end of online exam integrity?	Assessments in Education
34	Tabone, W., & de Winter, J. (2023)	Using ChatGPT for human-computer interaction research: a primer.	Psychology.
35	Uludag, K. (2023)	The use of AI-supported chatbot in psychology.	Psychology.
36	Ventayen, R. J. M. (2023)	OpenAI ChatGPT generated results: Similarity index of artificial intelligence-based contents.	Computer science
37	Wenzlaff, K., & Spaeth, S. (2022)	Smarter than humans? Validating how OpenAI's ChatGPT model explains crowdfunding, alternative finance, and community finance.	Finance.
38	Willems, J. (2023)	ChatGPT at universities–the least of our concerns.	Education
39	Zhai, X. (2022)	ChatGPT user experience: Implications for education.	Education
40	Zhai, X. (2023)	ChatGPT for next generation science learning.	Education

A systematic search was conducted using keywords to gather information from the 40 included studies while maintaining the accuracy of the data. To confirm and support the results, a document analysis was conducted as part of the triangulation process. Document analysis is a systematic procedure used to review or evaluate printed and electronic documentation (Bowen, 2009). This qualitative research method allows for the interpretation of the content within documents, providing an understanding of the context, subtleties, and complexities of the subject matter under examination (Corbin & Strauss, 2014). The following key details were obtained from the studies: subject matter, setting, results, and conclusions. The themes and categories determined from the document analysis are presented in Table 3.

Table 3. Themes and Categories of ChatGPT Usage

Positive Themes and Categories	Negative Themes and Categories
Integration of ChatGPT into education • Abstracting • Literature review • Generating literature • Translation and paraphrasing • Generating complex and deep answers for exams • Identifying students' needs earlier	Possible problems and measures taken • Cheating • Creating bias • Ethical issues • Legal issues

- Personalized learning experience
- Grading and assessment
- Data analysis
- Prevention of cybercrimes and cyberbullying
- Helping people study: ChatGPT
- Cataloguing
- Directing
- Material design and material generation

Table 3 details the themes related to the positive and negative effects of ChatGPT's usage within an education context. Under the positive theme of ChatGPT's usage, sub-categories are given on how it can be integrated into education. Under the negative theme of ChatGPT's usage, sub-categories are listed for possible problems in education and the precautionary measures that could be taken (Braun & Clarke, 2006).

Two experts from the field then analyzed the results, and the themes and categories of the study were compared according to Miles and Huberman's (1994) theory of internal consistency. Their comparison revealed a 100% match.

4. RESULTS

The study's results can be categorized into two different topic areas; focused on the integration of ChatGPT into daily and academic life, and the possible measures and problems associated with this new type of technology. Therefore, we aimed to classify the research literature into different segments and to explain the possible benefits and problems from the technology's application. Some research was found to have applied to both areas since both the technology's positive and negative effects were mentioned. Articles and sources indirectly related to education were evaluated within the scope of the research. The reason for this is to draw a broader perspective by considering how the developments in other fields and the applications of ChatGPT in other fields can affect education. The developments to be made in the field of education and the applications made can be handled with an interdisciplinary approach in this way.

4.1. Integration of ChatGPT into Education

Many articles discussed the integration of ChatGPT into education and its use as a supportive tool. ChatGPT has the potential to contribute to education within skills areas such as literature search, literature generation, translation, creating deep and complex answers, analyzing students' needs, personalized learning experience, grading, tracking student data, copy prevention, education system updates, data analysis, cyberbullying prevention, helping people study, and catalogue sources. The articles categorized under this section are shown in Table 4, with subgroups then described according to their subject division.

Table 4. Integration of ChatGPT Theme

No	Authors	Integration Topic
1	Aljanabi, M., Ghazi, M., Ali, A. H., & Abed, S. A. (2023)	Literature review; Helping people study
2	Aydın, Ö., & Karaarslan, E. (2022)	Literature review

No	Authors	Integration Topic
3	Baidoo-Anu, D., & Owusu Ansah, L. (2023)	Helping people study; Generating complex and deep answers for exams; Literature review
4	Bishop, L. (2023)	Generating literature; Translation and paraphrasing; Helping people study
5	Choi, J. H., Hickman, K. E., Monahan, A., & Schwarcz, D. (2023)	Generating complex and deep answers for exams
6	de Winter, J. C. F. (2023)	Generating complex and deep answers for exams
7	Dowling, M., & Lucey, B. (2023)	Data analysis
8	Duong, D., & Solomon, B. D. (2023)	Translation and paraphrasing
9	Firat, M. (2023)	Helping people study
10	Gilson, A., Safranek, C., Huang, T., Socrates, V., Chi, L., Taylor, R. A., & Chartash, D. (2022)	Generating complex and deep answers for exams
11	Gozalo-Brizuela, R., & Garrido-Merchan, E. C. (2023)	Material design and material generation
12	Guo, B., Zhang, X., Wang, Z., Jiang, M., Nie, J., Ding, Y., Yue, J., & Wu, Y. (2023)	Grading and assessment
13	Huh, S. (2023)	Generating complex and deep answers for exams
14	Jiao, W., Wang, W., Huang, J. T., Wang, X., & Tu, Z. (2023)	Translation and paraphrasing
15	Kutela, B., Msechu, K., Das, S., & Kidando, E. (2023)	Generating literature; Translation and paraphrasing
16	Lund, B., & Agbaji, D. (2023)	Abstracting
17	Alshater, M. M. (2022)	Literature review; Generating complex and deep answers for exams; Helping people study
18	Mijwil, M., & Aljanabi, M. (2023)	Prevention of cybercrimes and cyberbullying
19	Nisar, S., & Aslam, M. S. (2023)	Generating complex and deep answers for exams; Helping people study
20	Pavlik, J. V. (2023)	Literature review
21	Qadir, J. (2022)	Material design and material generation
22	Sun, F. (2022)	Literature review; Generating complex and deep answers for exams; Generating literature
23	Susnjak, T. (2022)	Generating complex and deep answers for exams; Helping people study
24	Tabone, W., & de Winter, J. (2023)	Data analysis
25	Uludag, K. (2023)	Directing
26	Wenzlaff, K., & Spaeth, S. (2022)	Generating complex and deep answers for exams
27	Zhai, X. (2022)	Literature review; Generating complex and deep answers for exams; Identifying students' needs earlier; Personalized learning experience; Grading and assessment
28	Zhai, X. (2023)	Generating complex and deep answers for exams; Personalized learning experience; Helping people study

Abstracting: The ChatGPT program is considered a serious summarization tool that can instantly scan 650 GB of written data. Some reviews have mentioned its ability to summarize long books according to predetermined criteria and within a very short space of time. Summarizing resources quickly provides a preview of the available information and a high level of skill in categorization and archiving (Lund & Ting, 2023). Recent research also mentioned this, with studies generally seen as having a faster impact on literacy skills due to ChatGPT's rapid access to information and faster categorization (Lund & Agbaji, 2023).

Literature review: When ChatGPT was first released, it was considered a significant surprise that it could scan literature resources. The fact that ChatGPT could quickly scan over 650 GB of written sources and quickly present the results by turning it into meaningful literature caused a surprise in the scientific world. Due to this ability, various academics authored articles on this subject to test the dimensions of this feature of ChatGPT (Aljanabi et al., 2023; Aydın & Karaarslan, 2022; Pavlik, 2023; Rudolph et al., 2023; Zhai, 2022).

Generating literature: One of the most discussed aspects about ChatGPT is its ability to generate literature. However, there were also reports of inaccurate content having been created (Rudolph et al., 2023). ChatGPT has extensive literature-generating capabilities within a short time span. Among these skills are complex texts that require deep and critical-thinking skills. The fluency and accuracy in these texts has been a cause of some concern, especially amongst academics, and the question of "what can be done about these works in the future" has emerged. Nevertheless, ChatGPT's ability to create literature is too advanced to ignore. It as been stated that ChatGPT's skills will be at a level to be evaluated scientifically in the future (Bishop, 2023; Kutela et al., 2023).

Translation and paraphrasing: ChatGPT's translation skills and capacity to paraphrase translated text are surprisingly high. There have been statements made that this skill is at the level of Google translate and other translation engines. ChatGPT was also used as a translation tool in some studies, with trials conducted on its translation skill. It has also been reported that ChatGPT has significant translation skills, but can encounter some technical problems in non-European languages, which are deemed "foreign languages." For this reason, it has been considered as very successful in translation, but with certain notable shortcomings (Jiao et al., 2023).

ChatGPT also has a high proficiency in paraphrasing; being able to paraphrase texts as required, even to the user's desired style. Since there is no risk of plagiarism in the generated texts, this feature is considered by some to be a feared area of application for ChatGPT, since ChatGPT can paraphrase existing texts in the literature to a very professional level. How to make use of these higher-level skills has also been the subject of academic articles (e.g., Bishop, 2023; Cotton et al., 2023; Gordijn & Have, 2023; Kutela et al., 2023; Rudolph et al., 2023).

Generating complex and deep answers for exams: ChatGPT's ability to generate deep and meaningful answers to questions has led scientists to research the program's potential. As a result, studies have been conducted in which ChatGPT was subjected to university-level exams in fields such as law, medicine, language, and pharmacy. The program, which scored similar to an above-average student in these exams, led scientists to draw conclusions as to how the program could be used in online exams, and that changes should be developed within exam systems to counter these high-level skills of the ChatGPT program (Choi et al., 2023; Duong & Solomon, 2023; Huh, 2023; Nisar & Aslam, 2023; Qadir, 2022). In addition to the program's exam question responses being more than that of a typical student, it has been

observed that ChatGPT was able to meet certain criteria with almost perfect results and a high success level in exams where ChatGPT's answers were evaluated based on multiple criteria such as precision, scope, relevance to the content, and length of the answers generated (Susnjak, 2022). While these studies confirmed that ChatGPT could create complex and deep answers within the scope of certain exam questions, scientists stated that due to the innovation created by ChatGPT, the differentiation and development of measurement and evaluation in education is seen as an inevitable result (Rudolph et al., 2023; Susnjak, 2022; Zhai, 2022).

Identifying students' needs earlier: ChatGPT and similar applications have a tremendous scanning capacity, and the ability of this skill to access a broader range of resources and data has positively affected users' scanning abilities. Due to these skills, the ChatGPT program can lead students to access additional support and resources by increasing their screening ability. In addition, AI can provide benefits through determining students' needs and identifying their deficiencies, especially through rapid analysis of student data. Preliminary analysis of students' needs is essential in establishing skills such as solving problems from the beginning, taking quick steps, and benefitting students ahead of conventional interventions (Zhai, 2022, 2023).

Personalized learning experience: Presenting a personalized learning skill to students based on the analysis of students' interests is also one of the skills that ChatGPT and similar AI programs can offer. The ability to offer face-to-face and online courses that meet a student's interests and abilities has been a subject considered a guide for new materials and content. These and similar opportunities have shown that ChatGPT has considerable potential to offer a personalized learning experience, especially in guiding students differently according to their needs (Rudolph et al., 2023; Zhai, 2022, 2023).

Grading and assessment: One area of research on ChatGPT has been the program's capacity to grade and evaluate student exams. There have also been studies published on the grade evaluation capability of the GPT-3 program, which is the previous version of ChatGPT. The qualities of the grading and evaluation skills of chatbots have been discussed in studies such as Gao (2021), Roscoe et al. (2017), and Zawacki-Richter et al. (2019). Similar to previous chatbots, ChatGPT has a high skill level in grading and evaluation, which can benefit students by providing quick feedback and performing student assessments much faster (Guo et al., 2023). Despite this, it has been stated that the program has yet to make evaluation mistakes and has only minor deficiencies (Cotton et al., 2023; Rudolph et al., 2023).

Data analysis: Another feature of ChatGPT is its ability to perform data analysis. This can result in individuals more easily performing behavioral analysis, text analysis, and the analysis of extensive textual data, and performing these tasks with high speed and precision so as to facilitate extensive scientific data processing in many fields. It has been seen in some studies that the analyses of qualitative data using ChatGPT have proven successful (Alshater, 2022; Tabone & de Winter, 2023). Not only that, but due to ChatGPT's features going beyond just data analysis in areas such as data generation and metadata development, the program could also be used for data generation analysis (Lund & Ting, 2023).

Prevention of cybercrime and cyberbullying: Cybersecurity, seen as the protection of Internet-connected systems, is made possible through the diversification of scenarios and analyses related to cybersecurity. In this context, programs such as ChatGPT, which can process large volume data and texts in a short timespan, can help prevent cybercrime and prevent content that may have a harmful effect on children, thanks to its fast data processing

ability. This and similar AI technologies may help prevent individuals and students from experiencing situations such as cyberbullying without need for ethical interventions in their private lives. It may also create a new field for the application of chatbots. The development of applications could help eliminate effects such as cyberbullying (Mijwil & Aljanabi, 2023).

Helping people to study: ChatGPT does not claim to replace people in education or academic writing, but that it may be considered as a helpful tool (Alshater, 2022; Bishop, 2023; Firat, 2023; OpenAI/ChatGPT, 2023; Susnjak, 2022). ChatGPT can also be considered a useful resource to be employed just like any other artificial intelligence application. Studies have also been conducted on whether or not the program may be considered as a supplemental application to student learning. In particular, thoughts on how students could best use such resources and what they could do with their aid have also been discussed. Estimations of how and in what way the ChatGPT program could be of greater use was included in studies by Nisar and Aslam (2023), Rudolph et al. (2023), and also Susnjak (2022).

Cataloguing: As well as data analysis and data creation, ChatGPT can also be used for the classification and cataloguing of significant texts, books, and data blocks. It has the potential to offer significant advantage in the simultaneous processing and scanning of large volumes of data, enabling such transactions to be handled much faster than otherwise possible. ChatGPT can be a valuable tool in categorizing and classifying processes since it can quickly access and process 650 GB of written data. This feature of ChatGPT has also been mentioned in the studies, such as by Lund and Agbaji (2023), Lund and Ting (2023), and Zhai (2023).

Directing: ChatGPT's current design excludes medical diagnoses from its infrastructure. From a disease's symptoms, the program has been designed not to reach a diagnosis, but programming the application in this context is heading in that direction (OpenAI/ChatGPT, 2023). However, it reveals the necessity of programs that can refer patients to specialists based on their reported symptoms in areas with high patient density where urgent professional guidance is needed. As a result, creating artificial intelligence systems that enable chatbot programs such as ChatGPT to provide accurate data and guide students to experts quickly can save significant time and expense (Deng & Lin, 2022; Uludag, 2023).

Material design and material generation: Applications such as chatbots feature high-level and fast content creation. This content creation ability can offer excellence in the creation of ideas for material development and text generation. Like many other programs in the field, ChatGPT has the potential as a helpful tool during the various stages of material development, design, and creation due to its different features. As such, the program's material development capability has been a subject addressed in a number of studies (e.g., Gozalo-Brizuela & Garrido-Merchan, 2023; Qadir, 2022; Rudolph et al., 2023; Zhai, 2022).

4.2. Possible Problems and Taking Measures

As well as considerable educational benefits, the ChatGPT program has certain potential disadvantages too in terms of education. In this context, the potential issues in education and some of the measures taken in relation to their negative impact are presented in Table 5, followed by their discussion.

Table 5. Possible Problems and Taking Measures Theme

No	Authors	Possible Problems Topic
1	Cotton, D. R., Cotton, P. A., & Shipway, J. R. (2023)	Grading and assessment; Cheating; Generating incorrect answers
2	Deng, J., & Lin, Y. (2022)	Translation and paraphrasing; Generating complex and deep answers for exams; Directing: Creating bias
3	Gordijn, B., & Have, H. T. (2023)	Translation and paraphrasing; Cheating; Ethical issues
4	Güçlütürk, Ö. Ü. O. G. (2022)	Legal issues
5	Haque, M. U., Dharmadasa, I., Sworna, Z. T., Rajapakse, R. N., & Ahmad, H. (2022)	Ethical issues; Cheating
7	Hartmann, J., Schwenzow, J., & Witte, M. (2023)	Creating bias
9	King, M. R., & ChatGPT. (2023)	Ethical issues; Cheating
10	Lund, B., & Ting, W. (2023)	Generating complex and deep answers for exams; Cataloging; Ethical issues
11	Rudolph, J., Tan, S., & Tan, S. (2023)	Literature review; Generating literature; Translation and paraphrasing; Generating complex and deep answers for exams; Identifying students' needs earlier; Personalized learning experience; Helping people study; Material design and material generation; Generating incorrect answers: Ethical issues
12	Shijaku, R., & Canhasi, E. (2022)	Cheating

Cheating: As a chatbot program, ChatGPT carries the risk of being used by students for the purposes of cheating in online assignments, exams, or where students submit texts that are not created from their own effort and are passed off as if their own, just as seen in previous versions of the program. This risk has led to the emergence of cheating as a significant problem, not only directly affecting students, but also those in academia. This situation has necessitated thought on how academics and educators can prevent such fraud from occurring. In this context, articles have been written regarding the potential for negative results of the ChatGPT program having been used by students and the inevitability of needing to design methods to prevent such a situation (Cotton et al., 2023; Gordijn & Have, 2023; King & ChatGPT, 2023; Ventayen, 2023). Although these articles may not be fully proven, ChatGPT claims to be able to detect artificial intelligence-generated text (Shijaku & Canhasi, 2023). In addition, Turnitin, one of the pioneering plagiarism scanning programs, claims to have developed a program that detects AI-generated texts (Chia, 2023).

Creating bias: ChatGPT and similar artificial intelligence models learn through high-volume data feeds. Introducing serious data to these artificial intelligence models creates information that can be used in the future. In this context, knowledge about the information that artificial intelligence models use, and especially from which data sources, becomes essential. One of the biggest concerns with ChatGPT is that the resources upon which ChatGPT feeds can be manipulated in order to produce undesirable and potentially biased results. Studies have shown that ChatGPT can draw biased conclusions, mainly since it relies upon resources fed themselves by low-volume or substandard resources (Deng & Lin, 2022).

In addition, it has been stated that the program is somewhat pro-environmental and left-libertarian oriented and has been planned accordingly to certain programming preferences (Hartmann et al., 2023).

Generating incorrect answers: Currently, ChatGPT has programming up to 2021 and therefore does not have a dependency upon real-time information (Guo et al., 2023). In this context, the program can unwittingly provide incorrect answers to events after 2021, or where few resources exist. Research has shown that the ChatGPT program can give incorrect answers in situations where few resources exist, and sometimes it can even produce empty texts, even where based on long texts. Although the program can reveal incorrect answers or fabricated texts in this context, its ability to generate a high level of correct information is considered more striking. However, the risk of developing incorrect answers reduces the program's reliability due to the margin of error in critical operations (Cotton et al., 2023; Rudolph et al., 2023).

Legal issues: Discussions about ChatGPT have shown that the program can be used for both positive and negative outcomes. For this reason, although no legal precedent exists related to texts produced by the ChatGPT program, some legal regulations on evaluating legal texts created by the program have been mentioned. Among these legal regulations, Turkey's Law on Intellectual and Artistic Works of the Republic of Turkey (law number 5824) was examined by a lawyer, and it was discussed that the texts created by ChatGPT could not have the quality of a work because there was insufficient content to reflect human labor. In this context, the provision of personal works using ChatGPT and works commissioned through the program are soon to be discussed in legal texts and addressed within university regulations (Güçlütürk, 2022).

Ethical issues: Since the ChatGPT program does not have ethical thinking awareness, it is seen that the program has an ethical thinking infrastructure based on the ethical judgments of those who were its programmers. Since ChatGPT does not develop an ethical perception independently, there is the risk of creating an undesirable result, such as the program's ability to answer undesirable or objectionable questions. Although the chatbot's programming has been designed to avoid consequences that may harm others, since the model is response-oriented, it can create fear due to the potential for harming individuals through undesirable responses. For example, the Molotov cocktail and neo-Nazi arguments were able to be developed through purposefully deceiving the program (Gordijn & Have, 2023; Haque et al., 2022; Lund & Ting, 2023; Rudolph et al., 2023; Vincent, 2022b).

5. DISCUSSION

Humanity has utilized technology for its own benefit, with development processes based on creating tools to serve a specific purpose (Arthur, 2009). Technology has taken an active role in many fields (e.g., medicine, education, and industry) in order to advance humanity to a higher level. As such, technology is seen as critical to humanity's interaction and communication with the environment in many people's lives. Technology can therefore be said to have evolved in its content creation and development (Bijker et al., 1987).

Artificial intelligence applications, one of the most significant advancements in digital technology, has rapidly developed in recent times in a way that has increased the interaction of humans with their surrounding environment (Newquist, 1994). This situation has led to changes across various fields, forming a partnership between humans and artificial intelligence in regulating, changing, and developing the world's educational environment

(Rudolph et al., 2023; Zhai, 2022). ChatGPT, the final product of this partnership, has taken people's content creation and their impact on educational environments to a whole new level (Bishop, 2023; Duong & Solomon, 2023; Jiao et al., 2023; Kutela et al., 2023; Lund & Agbaji, 2023; Rudolph et al., 2023; Zhai, 2022, 2023). Within the scope of this discussion, attempts have been made to understand how artificial intelligence, and ChatGPT in particular, directs human interaction with content and the environment.

Literature review and abstracting, considered the primary features of ChatGPT, will likely benefit teachers and students in many different ways, and especially in the context of educational lessons and course content. Since ChatGPT can be used to summarize the available resources that are to be examined in lessons, it can create an environment for different ideas to be presented and discussed more rapidly in the educational context. ChatGPT can summarize texts containing many pages, and do so both quickly and accurately. This provides individuals with labor and time savings, as well as ease of access to vast amounts of information. Nevertheless, ChatGPT summaries need to pay attention to details and reflections, which may lead to important information being missed or misinterpreted by individuals (Aljanabi et al., 2023; Aydın & Karaarslan, 2022; Lund & Agbaji, 2023; Lund & Ting, 2023; Pavlik, 2023; Rudolph et al., 2023).

Since ChatGPT AI provides a comprehensive literature review feature, educators can see a significant impact on content reviews. Among the main points of today's education understanding is that knowledge does not consist of books that offer limited content from a fixed point of view. ChatGPT can provide researchers and students with a comprehensive literature review in a short time, making it easy to identify the diversity and limits of the literature on a particular research subject. However, ChatGPT may not be able to discern essential details in the literature or to reveal patterns of knowledge compared to the application of the experienced human eye (Aljanabi et al., 2023; Aydın & Karaarslan, 2022; Pavlik, 2023; Rudolph et al., 2023; Zhai, 2022).

Artificial intelligence can be utilized as an educational tool in cases where the discussions aimed to be had in the classroom with students are barren and cannot otherwise be developed. ChatGPT can provide detailed answers to students preparing for tests and exams, providing them with guidance on exam scope and the necessary course content to be learned (Choi et al., 2023; Duong & Solomon, 2023; Huh, 2023; Nisar & Aslam, 2023; Qadir, 2022; Rahman & Watanobe, 2023; Sok & Heng, 2023). However, students utilizing ChatGPT in place of searching for their own answers to every question can result in addiction and can negatively affect the development of human-specific critical-thinking and problem-solving skills (Larochelle et al., 1998; Steffe & Gale, 1995).

While people may seek to understand and learn more languages in today's globalized world, they cannot easily learn and use different languages due to each having its own respective educational process (Lightbown & Spada, 2013). Accordingly, ChatGPT can be essential for accessing and translating resources in different languages. ChatGPT can therefore eliminate language barriers and make information accessible in languages that individuals would otherwise not be able to access. However, whilst AI translated texts may be factually correct, they may lack the ability to capture the metaphors and nuances that a human being would more naturally make sense of; and this situation poses a risk to potentially inaccurate information being used in academic research or in other educational contexts (Bishop, 2023; Cotton et al., 2023; Gordijn & Have, 2023; Jiao et al., 2023; Kutela et al., 2023; Rudolph et al., 2023).

People constantly generate and use information to explore the dimensions of their thoughts. Associating the knowledge produced with different fields and adapting it to new fields requires interdisciplinary work between business lines (Gözüm, 2022; Mercan et al., 2022; Van Laar et al., 2017). The in-depth answers offered by artificial intelligence to complex situations and questions facilitates the adaptation of knowledge produced by humans in different disciplines. New disciplines will therefore emerge to improve human knowledge, and ChatGPT can help create literature on a particular topic as well as offer help in content creation in the field of education. However, the literature created may be far from being creative or original in discovering detailed information and relationships specific to certain fields of education. This situation also includes the risk that, after some time, content may be become similar to each other (Choi et al., 2023; Duong & Solomon, 2023; Huh, 2023; Nisar & Aslam, 2023; Qadir, 2022).

The creation of personalized learning environments and the presentation of learning experiences according to individual differences can be facilitated by artificial intelligence applications, and their essential existence can be improved. ChatGPT can create more engaging and personalized learning content for students. This may affect learning positively; however, there is a risk that ChatGPT may be far removed from social and cultural norms and offer a learning experience with a specific cultural context. This may negatively affect context formation, which is vital for the transfer of learning (Rudolph et al., 2023; Zhai, 2022, 2023).

There exists the potential for artificial intelligence to be utilized in creating new material and content in learning activities that teachers prepare individually for their students. ChatGPT offers the concept of creating material as individualized educational content, whereby the AI program could both quickly and efficiently create interesting learning resources. Students can already utilize artificial intelligence features as a helpful resource to present their ideas in different dimensions and according to a new structure. However, the material ideas suggested by ChatGPT may still require additional creativity and nuance provided through human intervention and ideation. This current limitation may reduce the generated material's potential for engaged and affective learning. In addition, copyright issues may arise regarding the patent of ideas put forward by ChatGPT with respect to the use of its materials. In this context, teachers may be asked to produce practical and creative products that can be utilized in the learning environment instead of classical paper and pencil-based tasks in the fulfilment of their responsibilities (Alshater, 2022; Lund & Agbaji, 2023; Lund & Ting, 2023; Tabone & de Winter, 2023; Zhai, 2023).

ChatGPT can save teachers valuable time and effort when creating criteria for evaluation and grading. At this point, the fact that artificial intelligence can already evaluate students individually and provide output suited to the educational environment can also affect the evaluation and rating of students. However, ChatGPT is unlikely to utilize alternative measurement and evaluation techniques, and there are risks associated with making process-based evaluations where certain information needs to be measured. ChatGPT may also present unfair criteria, ignoring the educational nature of teachers, or bypassing the need for teachers to assess the classroom atmosphere and to act accordingly (Cotton et al., 2023; Guo et al., 2023; Rudolph et al., 2023).

In the process of evaluating the interests and needs of students in the classroom and preparing activities according to the students' interests and needs, it may not always be possible due to the physical conditions and limitations of the educational environment, e.g., class size and inadequacies of the individual time allocated to each student. This situation can

also affect the orientation of the students and the direction in which they gain skills. Testing students' interests and needs through artificial intelligence before starting classroom practices can enable teachers to plan, implement, and direct a more effective educational environment for their students (Zhai, 2022, 2023).

Developing conditions for a better world awaits a human model that knows, applies knowledge, and produces new knowledge syntheses across different fields. Given our modern daily lives, people have an innate need to analyze and interpret many forms of data in order to generate more information. Due to the individual differences of people, the synthesis of analyzed information can differ, and different ideas and products can emerge as a result; however, ChatGPT offers faster data analysis and classification. Instead of using many resources while preparing educational content, teachers can design content suitable for their purposes using AI features of data analysis and data classification (Alshater, 2022; Lund & Ting, 2023; Tabone & de Winter, 2023).

While considering the potential advantages of artificial intelligence in education, it is also essential to consider the conceivable disadvantages too. Research has shown that artificial intelligence can produce false information, and it has been observed that the sources that provide the data behind artificial intelligence programs such as ChatGPT may be biased. In this context, the final evaluation of the knowledge produced by artificial intelligence in education falls ultimately on teachers and students. In ChatGPT, the algorithm is unlikely to objectively interpret the current situation, especially if the data used is biased. In order to overcome this, different and unbiased data should be created according to social and cultural norms (Cotton et al., 2023; Deng & Lin, 2022; Gordijn & Have, 2023; Hartmann et al., 2023; King & ChatGPT, 2023; Ventayen, 2023).

ChatGPT approaches the problem of evading plagiarism checks by providing users with answers to previously asked questions in different forms. However, this poses a problem since students can utilize ChatGPT for copying text and in meeting other assignment needs; whereas, these assignments are designed to promote and facilitate the students' own academic development. For this reason, cheating through this method can cause students to avoid their academic responsibilities; opting instead to shift that duty to an artificial intelligence program instead of fulfilling their own learning responsibilities and resulting in AI functioning beyond its intended purpose (Rudolph et al., 2023; Zhai, 2022).

Over time, ChatGPT has evolved to provide more accurate and precise responses. Through AI and machine learning advancements, it has become adept at understanding user queries and generating comprehensive yet specific responses. While not perfect, with the occasional discrepancy, the ability of ChatGPT to understand context, interpret complex questions, and deliver concise, relevant information has notably improved. Continued developments and refinement are expected to enhance these capabilities yet further, making ChatGPT an increasingly valuable tool in various applications, from education and research to simple information retrieval (Karakose, 2023; Karakose et al., 2023; Tulubaş et al., 2023).

Unless a platform is established to ensure objective response and accountability regarding the use of ChatGPT, many ethical issues can be observed regarding privacy, surveillance and potential risks arising from its use. ChatGPT is deemed not responsible for data privacy, accuracy, and bias. However, information produced by a platform that does not assume responsibility brings about certain problems and concerns in the legal context. Various researchers have expressed this view, with numerous concerns reported in the literature. Whether or not ChatGPT can be an author and to what extent it can be used are

among the ethical issues connected to this type of technology. It should not be forgotten that artificial intelligence is a tool for learning and a technological product that can be utilized as part of the teaching process. Therefore, educators and researchers need to adhere to ethical values themselves when it comes to the generation of knowledge and ideas (Bostrom & Yudkowsky, 2018; Etzioni & Etzioni, 2017).

Misuse of technology may cause material, social, and individual unfair gains, and the improper use of technologies such as ChatGPT may even cause injustices. While open-access has created a wealth of AI data, legal restrictions on its usage should be addressed. At this point, it is thought that the use of AI over personal human labor may cause anxiety and other problems. Since ChatGPT technology is still a very new technology, legal texts about its usage are not yet available, but there are some examples where legal texts are interpreted according to the unethical use of ChatGPT (Wang & Siau, 2019; Yudkowsky, 2008).

Thinking plays a vital role in the development of the human brain, and people solve problems through thinking (Gözüm et al., 2019) which causes an increase in neural networks and the differentiation of neural network connections in the human brain (Kaplan & Haenlein, 2019; Newquist, 1994). As a result, significant effects can be seen on the life skills of individuals. As such, a high degree of adherence to the content created by ChatGPT may negatively affect students' cognitive skills and thereby reduce their creative-thinking skills (Diamond, 2013). At the same time, the adverse effects of artificial intelligence on the social aspect of human beings should also be considered. Uncontrolled excessive use of artificial intelligence could result in harmful situations that could lead to artificial intelligence addiction or AI-induced cyberloafing by students (Gordijn & Have, 2023; Haque et al., 2022; Lund & Ting, 2023; Mijwil & Aljanabi, 2023; Rudolph et al., 2023; Vincent, 2022b). For this reason, teachers and students should not lose sight of the importance of producing their own new knowledge through the established process of analyzing, interpreting, and synthesizing ideas obtained from sources during the educational process. They should, therefore, regulate their use of artificial intelligence in a way that does not overshadow their creativity (Rudolph et al., 2023).

It is against the basic understanding of education that the social aspect of human beings and our natural senses in life are accepted only as machines. Humans should be considered as a whole, and all developmental areas of individuals should be developed within the educational environment (Butin, 2005, 2014; Tozer et al., 2011). Therefore, it is vital that ChatGPT is used in education in a way that best contributes to the holistic development of the individual.

5.1. Limitations of the study

Despite the apparent benefits of applying ChatGPT in education, the current study has several limitations. The use of artificial intelligence technologies in the education sector, such as ChatGPT, is still a relatively recent development, and the current study may therefore be limited by the basic need for long-term data and outcomes related to their implementation. While artificial intelligence technologies like ChatGPT show clear potential to enhance education, overemphasis or uncontrolled use of such programs could inhibit human cognitive and social development, and thereby overshadow the importance of producing new knowledge through critical analysis, interpretation, and the synthesis of ideas.

6. CONCLUSION

As the constructivist approach predicted, resources have increased with the modern age, leading to other tools having evolved that separate the learning source from just that of the classroom teacher. The latest version of these tools is ChatGPT, and other similar artificial intelligence applications that we have seen introduced relatively recently. In this case, it is also crucial for teachers to be better guides to their students than ever before, since with the constructivist approach, students informed through the use of artificial intelligence technologies, with all their positive and negative aspects, will still need to be guided in the right direction. It should be noted that teachers are there to act as guides, whilst ChatGPT is a learning tool that may be made use of by both students and teachers (Gözüm & Kandır, 2021; Kim, 2001).

The final result of the current research is the acknowledgement that the integration of artificial intelligence into the educational environment has already begun. Performing high-level cognitive skills such as the production, analysis, and synthesis of information through technological means has created a new paradigm, and education should take advantage of its positive aspects by utilizing this emerging paradigm. However, as a law of nature, educators are expected to think and implement creative measures in order to avoid the negative aspects of AI, meaning that education will inevitably emerge in a new form in the future.

7. SUGGESTIONS

According to the results of the current research, some suggestions are put forward to researchers, educators, and students in order that they may avoid the negative aspects of including artificial intelligence applications in education and training processes, but to also benefit from its positive aspects.

Researchers should conduct experimental research so as to determine the effects of artificial intelligence applications such as ChatGPT on education. The experimental research results on the positive effects on education identified in this literature review are essential. However, the validity of the literature review can be questioned by comparing the reported results of the experimental research with the discussions presented in the current study.

Educators should consider the suggestions of field experts in the process of integrating ChatGPT within the educational environment and as part of the teaching and learning process.

Providing inservice training to educators is critical. Also, preservice teachers could be given access to courses on artificial intelligence applications and in-class adaptation to technology usage as part of their preservice training.

Students may opt to make use of artificial intelligence applications in the constructivist education approach as one of the educational tools available to them; however, they should be made aware of their own responsibilities as students and not place that role on AI applications such as ChatGPT.

In addition, the ethical and legal status of artificial intelligence, which is one of the critical results highlighted in the current study, should be considered by users of ChatGPT. For this reason, it should be placed on the current education agenda as an education policy so that researchers, teachers, and students can be consciously aware of artificial intelligence applications and their evolvement in the future.

DECLARATIONS

Author Contributions: Conceptualization, Z.H.İ. and A.İ.C.G.; methodology, Z.H.İ. and A.İ.C.G.; software, Z.H.İ.; validation, Z.H.İ. and A.İ.C.G.; formal analysis, Z.H.İ.; investigation, Z.H.İ.; resources, Z.H.İ. and A.İ.C.G.; data curation, Z.H.İ.; writing—original draft preparation, Z.H.İ. and A.İ.C.G.; writing—review and editing, Z.H.İ., A.İ.C.G., S.P., and M.K.; visualization, Z.H.İ., A.İ.C.G., S.P., and M.K.; supervision, Z.H.İ., A.İ.C.G., S.P., and M.K.; project administration, Z.H.İ. and A.İ.C.G.; funding acquisition, M.K. and S.P.

Conflicts of Interest: The authors declare no conflict of interest.

Funding: This research received no external funding

Ethical Approval: Not applicable.

Data Availability Statement: Research data are available upon request.

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