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Original paper

The Attitudes of Students (Biomedical Engineering) Towards Chat GPT

Sharareh Ehteshamzad^{1*}, Rahim Ahmadi²

¹ Department of Biomedical Engineering, Hygiene Faculty, Medical Branch, Islamic Azad University, Tehran, Iran

² Department of Biology, Avicenna International College, Budapest, Hungary

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Abstract

Background and aim: This study explores the attitudes of biomedical engineering students towards ChatGPT, a natural language processing model developed by OpenAI. The aim is to understand the extent of its application and integration within the academic landscape, particularly in the field of medical engineering.

Methods: A survey of 150 biomedical engineering students, mostly from Iran, was conducted between May 28 and September 19, 2023. It gathered demographic data, assessed familiarity with ChatGPT, and explored attitudes toward its applications. Data was collected electronically through LinkedIn and Google Forms, prioritizing anonymity and ethical standards.

Results: Results revealed that 67.3% of participants had experience using ChatGPT, demonstrating a substantial user base among biomedical engineering students. The majority (82%) found ChatGPT to be effective and useful in learning, with 81.4% considering the learning experience through ChatGPT to be attractive. Moreover, nearly half of the participants disagreed with the notion that ChatGPT is solely an informational tool, recognizing its potential as a learning aid. Participants reported pleasant experiences (75%) using ChatGPT for learning, affirming its value in education.

Conclusion: The study underscores ChatGPT's positive impact on learning and productivity for biomedical engineering students. While acknowledging concerns about potential misuse, it suggests ChatGPT holds promise as an educational tool, emphasizing the need for ongoing research to integrate and regulate advanced language models in education.

Keywords: *ChatGPT, Artificial Intelligence, Biomedical Engineering, Learning Experience with ChatGPT*

***Corresponding author:** Sharareh Ehteshamzad, Department of Biomedical Engineering, Hygiene Faculty, Medical Branch, Islamic Azad University, Tehran, Iran.

E-mail address: bme.sharareh.ehteshamzad@gmail.com

Introduction

Biomedical engineering (BME) is an interdisciplinary field that often focuses on medicine [1]. Due to this field, medical engineers are involved in various medical fields that will lead to better services and products [2]. BME seeks improving the quality of life by using advanced technology [3]. Also, medical engineers by applying the principles of electrical, mechanical, chemical, optical and other principles of engineering help to control, diagnose and treat patients, or by integrating engineering and medicine, they make a tool to be used in the field of health [4], [5].

Artificial intelligence (AI) has transformed medical technologies and is considered a branch of computer science that can effectively handle highly complex problems in areas with massive amounts of data but limited theory [6]. AI has had a profound impact on society, bringing with it a multitude of economic benefits and improving various aspects of daily life [7]. The concept of AI was first introduced in 1950, but early models were limited in their capabilities and were not widely used in the field of medicine. However, in the early 2000s, significant advancements were made in the field of deep learning (DL), which helped to overcome many of these limitations. Today, AI has the ability to analyze complex algorithms and learn autonomously, making it a valuable tool in clinical practice [8].

ChatGPT is an advanced language model developed by OpenAI. It has the capacity to generate text based on extensive human data and can assist individuals and communities in making informed decisions about their health [9]. The model, GPT-3, boasting 175 billion parameters, represents a significant leap in language modeling technology. It forms the foundation of ChatGPT, a widely acclaimed Natural Language Processing (NLP) engine with far-reaching applications in various domains, including education and health [10]. Within just one week of its launch in November 2022, ChatGPT garnered over a million subscribers. A newer version, GPT-4, with a staggering 170 trillion parameters, was released in March, marking a major computational milestone. It has demonstrated superior performance in the US bar exam compared to its predecessor. However, users are required to subscribe and face usage restrictions. The scientific community has expressed frustration over OpenAI's limited transparency regarding the training and inner workings of GPT-4 beyond the user interface [10]. ChatGPT holds great potential in advancing both universities and libraries. It is imperative, however, to utilize this technology in a manner that is legally sound and aligns with ethical frameworks [11]. Research indicates that ChatGPT has the potential to replace conventional search engines for students and instructors alike. Students can leverage it as a tool for addressing theoretical questions and generating ideas for program-specific queries. Instructors can integrate it into classroom settings and workshops for discussing and evaluating the generated responses [12]. As artificial intelligence continues to make strides across various industries, ChatGPT emerges as a contentious force in the field of medical engineering [13]. The introduction of artificial intelligence in education stems from the integration of information and communication technologies as tools for enhancing teaching and learning [14]. Investigations have shown that artificial intelligence, in the form of ChatGPT, can influence the academic pursuits of medical engineering students. Presently, many researchers and students widely employ large language models like ChatGPT for both academic and non-academic tasks, including writing articles, formal and informal writings, summarizing articles, and even generating ideas. The use of ChatGPT has become commonplace in the realm of research [15]. The technology is applied in various educational contexts, particularly in adaptive learning systems. These systems possess the capability to adjust the content's complexity based on a student's performance [14]. Future AI support has the potential to alleviate teachers of certain tasks, enabling them to focus on creating innovative lesson plans, engaging in professional development, and

offering personalized coaching to students. These endeavors are pivotal in enhancing students' preparedness for future challenges and skills [10]. It is of utmost importance to observe ethical standards when employing this technology. Incorrect usage could potentially hinder students' learning and discourage effort, which could have a detrimental impact on teachers' performance. They may struggle to differentiate between students who genuinely engage with the material and those who rely heavily on ChatGPT, potentially affecting the assessment of students' progress and learning within the course [15]. ChatGPT introduces challenges to education, as it opens up the possibility of AI-assisted cheating in assignments and exams. This has led some educational institutions to prohibit its use on campus [16].

Given the widespread adoption of GPT-based technology among students worldwide, particularly in academic contexts, it is crucial to understand its impact on learning and knowledge acquisition. Despite its prevalent use, there remains a dearth of comprehensive studies examining students' attitudes towards artificial intelligence-assisted learning tools. Recognizing this gap, the present study focuses on investigating the utilization of ChatGPT by students in the field of medical engineering. The findings are anticipated to shed light on the extent of its application and provide insights into its effective integration within the academic landscape, shaping the future of education for students in this field.

Methods

- Study Design and Participants

This study aimed to assess the attitudes of biomedical engineering students towards Chat GPT, a natural language processing model developed by OpenAI. A cross-sectional survey was conducted between 28 May, 2023 and 19 September 20, 2023 among a cohort of 150 participants. The study cohort consisted of biomedical engineering students predominantly from Iran, with a small representation from other countries.

- Survey Instrument

A structured questionnaire was designed to gather information on participants' familiarity with and perceptions of Chat GPT. The questionnaire was divided into three sections, encompassing a total of 30 questions:

1. Demographic Information: Participants were asked to provide information on their gender, nationality, and academic status.
2. Familiarity with Chat GPT: This section included questions about the participants' prior knowledge and experience with Chat GPT.
3. Perceptions and Attitudes: Participants were asked to rate their attitudes towards Chat GPT using a Likert scale ranging from "Strongly Disagree" to "Strongly Agree" for various statements related to its applications in biomedical engineering.

- Data Collection

The survey was distributed electronically via LinkedIn and the Google Forms platform, ensuring anonymity and confidentiality. Participants were provided with a clear explanation of the study's purpose, estimated time required for completion, and instructions for navigating the questionnaire.

- Ethical Considerations

This study obtained ethical approval from the Institutional Review Board, adhering to established guidelines for research involving human participants. Informed consent was obtained from all participants prior to their participation in the survey.

- Data Analysis

The data collected for this study was stored and managed securely using Google Drive, allowing

for organized storage of survey responses and related documents. Descriptive statistics, including frequencies and percentages, were employed to summarize demographic characteristics and participants' attitudes towards Chat GPT. Comparative analyses were conducted to assess potential differences in attitudes based on gender and nationality.

Results

Table 1. Demographic Profile of the Participants: This section encompasses information on the quantity, gender distribution, age distribution, and educational background of the surveyed population.

Total number of participants	Gender	Average Age	Graduation Status
150	Female: 48%	18-22: 23.3%	Graduated: 62%
	Male: 52%	23-25: 36.7%	Undergraduate: 38%
	-	25-30: 30.7%	-
	-	Above 30: 9.3%	-

The results showed that 67.3% of the studied population have experience using GPT chat, while 25.4% of them have not had such experience.

Regarding the effectiveness and usefulness of GPT chat in learning, 82% of the studied population believed that this technology can be useful, while 14% of this population believed that GPT chat is not effective in learning (Figure 1).

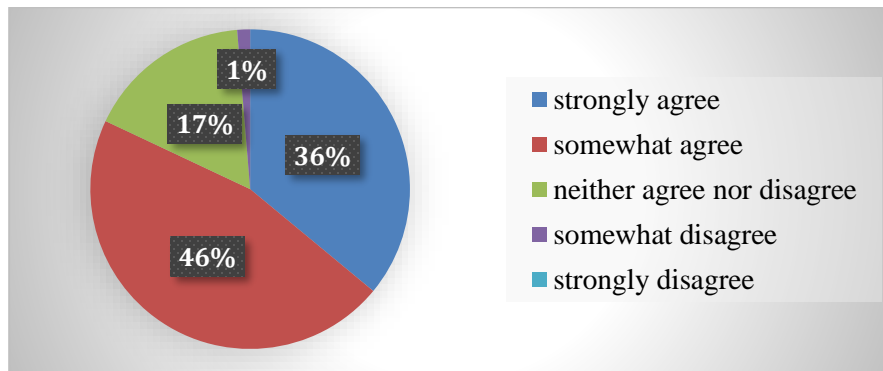


Figure 1. The percentage of people's answers regarding the usefulness and effectiveness of Chat GPT in learning

81.4% of the population stated in the survey that the experience of learning through GPT chat can be attractive for them, and only a small percentage did not find learning through GPT chat attractive (Figure 2).

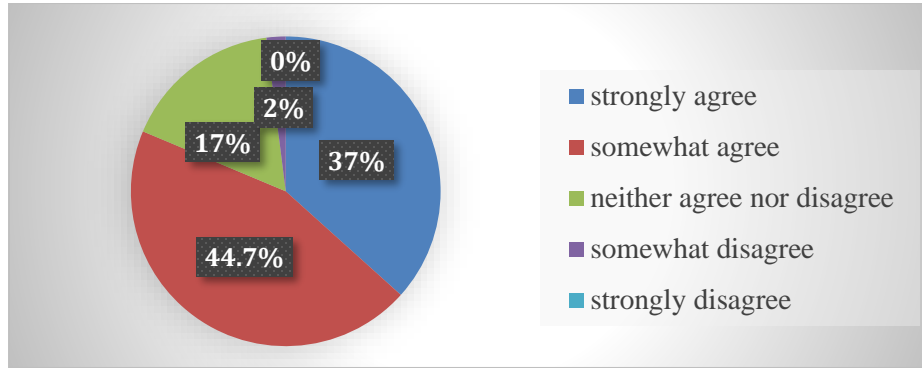


Figure 2. Percentage of attractiveness of learning with chat GPT for survey participants

About the fact that chat GPT is only an information tool and not a learning tool, almost half of the surveyed population disagreed, while 29% had no opinion and almost 20% of the population agreed (Figure 3).

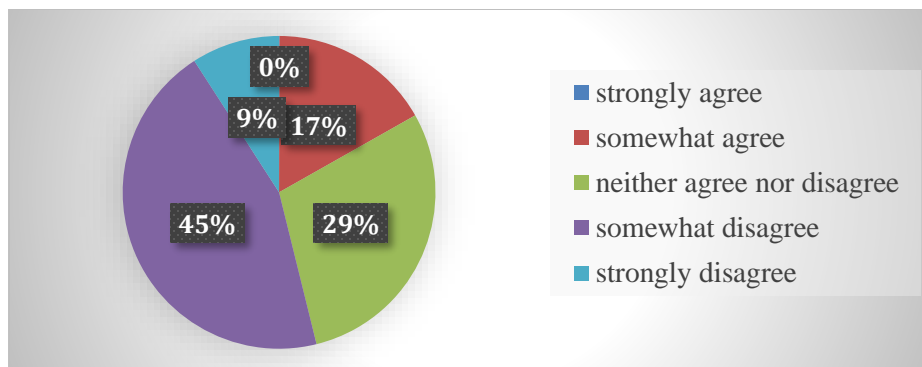


Figure 3. The percentage of participants' opinions about Chat GPT being merely an informational tool rather than learning

Also, 3/4 of the participants considered using Chat GPT for learning as a pleasant experience, and this percentage was very small among the opponents (Figure 4)

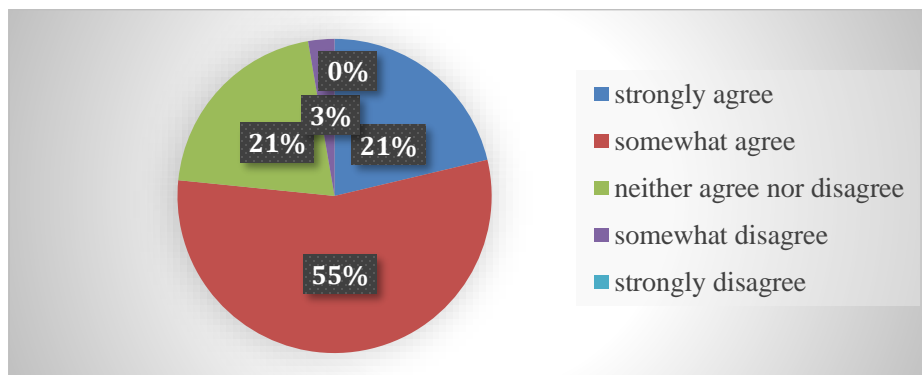


Figure 4. Percentage of Users Finding Chat GPT Beneficial for Learning

86.6% of the participants, who included medical engineering students, believed that their courses are such that the use of technology is helpful. The percentage of opponents was only close to 5% (Figure 5).

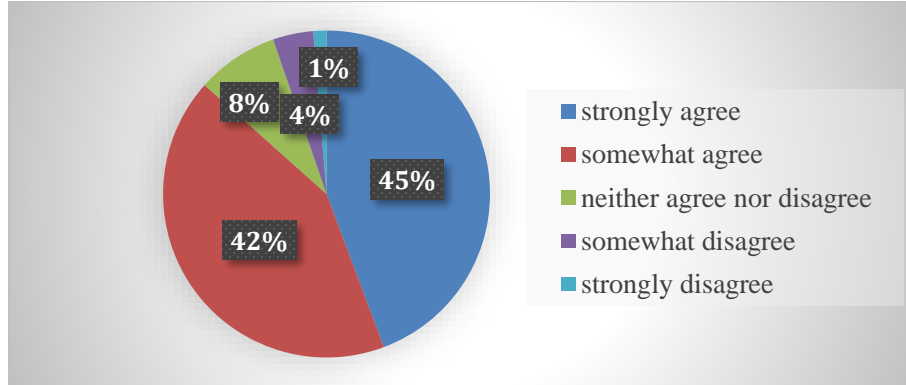


Figure 5. Participants' opinion regarding the relevance of their academic courses to technology

More than 3/4 of the participants believed that the use of GPT chat accelerates and facilitates learning, while only nearly 5% of them disagreed with this issue (Figures 6 and 7).

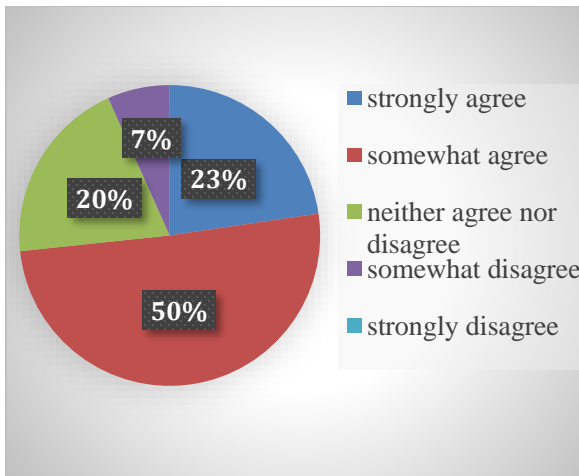


Figure 6. Percentage of people who think that chat accelerates learning

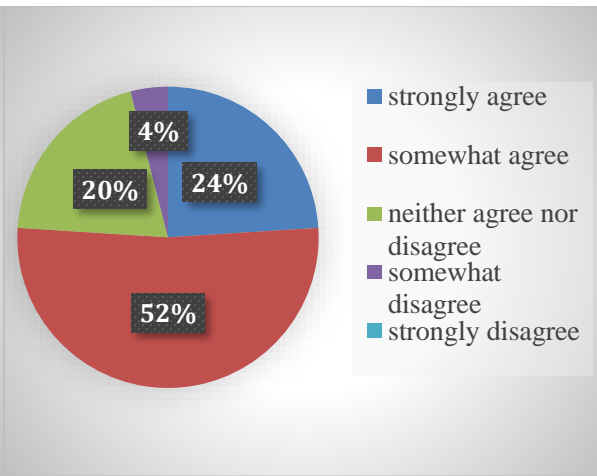


Figure 7. Percentage of people who think that chat facilitates learning

Also, 70% of participants agreed that Chat GPT is very useful for reviewing course materials, while only nearly 7% disagreed and 23% had no opinion (Figure 8).

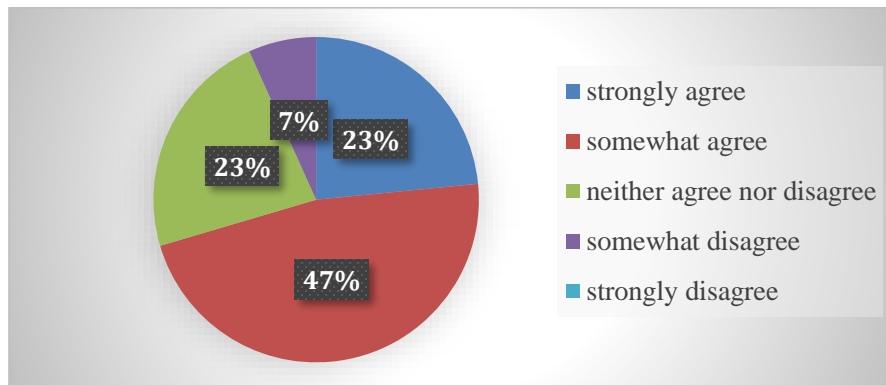


Figure 8. The opinion of the participants about reviewing course materials with Chat GPT

47.7% of the participants believed that Chat GPT is more efficient than other technologies, while 38.7% of the population did not have an opinion about this (Figure 9).

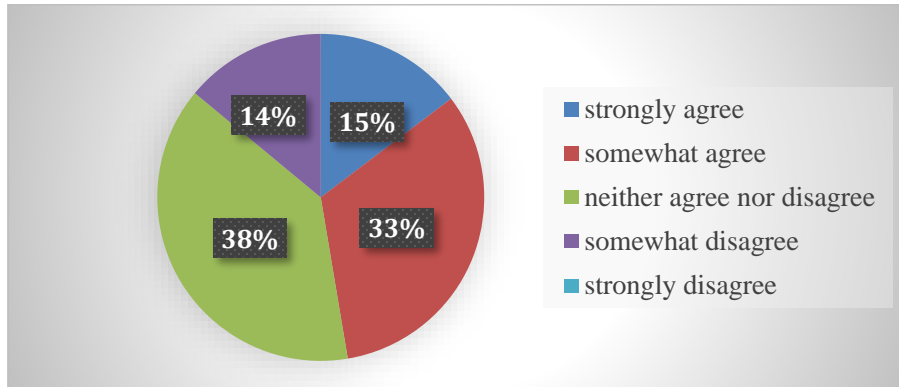


Figure 9. Comparative Evaluation of GPT Chat and Other Technologies According to Participant Perspectives

More than 70% of the participants believed that by producing educational content by ChatGPT, it is possible to make the best use of this technology and also reduce wasted time. (Figures 10 and 11)

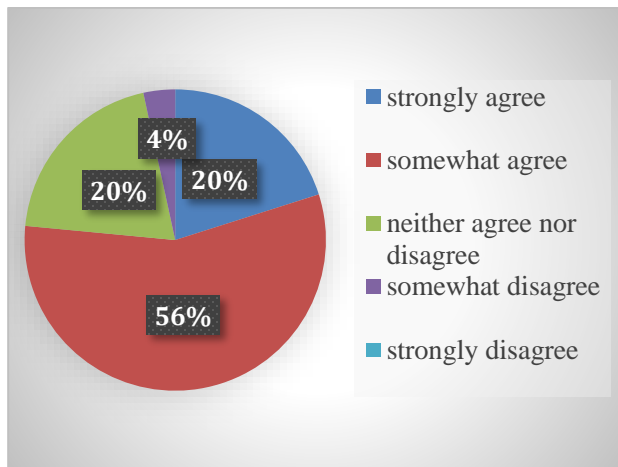


Figure 10. The opinion of the participants regarding the usefulness of content creation with Chat GPT Chart

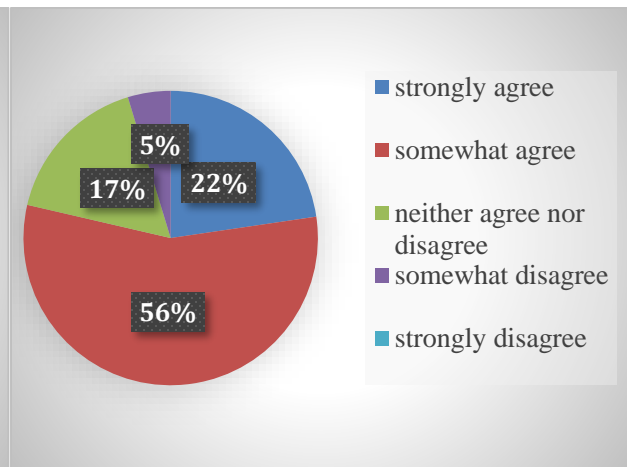


Figure 11. The opinion of the participants regarding the reduction of wasted time by using ChatGPT

Figure 12 illustrates that 64% of participants find that GPT chat increases their motivation to learn, with a minority expressing disagreement on this matter (Figure 12).

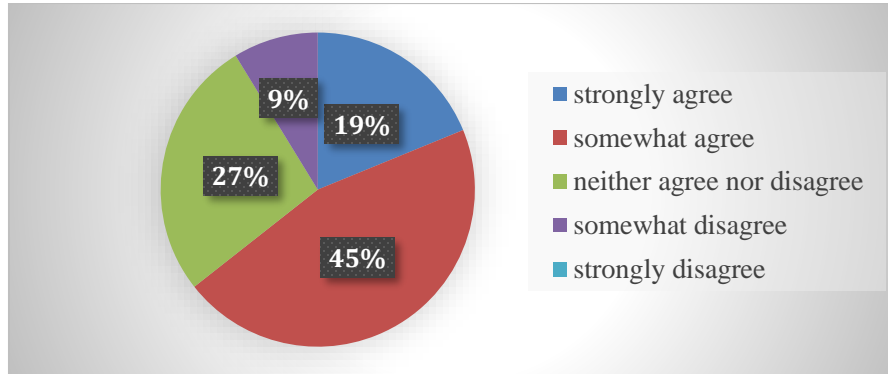


Figure 12. Participants' opinion regarding the effect of ChatGPT to increase motivation for learning

71.8% of the statistical population believe that the future of ChatGPT will completely transform education, while about 22% of them did not have such an opinion (Figure 13).

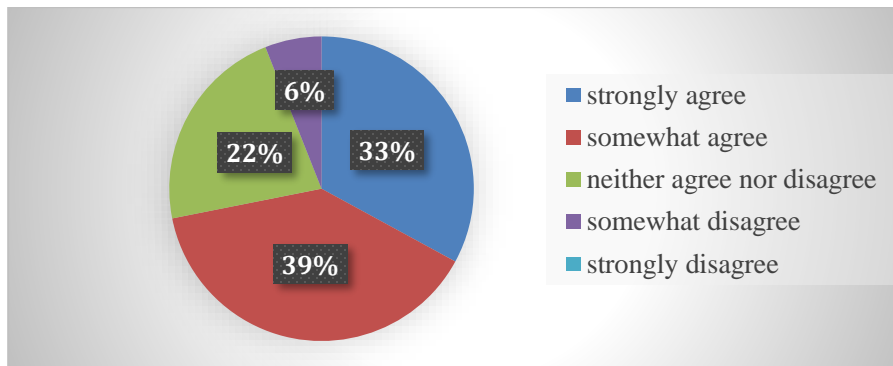


Figure 13. Participants' opinion regarding the transformation of education in the future by ChatGPT

According to Figure 14, 42.3% of respondents believe that the use of ChatGPT leads to an increase in cheating. Meanwhile, 28.9% did not express a specific opinion on this matter, and 23.5% disagreed, asserting that this technology is not a cause of cheating.

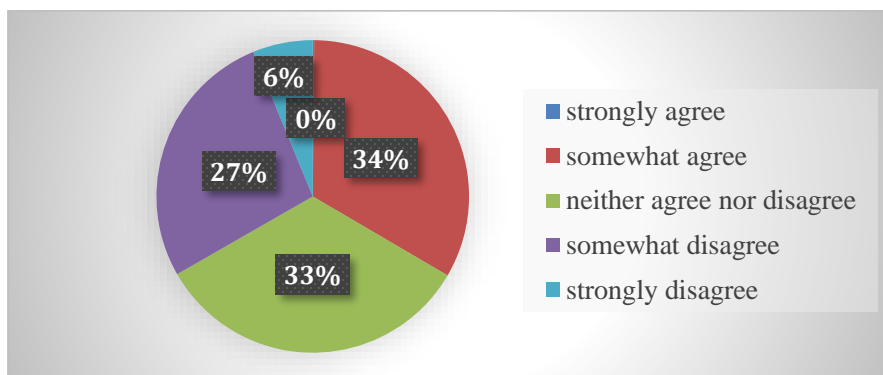


Figure 14. The opinion of the participants regarding the increase of cheating using ChatGPT

About 3/4 of the participants believed that the use of GPT chat facilitates research work and the production of scientific articles and accelerates their production, while about 20% did not have an opinion on this issue (Figures 15 and 16).

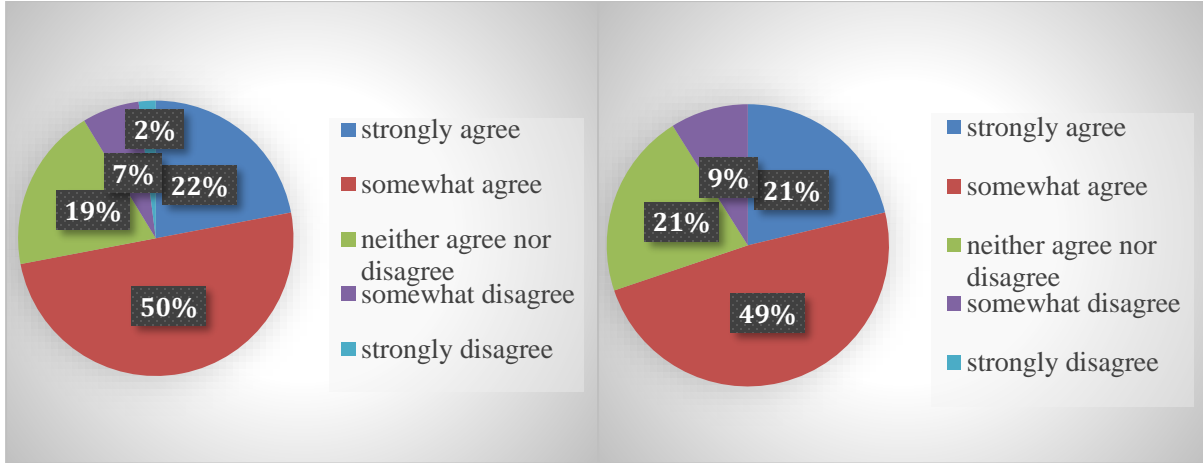


Figure 15. Users' opinions regarding the fact that the use of ChatGPT facilitates the production of scientific articles

Figure 16. Users' opinions regarding the fact that the use of ChatGPT accelerates the production of scientific articles

More than half of the surveyed population disagreed with restricting the use of this technology, while about 20% agreed and 27.3% had no opinion about it (Figure 17).

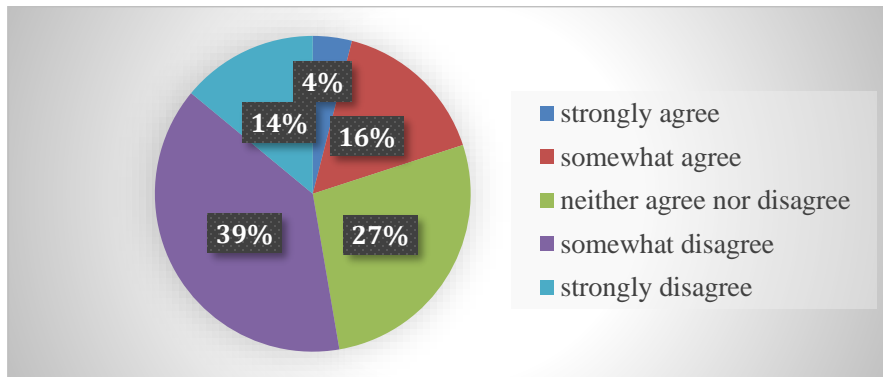


Figure 17. Users' opinions regarding the limitation of the use of ChatGPT

About 72% of the statistical population agree with the expansion of GPT chat in education and 22.7% have no opinion (Figure 18).

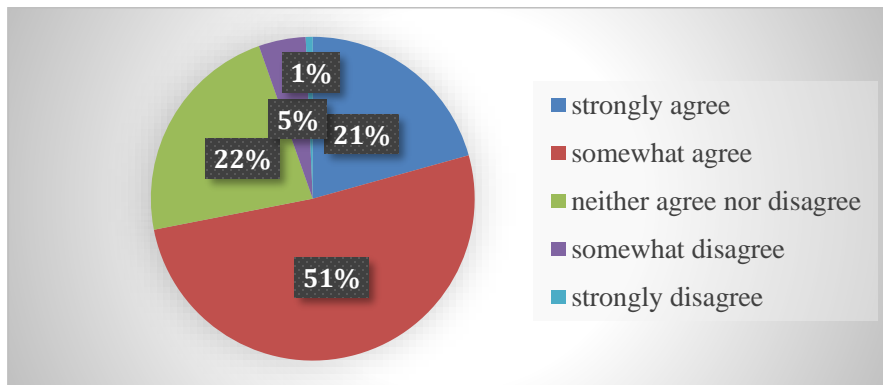


Figure 18. Users' opinions regarding the restriction of the use of ChatGPT

Regarding the future of GPT chat and the replacement of textbooks, 47% of the participants believed that GPT chat will replace books in the future, while nearly 30% had no opinion about this. And 18.8% were against this claim (Figure 19).

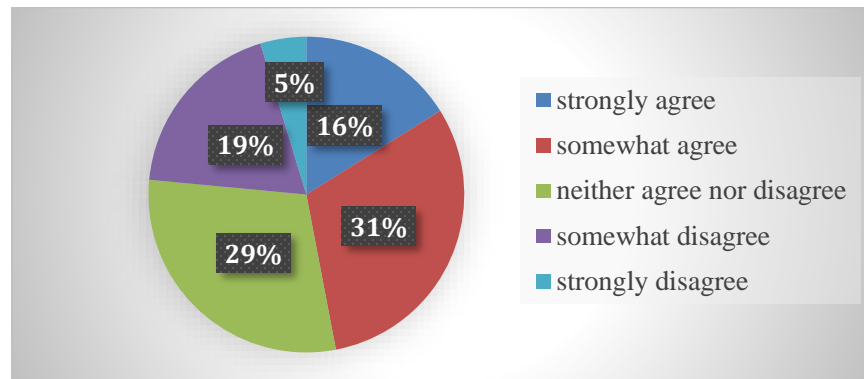


Figure 19. Users' opinions regarding replacing textbooks with ChatGPT in the future

Discussion

Results of this study indicate that more than half of the participants in this survey had experience using ChatGPT. Other studies also show that the use of ChatGPT among students is expanding. In this regard, the study conducted in this article demonstrates that ChatGPT plays a significant role in studies and universities [11]. The results of this study showed that, in the opinion of most participants, using ChatGPT can be beneficial and effective, while also facilitating and expediting learning. As previous studies have also shown, the use of ChatGPT can be a suitable tool for learning. In this context, ChatGPT can serve as a tool in various educational fields, providing teachers with the opportunity to focus on creating creative lesson plans and participating in student professional development. These efforts are crucial for enhancing students' readiness for future skills and challenges [10]. Moreover, more than half of the participants believed that ChatGPT, in addition to being an informational tool, is also a learning tool. Additionally, nearly half of them believed that ChatGPT is superior to other technologies and motivates them to learn. Furthermore, the majority of the surveyed population believed that using ChatGPT can make the production of scientific articles easier and faster. Other studies also indicate that researchers have shown a great interest in ChatGPT and its application in their research. These studies have stated that the use of ChatGPT in research has become very common [15]. Additionally, the majority of participants had a positive outlook regarding the future of ChatGPT. They believed that the educational process will undergo a transformation with this technology. Some even agreed that in the future, this technology could replace textbooks. In this vein, studies have shown that ChatGPT serves as a powerful tool for both students and instructors, potentially replacing search engines. This aids students in addressing theoretical questions and generating ideas for program-specific queries. Instructors can seamlessly integrate it into classrooms and workshops for discussion and evaluation of responses [12]. However, some participants believed that there might be an increase in cheating through the use of ChatGPT, and some research indicates that the use of ChatGPT may disrupt learning. In this regard, studies have been conducted demonstrating that the use of ChatGPT may lead to a reduction in learning quality and an inability for instructors to accurately assess student learning [15], [16]. In this survey, more than half of the population opposed restricting this technology, while the majority were in favor of expanding its use in education.

Conclusion

In conclusion, the results of this study indicate that a significant portion of the participants in this survey believe that using Chat GPT is a useful and practical tool for facilitating quick and efficient learning. It is also seen as a valuable resource for generating scientific articles and preventing time wastage. However, some individuals express concerns about the potential negative impact of Chat GPT on active learning and the possibility of cheating in courses where its use is permitted. Therefore, careful regulation of its usage is deemed necessary. A noteworthy percentage of participants believe that Chat GPT has the potential to revolutionize education in the future, with some even advocating for its widespread adoption as a substitute for traditional textbooks. Nonetheless, further research is needed to gain a more comprehensive understanding of students' attitudes towards the use of Chat GPT and to delineate its strengths and weaknesses more precisely.

Acknowledgment

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Conflict of interests

The authors declare that there are no competing interests.

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