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Integrating ChatGPT in Education and Learning: A Case Study on Libyan Universities

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A B S T R A C T

Integrating Artificial Intelligence (AI) technologies in the process of learning and education has become one of the revolutionary technological advancements of this era. This study evaluates the potential for integrating ChatGPT into university-level learning and education in Libya. An online questionnaire was distributed to students and academic staff across Libyan universities, with statistical analysis conducted on over 1000 responses to identify patterns. Despite a high number of participants being unfamiliar with ChatGPT, there was strong motivation to learn and integrate it into their work and studies. Scientific research and study emerged as the primary applications of ChatGPT among lecturers and students, respectively, with mobile applications being the most common access point. The findings indicate widespread consent for integrating ChatGPT into the educational process of Libyan universities. However, concerns were raised about overreliance on AI technologies, potentially leading to laziness and compromising integrity and creativity, particularly among students. Given the inevitability and increasing use of such technologies, the study emphasizes the importance of establishing rules and regulations for the utilization and integration of AI-supported tools like ChatGPT.

دمج خدمات تشات جي بي تي في التعلم والتعليم: دراسة على الجامعات الليبية

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الكلمات المفتاحية:
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تشات جي بي تي
الدمج
التعلم والتعليم
دراسة
التحليل الإحصائي.

الملخص

إن دمج تقنيات الذكاء الاصطناعي في عملية التعليم والتعلم أصبحت إحدى ثورات التطور التقني لهذا العصر. هذه الدراسة تهدف لتقييم كيفية دمج تشات جي بي ت في التعليم والتعلم داخل الجامعات الليبية. تم توزيع استبانة الكترونية على الطلبة والكادر الوظيفي على مختلف الجامعات داخل ليبيا. تم استخدام التحليل الإحصائي على أكثر من ألف عينة للحصول على تصور عام للنتائج. بالرغم من وجود عدد كبير من المشاركين الذين لا يعرفون ماهو تشات جي بي تي إلا أنه يوجد لديهم إقبال عالٍ على استخدامه ودمجه في دراستهم وعملهم. يُعد البحث العلمي وكذلك الدراسة من أهم تطبيقات تشات جي بي تي بين أعضاء هيئة التدريس والطلبة. تُعد تطبيقات الهاتف النقال الطريقة المفضلة لاستخدام تشات جي بي تي. العينة توضح قبول كبير داخل الجامعات الليبية لدمج خدمات تشات جي بي تي في العملية التعليمية ولكن في نفس الوقت هناك تخوف من التأثير السلبي للاعتماد على هذه الأداة والذي بدوره قد يسبب التكاسل على أداء المهام وفقدان النزاهة العلمية والإبداع بين المستخدمين خصوصاً الطلبة. حيث إن هذه التقنيات المدعمة بالذكاء الاصطناعي قادمة لا محالة، فإن هذه الدراسة تحض وتؤكد على حاجة المؤسسات التعليمية تحديداً الجامعات الليبية على تعديل قوانينها ولوائحها لاستخدام ودمج هذا الأداة.

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1. Introduction

This is the Artificial Intelligence (AI) era, where AI technologies are continuously integrated to underpin various applications in different domains. One AI-supported technology that has emerged lately is the use of chatbots, especially ChatGPT, in learning and education. This has introduced extraordinary opportunities combined with enormous challenges that have triggered researchers to identify the impact of chatbots in education, showing possible benefits and risks.

ChatGPT (Generative Pre-trained Transformer), developed by OpenAI and released to the public on November 30th, 2022, has been widely utilized across different user groups for various purposes. The characteristics of this tool, such as being somewhat concise, conversational, and remembering the chat with the user, provide a personalized, engaging, and creative learning experience.

With the assistance of ChatGPT, especially the non-free version (GPT-4), learners have quick access to information in any domain, an assistant tool to solve mathematical problems, an easy method to write essays and assignments, and a mentor for coding and debugging codes. Educators can gamify education, making the classroom more engaging and collaborative. They can also generate quizzes, give quick feedback, and grade their students individually. Researchers have easy access to any information and scientific papers related to their domain of interest, with a variety of ideas for brainstorming and a list of related references.[1] [2]

Although there are other well-known chatbots like Google Bard (recently renamed to Gemini), ChatGPT has gained popularity over them. For instance, regarding topics related to education, millions of tweets were produced within the first two months of its release[3]. It is argued that it is more popular now than the search engine Google, and this might be because some people prefer the information in a conversational manner rather than links leading to the search results. Indeed, it is changing how users engage with technology[4].

While students seem to be exhilarated about the ability to use ChatGPT for their studies and assignments, educators, on the other hand, are concerned about the risks of this chatbot. It is evident that some educators might downgrade students' assignments out of suspicion about the use of ChatGPT to write them [5]. Some universities welcomed the use of ChatGPT with caution, while others banned its use and adopted tools that can detect AI-generated text. This is because ChatGPT, as a language model that learns from user-generated content, can spread misinformation, create opportunities for cheating and plagiarism, introduce ethical and security issues, negatively affect student-teacher communications and interactions, and hinder learners' critical thinking and creativity[6].

ChatGPT is already being used by learners and is going to become even more popular. Therefore, instead of banning ChatGPT, feasible and rigorous regulations and policies must be implemented for its integration into education [7] [8].

With these promising benefits and invincible complications, researchers are still exploring how to safely integrate and implement ChatGPT in the education sector. As Libyan universities have been effectively evaluating how to employ cutting-edge technologies into their educational process (e.g, [9]), this study attempts to evaluate the possibility of integrating ChatGPT into education at the university level in Libyan universities, showing possible benefits, main challenges, and recommended guidelines. This study answers the research questions:

Q1: What are the main benefits and challenges of integrating ChatGPT into education within Libyan universities?

Q2: Are students and educators ready for this tool?

Q3: How to effectively integrate this tool in the education and learning process?

2. Related Work

Since its release and due to its popularity, ChatGPT has been the focus of many multidisciplinary researchers evaluating its application in the field of education and learning, focusing on its capabilities and undeniable risks.

An early study on the merits and challenges of using ChatGPT for teaching and learning addressed how it can impact the education sector. The study summarized the benefits of ChatGPT for students in terms of learning new vocabulary, translation, and generating reading and writing ideas. The study also showed that teachers utilize ChatGPT to gamify education, make quizzes, and provide clarifications, as well as tailored and engaging lessons. The authors highlighted the importance of the human role, specifically teachers. They recommended the presence of teachers while learners benefit from ChatGPT in their studies. Finally, they recommended responsible use of ChatGPT to avoid its risks [10].

The findings conform with another literature review article that collected scientific papers produced within the first three months of ChatGPT's release. The article highlighted how ChatGPT revolutionized the higher education sector by introducing more collaborative and engaging classrooms with more interactive communications between teachers and students, facilitating remote learning, automating repetitive tasks, and enhancing academic writing. However, the authors also pointed to some critical issues related to the use of ChatGPT, especially the lack of transparency, creativity, and critical thinking, the possibility of plagiarism, and issues related to data privacy and security. Additionally, ChatGPT can provide different responses to the same prompts, which might cause confusion and different learning experiences. The article concluded with guidelines on the appropriate usage of ChatGPT and encouraged consultation with experts from various fields such as education, psychology, and data security to ensure the ethical use of this tool [11].

Another systematic literature review of using AI chatbots in education, including ChatGPT, shows that students benefit the most from chatbots, which provide personalized learning experiences that suit their needs and motivate them to study and solve difficult problems. Educators use the chatbots to provide tailored learning activities and customized feedback that adheres to their students individually. However, educators were also concerned with the drawbacks brought by the chatbots, such as reliance, false information, and ethical issues that can affect students' achievements, creativity, and integrity [12].

Other researchers focused on the implications of implementing advanced AI technologies in higher education, showing how traditional classes are not as effective as they used to be and that institutions need to adopt AI chatbots like ChatGPT for more effective studying, teaching, and research. Like the other studies, regulations and rules to mitigate the negative impacts of this tool are encouraged. It is recommended to spread awareness among students about the essential characteristics of ChatGPT, such as its source of information and its limitations [13].

As ChatGPT has shown a great ability to pass exams in different domains, including education, mentors are concerned about how to perform assessments rigorously for plagiarism detection. Nine authors from seven different Australian universities examined the performance of ChatGPT in engineering education assessment. Ten subjects were used to examine ChatGPT's responses. The study shows that ChatGPT could generate responses excellently. It is very likely that ChatGPT will become even more powerful in newer versions as larger datasets will be used for training this tool. The authors are encouraging the engineering community to avoid writing assignments for assessment and to adopt interview, project, and experimental-based assessments [14].

Another engineering-background author has utilized ChatGPT to demonstrate its possible capabilities and limitations in engineering education. The author prompted ChatGPT with multi-domain inquiries to obtain and examine its responses. The author emphasizes that due to the potential of ChatGPT and other AI tools, these are sooner or later going to be used in the engineering sector. Therefore, the community needs to be aware of the drawbacks of these AI tools and improve their regulations to minimize these limitations [8].

A group of 22 scientists, engineers, and researchers from different institutions among five leading countries recently explored the "transformative effects" of ChatGPT on education. The authors explained that ChatGPT has gained international popularity due to its "cogent, orderly and instructive" responses.

Like all other articles in the literature, they emphasized similar capabilities and limitations of this chatbot, yet they raised a concern about the credibility of the data used to train ChatGPT, which might jeopardize educational value. They also explained that not all learners have access to a stable internet connection, which will increase the digital gap due to inequality in learning opportunities among students across the world [15].

With the great benefits of ChatGPT for students, greater responsibilities rely on the educators and educational institutions to ensure the effective, reasonable, and ethical utilization of this tool. Educators need extensive training on how to use this tool effectively [16]. They must enhance their teaching methods to comply with the new advancements in the teaching process in the era of ChatGPT [17]. Although ChatGPT is beneficial for both tutors and students, there are limitations that require immediate attention, where educational institutions and educators need to set assessments and policies that can detect AI-generated text, and educate students on the limitations of ChatGPT to eliminate cheating and encourage critical thinking and creativity [18].

3. Methodology

1. The Questionnaire

An electronic questionnaire was prepared using Google Forms. The questionnaire consists of three parts: the first part is for personal information about the participants. The second part contains items for individuals who do not use ChatGPT, while the third part contains five items for participants who use this AI tool. The questionnaire was carefully reviewed and tested before being distributed to ensure accuracy and avoid errors.

2. Sample Collection

This study targeted students and all staff members (i.e., lecturers, teaching assistants, technicians, and other employees) within various Libyan universities. The questionnaire link was posted on student groups on Microsoft Teams and other social media applications, including WhatsApp and Facebook groups of various colleges of Libyan universities to reach the largest possible population. Within approximately a month, 1138 individuals participated, and their views were collected for analysis.

3. Statistical analysis

The collected data was reviewed and statistically analysed using Microsoft Excel and IBM SPSS. Categorical data was described in numbers and percentages, and scaled data was presented as Mean and Standard Deviation.

A Chi-square test was performed to investigate the relationship between the demographics and scaled variables. Further, T-test and One-Way ANOVA analysis were used to determine whether there are any statistically significant differences between the means of participants' responses based on the study factors. P-value of <0.05 was considered as significant. All assumptions of statistical tests have used in the analysis was investigated and met.

4.Results

In this study, 1138 individuals participated in filling out the electronic survey, but 3 of them were excluded due to duplications; hence the analysis was performed on 1135 participants. As shown in Table 1, most of the respondents (61%) were females, and only 39% were males. Also, 33% of the respondents were between the ages of 35 and 44 years old, followed by 23% and 21% who were aged 25-34 and 18-24, respectively. Seventeen percent of the sample were aged 45-54 years old, and only 6% were above 55.

Furthermore, the results indicate that lecturers comprise 49% of the sample, while students make up 31%. The remaining university staff represents a smaller percentage.

Table1: Frequency distribution of characteristics in all selected participants

variables		n	Percentage
Gender	Male	696	61%
	Female	439	39%
Age	18-24	243	21%
	25-34	260	23%
	35-44	376	33%
	45-54	195	17%
	55-64	51	05%
	65 & above	10	01%
University	Gharyan	304	27%
	Tripoli	128	11%
	Others	703	62%
Participants	student	357	31%
	Teaching assistant	120	11%
	Employee	84	07%
	Technician	23	02%
	Lecturer	551	49%

Additionally, in terms of the academic degrees of educators, it is noticeable (Figure 1) that out of 551 educators, most of them are assistant lecturers and lecturers, as their percentage reached 37% for both. The percentage was small for those who hold the degree of professor.

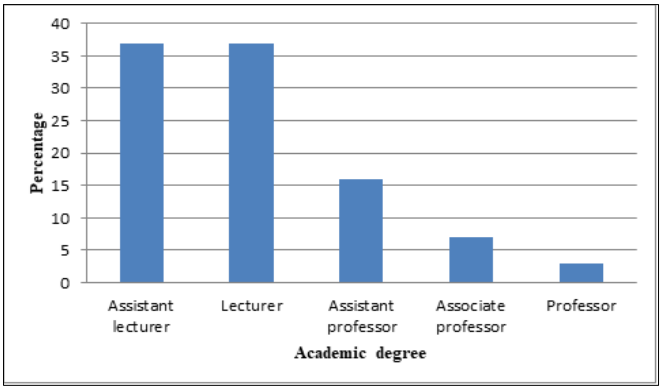

Figure 1: The percentage of an academic degree of educators

As shown in Table 2, there is a statistical relationship between the participants who use or do not use ChatGPT and the study factors i.e. gender, age, and participants' status. Although ChatGPT has become popular recently, the majority of the participants (60%) have not used this AI tool before.

Moreover, the findings showed that men are more likely to not use ChatGPT compared to women. Also, individuals who are aged between 35 and 44 seem to be equivalent in terms of using or not using ChatGPT, as this age group scored top in both categories. The next age group who has not used ChatGPT before was between 25 and 34. Younger generation (18-24 years old) seem to be familiar with this AI tool. Besides, the use of ChatGPT is more common among educators and students compared to others.

Table 2: Chi-Square test results for the participants who use or do not use ChatGPT and the study factors

Factors		No	Yes	P
Gender	Male	454	242	0.000
	Female	228	211	
Age	18-24	146	97	0.000
	25-34	174	86	
	35-44	211	165	
	45-54	112	83	
	55-64	30	21	
	65& above	09	01	
Participants	Students	214	143	0.037
	Teaching assistant	77	43	
	Employee	65	19	
	Technician	21	02	
	Lecturer	305	246	

The participants in this study provided multiple reasons for not using ChatGPT before. Due to lack of familiarity with this tool, 90% of individuals have not used ChatGPT before, however, 69% of them have a desire to use it in the future (as shown in Figure 2).

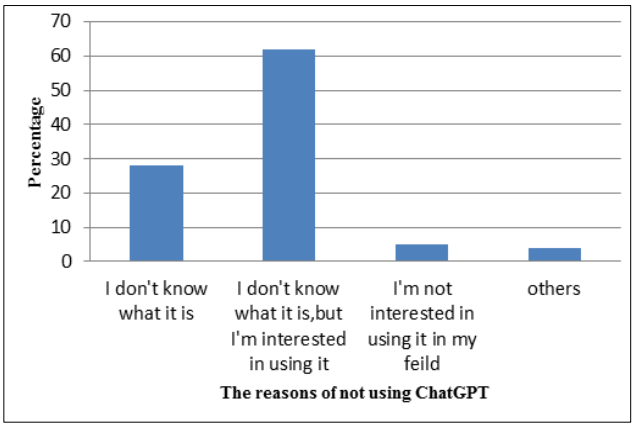

Figure 2: The reasons of not using ChatGPT from participations

Only 4% of the individuals who have not used ChatGPT stated other different reasons for that; these can be summarized as: their lack of knowledge on how to use it, their fears that it would weaken their intellectual creativity, and finally they stated that there is no need to use this AI tool in their field of interest.

As illustrated in Table 3, most of the participants (90%) who have used ChatGPT agreed that it is useful in their domains, and 75% of them agreed that it should be integrated in learning and education. This is confirmed by the average values of their answers, which were high. More importantly, the value of the standard deviation is small, which indicates that there is a relatively high level of agreement among the respondents.

Table 3: The response of participation who use ChatGPT about useful of this AI tool and integration it in education.

Question	Result	%	Mean	S.D*
Do you think using ChatGPT is useful in your field?	Agree	90%	2.85	0.48
	Don't know	5%		
	Disagree	5%		
Your opinion in integrating ChatGPT in learning and education.	Agree	75%	2.61	0.73
	Don't know	10%		
	Disagree	15%		

* S.D: Standard Deviation

In addition, the sentiment analysis of users' comments on the same point (i.e. how do you think ChatGPT is going to be useful in your field when integrated in learning and education?) showed positive responses across all comments except for one that was neutral, which implies that there is an overall acceptance of the integration of ChatGPT at the university level in the Libyan university education.

As shown in Figure 3, the participants who have used ChatGPT use it on different platforms. The most common one is mobile phones (47%) followed by browsers (27%) and then laptops (26%).

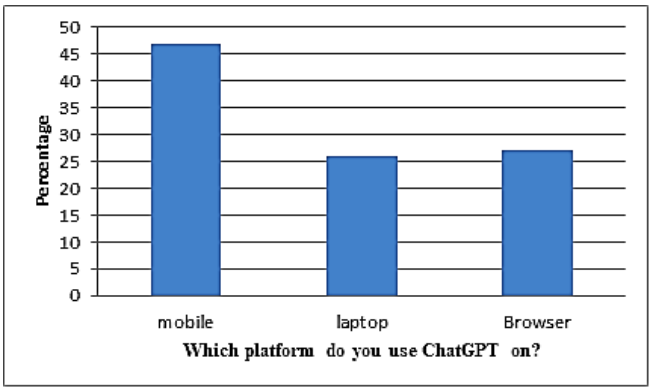

Figure 3: The percentage of participations for platform that used in ChatGPT

Additionally, as can be seen in Figure 4, participants use ChatGPT for several purposes; most of which is scientific research (43%), then studying (29%), followed by preparing lectures (16%), and finally assignments and writing tasks (12%). Some of the participants added that they use it for translation, learning science and acquiring knowledge in diverse domains.

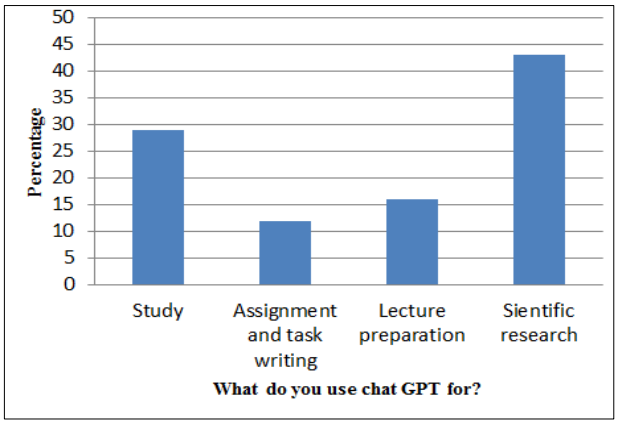

Figure 4: The percentage of participations for the purpose of their using ChatGPT

An independent T-test and One-Way ANOVA analysis were used to study the differences between the participants' responses regarding their views on the usefulness of ChatGPT, and the possibility to integrate it in learning and education. This was in terms of their age, gender and status. Regarding gender, there was no statistically significant differences between the participants' responses (P-value>0.05). This indicates that male responses do not differ from females' regarding the two questions shown in the Table 4.

Table 4: The results of independent T-test

Question	P-value
Do you think using ChatGPT is useful in your field?	0.293
Your opinion in integrating ChatGPT in learning and education	0.173

Similarly, the results of ANOVA analysis (Table 5) indicate that there were no differences between the participants' responses in terms of age or status (P-value>0.05).

Table 5: Results of One-Way ANOVA analysis

Question	Factor	P-value
Do you think using ChatGPT is useful in your field?	Age	0.519
	Status	0.314
Your opinion in integrating ChatGPT in learning and education.	Age	0.165
	Status	0.08

5. Discussion

This section addresses three main points: limitations and assumptions associated with this case study and a summary of the benefits, disadvantages, and possible regulations of using ChatGPT in learning and education.

There are some limitations in this study that might affect its generalizability. Although a comprehensive list of Libyan universities was provided within the questionnaire, an option for "other university" was included in case a university was missing. However, the questionnaire did not allow participants to add the name of their university, resulting in (158) responses under this option. Allowing participants to add the name of their university when missing could have benefited the study.

Additionally, while the sample size was adequate for analysis, it was relatively small compared to the actual number of students and academic staff in Libyan universities. There appears to be a general reluctance to participate in questionnaires, even electronic ones.

Furthermore, due to the lack of official communication channels with universities, social media and other platforms like Microsoft Teams were used to distribute the questionnaire. While this approach helped to reach many participants, distributing the questionnaire officially, such as by publishing the link on universities' websites, might have increased participation.

Most of the assumptions associated with the study's factors were accurate except for a few cases. For example, it was expected that lecturers and students would be the main participants and fewer responses would be collected from the other academic staff; it was indeed the case. However, it was expected that students would participate the most, but it was not the case as lecturers were the main participants (357 compared to 551 respectively).

It was expected that not many participants are familiar with ChatGPT, especially the employees and technicians, this assumption

was accurate. Also, in terms of age, it was expected that the older the participant, the more likely that they would not be familiar with ChatGPT. This assumption was partially accurate as participants from the age group 35-44 participated the most with 376 participants and 165 of them are familiar with ChatGPT.

As can be comprehended from the literature and the presented case study, ChatGPT is already being used and is going to be used even more in the future i.e., it is inevitable. Therefore, it is important to raise awareness of the capabilities and limitations of ChatGPT as well as implement rigorous regulations and guidelines on how to properly use it.

The benefits of this tool as well as the accompanied limitations are explicit, but what is challenging is how to avoid or at least minimize these limitations. Some of the studies listed in the related work section, especially the review articles, discussed some guidelines on how to properly use ChatGPT in general, and for learning and education in specific. For instance, it is recommended to use ChatGPT as a secondary assistant tool, and to encourage the learners not to completely rely on this tool [11].

Also, academic institutions, publishers, language model programmers are encouraged to cooperate to ensure an ethical and moral use of ChatGPT, where scientific integrity cannot be compromised [19]. Some studies discussed ideas for implementing ChatGPT in education showing possible technological issues and methods to overcome them [20].

More importantly, there is an agreement in literature on motivating academic institutions to invest in training educators on how to properly use this chatbot, this is to ensure proper utilization in the learning process.

Finally, it is essential to implement rigorous detecting tools and watermarks in text generated using AI tools; this has been already recommended by OpenAI and is a work in progress, as so far detection tools like ZeroGPT are reported to be insufficient.

Inspired by the literature, Table 4 summarizes the possible benefits, limitations of integrating ChatGPT in the Libyan university education sector and provides possible guidelines on how to effectively overcome the limitations of this integration.

Table 4: The possible benefits, limitations and guidelines of integrating ChatGPT in learning and education.

Benefits	Limitations	Guidelines
Collaborative and engaging classes	lack of creativity and critical thinking	Use ChatGPT as an assisting secondary tool.
Remote learning and suitability for disabled students	Lack of emotional intelligence and student-teacher communications	Encourage traditional classrooms and assessments when possible (e.g., presentations, interviews, group projects).
- Ease of access to variety of topics and domains -Personalized learning experience	- False or inaccurate information - Data security - Possibility of different responses to the same question or prompt	- Spread awareness of benefits and limitations of ChatGPT. - Encourage critical thinking.
Translation and academic writing	Ethical issues (e.g., Cheating, plagiarism, copyrights, academic integrity)	- Spread awareness of ethics and ethical issues of ChatGPT. - Implement rigorous detection methods. - Implement watermarks for Ai-generated text.
24/7 Availability	- Technical issues - unstable internet connections - limited access to non-free versions of ChatGPT - Inequal chances of learning	- Acknowledgment, as solutions are dependent on the region/country using this tool. - Implement alternative methods for learning, teaching and assessment when possible. - Consult multidisciplinary experts

6. Conclusion

There has been extensive and ongoing exploration of the impact of ChatGPT on education and learning. The benefits and limitations of integrating ChatGPT are understandable; however, further research is still required to overcome the possible drawbacks of ChatGPT's integration. This should be considered from the perspectives of both learners and educators. As ChatGPT has already been used for learning and education, instead of banning ChatGPT within institutions, it is essential to develop awareness, rigorous regulations, and policies on how to effectively utilize it. These must be continuously updated to eliminate the risks associated with this chatbot.

This study examined whether students and staff within Libyan universities are ready to integrate ChatGPT into their educational experience. It seems that both educators and learners are optimistic about this integration. Various and some exclusive limitations (e.g., technical issues, unstable internet connections, limited access) might cause a delay. However, ChatGPT has been used, and it is anticipated that it will be gradually adopted across educators and learners in the Libyan educational institutions.

7. References

[1]- S. Ghazanfer Abbas, M. Ehsan, G. Akbar, A. Rehman, H. Bibi, and Z. Hassan Sian, "Effects Of Chatgpt Integration As An Artificial Intelligence Tool For Education And Research: An Exploratory Survey At The University Level-Palarch's," *J. Archaeol. Egypt/Egyptology*, vol. 20, no. 2, pp. 20-(2), 2023.

[2]- M. . Patrício and B. . Gonçalves, "ChatGPT: Systematic Review of Potentials and Limitations in Education Information Technology and Systems.," in *Lecture Notes in Networks and Systems*, 2024, pp. 339–348.

[3]- T. Fütterer *et al.*, "ChatGPT in education: global reactions to AI innovations," *Sci. Rep.*, vol. 13, no. 1, pp. 1–14, 2023, doi: 10.1038/s41598-023-42227-6.

[4]- A. Haleem, M. Javaid, and R. P. Singh, "An era of ChatGPT as a significant futuristic support tool: A study on features, abilities, and challenges," *BenchCouncil Trans. Benchmarks, Stand. Eval.*, vol. 2, no. 4, p. 100089, 2022, doi: 10.1016/j.tbench.2023.100089.

[5]- A. Farazouli, T. Cerratto-Pargman, K. Bolander-Laksov, and C. McGrath, "Hello GPT! Goodbye home examination? An exploratory study of AI chatbots impact on university teachers' assessment practices," *Assess. Eval. High. Educ.*, vol. 0, no. 0, pp. 1–13, 2023, doi: 10.1080/02602938.2023.2241676.

[6]- B. Memarian and T. Doleck, "ChatGPT in education: Methods, potentials, and limitations," *Comput. Hum. Behav. Artif. Humans*, vol. 1, no. 2, p. 100022, 2023, doi: 10.1016/j.chbah.2023.100022.

[7]- M. Halaweh, "ChatGPT in education: Strategies for responsible implementation," *Contemp. Educ. Technol.*, vol. 15, no. 2, 2023, doi: 10.30935/cedtech/13036.

[8]- J. Qadir, "Engineering Education in the Era of ChatGPT: Promise and Pitfalls of Generative AI for Education," *IEEE Glob. Eng. Educ. Conf. EDUCON*, vol. 2023-May, 2023, doi: 10.1109/EDUCON54358.2023.10125121.

[9]- M. Alssager and I. Nasir, "Evaluation of using Google Classroom as a Tool for Asynchronous E-learning at Sebha University," *J. Pure Appl. Sci.*, vol. 20, no. 1, pp. 44–49, 2021, doi: 10.51984/jopas.v20i1.986.

[10]- S. Sharma and R. Yadav, "Chat GPT-A Technological Remedy or Challenge for Education System," *Glob. J. Enterp. Inf. Syst.*, vol. 14, no. 4, pp. 46–51, 2022, doi: 10.18311/gjeis/2022.

[11]- P. Pethigmage and M. Lankathilaka, "AI in Higher Education: A Literature Review of ChatGPT and Guidelines for Responsible Implementation," vol. VII, no. VI, pp. 306–314, 2023, doi: 10.47772/IJRISS.

[12]- L. Labadze, M. Grigolia, and L. Machaidze, "Role of AI chatbots in education: systematic literature review," *Int. J. Educ. Technol. High. Educ.*, vol. 20, no. 1, pp. 1–17, 2023, doi: 10.1186/s41239-023-00426-1.

[13]- J. Dempere, K. Modugu, A. Hesham, and L. K. Ramasamy, "The impact of ChatGPT on higher education," *Front. Educ.*, vol. 8, no. September, 2023, doi: 10.3389/feduc.2023.1206936.

[14]- S. Nikolic *et al.*, "ChatGPT versus engineering education assessment: a multidisciplinary and multi-institutional benchmarking and analysis of this generative artificial intelligence tool to investigate assessment integrity," *Eur. J. Eng. Educ.*, vol. 48, no. 4, pp. 559–614, 2023, doi: 10.1080/03043797.2023.2213169.

[15]- S. S. Gill *et al.*, "Transformative effects of ChatGPT on modern education: Emerging Era of AI Chatbots," *Internet Things Cyber-Physical Syst.*, vol. 4, no. June 2023, pp. 19–23, 2024, doi: 10.1016/j.iotcps.2023.06.002.

[16]- M. Montenegro-Rueda, J. Fernández-Cerero, J. M. Fernández-Batanero, and E. López-Meneses, "Impact of the Implementation of ChatGPT in Education : A," pp. 1–13, 2023.

[17]- A. Rejeb, K. Rejeb, A. Appolloni, H. Treiblmaier, and M. Iranmanesh, "Exploring the impact of ChatGPT on education: A web mining and machine learning approach," *Int. J. Manag. Educ.*, vol. 22, no. 1, p. 100932, 2024, doi: 10.1016/j.ijme.2024.100932.

[18]- C. K. Lo, "What Is the Impact of ChatGPT on Education? A Rapid Review of the Literature," *Educ. Sci.*, vol. 13, no. 4, 2023, doi: 10.3390/educsci13040410.

[19]- S. A. Bin-Nashwan, M. Sadallah, and M. Bouteraa, "Use of ChatGPT in academia: Academic integrity hangs in the balance," *Technol. Soc.*, vol. 75, no. September, p. 102370, 2023, doi: 10.1016/j.techsoc.2023.102370.

[20]-N. Rane, "Chatbot-Enhanced Teaching and Learning: Implementation Strategies, Challenges, and the rRole of ChatGPT in Education," *SSRN Electron. J.*, no. December, 2023, doi: 10.2139/ssrn.4603204.