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The Effectiveness and Challenges of ChatGPT Use in Science Teachers' Practices

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Abstract

The AI-developed ChatGPT model has drawn a significant attention in education since it provides a variety of applications that can enhance teaching and learning methodologies and support teachers in their professional roles. This mixed approach study aims to investigate various aspects of ChatGPT use in science teaching practices. A survey with 20 Likert scale items was used to gather quantitative data from 45 intermediate and secondary science teachers in Lebanese public and private schools and eight teachers were interviewed to obtain qualitative data. The statistical analysis of quantitative data was followed by thematic analysis of qualitative data. The results indicated that most participants had a positive view towards integration of ChatGPT in science instruction. Participants used ChatGPT in their teaching practices, 70% claimed that it increased student engagement, 60% claimed that it helped students understand difficult concepts, 65% proposed that it provides personalized learning, and 55% said that it improved student learning outcomes. However, the drawbacks to using ChatGPT, such as limitations in the system's contextual understanding, irrelevant responses that confuse students (50%) reported by teachers, technical problems and limitations (55%) reported by teachers, and concerns about students relying too much on ChatGPT (38%) from teachers. Further comparative studies are recommended to investigate the efficacy of various AI models and modifications in instructional methodologies that should be carried out in different learning domains, and educational contexts.

Keywords

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Artificial intelligence (AI), ChatGPT, science teaching practices.

Résumé :

Le modèle ChatGPT développé par l'IA a attiré une attention significative dans le domaine de l'éducation, car il offre une variété d'applications pouvant améliorer les méthodologies d'enseignement et d'apprentissage et soutenir les enseignants dans leurs pratiques professionnelles. Cette étude à approche mixte vise à examiner divers aspects de l'utilisation de ChatGPT dans les pratiques d'enseignement des sciences. Un questionnaire de 20 items sur une échelle de Likert a été utilisé pour recueillir des données quantitatives auprès de 45, intermédiaire et secondaire, enseignants de sciences, dans les écoles publiques et privées libanaises, et huit enseignants ont été interviewés pour obtenir des données qualitatives. L'analyse statistique des données quantitatives a été suivie d'une analyse thématique des données qualitatives. Les résultats ont indiqué que la plupart des participants avaient une vision positive de l'intégration de ChatGPT dans l'enseignement des sciences, 70% déclarent que cela augmentait l'engagement des élèves, 60% affirment que cela aidait les élèves à comprendre des concepts difficiles, 65% trouvent que cela offre un apprentissage personnalisé et 55% pensent que cela améliorait les résultats d'apprentissage des élèves. Cependant, les inconvénients de l'utilisation de ChatGPT, tels que les limitations dans la compréhension contextuelle qui entraînent des réponses non pertinentes et embrouillent les élèves (50%), les problèmes techniques (55%), et les préoccupations concernant la dépendance excessive des élèves à ChatGPT (38%). Il serait utile de mener des études comparatives supplémentaires pour explorer l'efficacité de divers modèles d'IA dans différents domaines d'apprentissage et contextes éducatifs.

Mots clés

Intelligence artificielle (IA), ChatGPT, Pratiques d'enseignement des sciences.

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مستخلص:

استرعى برنامج دردشة او ChatGPT الذي طوره الذكاء الإصطناعي (AI) اهتماماً كبيراً في مجال التعليم لأنه يقدم مجموعة متنوعة من التطبيقات التي يمكنها أن تعزز منهجيات التعليم والتعلم وتدعم المدرسين في ممارساتهم المهنية. تهدف هذه الدراسة، التي تعتمد المنهج البحثي المختلط، الى استقصاء مختلف جوانب استخدام الدردشة من قبل مدرسي العلوم في لبنان والتحديات التي يواجهونها باستخدام هذا التطبيق في ممارساتهم التعليمية، واستخدمت الدراسة استبيانا شمل 20 سؤالاً لجمع البيانات الكمية من 45 مدرساً للعلوم في التعليم الأساسي والثانوي، في المدارس الرسمية والخاصة، كما أجريت مقابلات مع ثمانية مدرسين للحصول على بيانات نوعية. ثم أجري التحليل الإحصائي للبيانات الكمية والتحليل الموضوعي للبيانات النوعية. وأشارت النتائج إلى أن معظم المشاركين لديهم رأي إيجابي بشأن إدماج برنامج ChatGPT في ممارساتهم التعليمية لمادة العلوم، وأفاد 70% منهم أنه زاد من تفاعل التلاميذ، وادعى 60% أنه ساعد التلاميذ على فهم المفاهيم الصعبة، واقترح 65% أنه يوفر تعلّمًا شخصياً، وقال 55% إنه حسّن نتائج تعلم التلاميذ. ومع ذلك، كانت هناك عيوب لاستخدام ChatGPT، مثل محدودية فهم السياق التي تعطي اجابات غير مرتبطة بالسؤال وتربك التلاميذ (50%)، والمشاكل التقنية (55%)، والمخاوف بشأن اعتماد التلاميذ بشكل مفرط على ChatGPT (38%). من المفيد اجراء دراسات مقارنة إضافية لاستكشاف فعالية مختلف نماذج الذكاء الاصطناعي في مجالات تعلم مختلفة وسياقات تعليمية متنوعة.

كلمات مفتاحية

الذكاء الإصطناعي، دردشةChatGPT، ممارسات تعليم العلوم.

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1-Introduction

Technology integration in education nowadays has become a prevalent phenomenon to improve teaching and learning. In the current era of rapidly expanding knowledge, knowledge is accessible everywhere, individuals fear knowledge, and learning resistance is growing stronger. If knowledge is not organized according to the practical and engaging logic, people will quickly grow tired of it and the use of traditional classroom model will eventually disappear (Wang.2023). The development in Artificial intelligence (AI) appears to revolutionize current educational practices, the generative AI tool, ChatGPT surprised everyone with its advanced ability to complete complex tasks. ChatGPT defines itself (May, 17, 2024) as" ChatGPT, developed by Open AI, is a language model based on the GPT (Generative Pre-Trained Transformer) architecture. It is designed to understand and generate human-like text based on the input it receives". Teachers have different and varied opinions about ChatGPT 's exceptional capacity to execute complicated tasks in the field of education. According to previous studies, global education systems are greatly affected by the quick and constantly evolving advancements in technology (Ausat et al., 2023), artificial intelligence (AI) has recently grown due to its miscellaneous uses in many fields and to its ability to function like the human brain and do repetitive tasks, AI is used in education to improve academic support, Intelligent Tutoring Systems (ITS) is an example of one-to-one personal tutoring, where research findings claimed that this tutoring system had a favourable impact on college students' academic performance (Lo, 2023).

1.1. Significance of the Study

The importance of this study, lies in its ability to shed light on improving science instruction by the use of ChatGPT technology, and by understanding the restrictions and problems faced by teachers for ensuring proper implementation and exploiting its benefits as an innovative tool that can update and modify the teaching strategies to cope with the effectiveness and challenges of this

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technology. Moreover, this study finding can give insight for policy makers and curriculum developer about the integration of technology in teaching sciences and can be the corner stone to rely on regarding the importance of teachers' continuous professional development specifically digital literacy. The development of ChatGPT by Open AI based on Instruct GPT (Ouyang, Zheng, & Jiao, 2022) has gained significant attention in education, since it differs from other chatbots by its ability to produce thorough and explicit answers to many human questions and even more can correct inappropriate questions. According to Heath et al. (2022), when incorporating new AI tools into educational practices or modifying educational practices based on AI tools, it is critical to examine technology to figure out its unanticipated benefits and drawbacks. From this point of view, the aim of our study is to investigate the effective aspects of ChatGPT use and the upcoming challenges of ChatGPT integration in science teaching practices. This study is employed by two research questions:

1- What are the effective aspects of ChatGPT use in science teachers' teaching practices?
2- What challenges are faced by science teachers when using ChatGPT in their teaching practices?

1.2. Literature Review

Artificial intelligence (AI) plays an important role in the field of education by providing abundant information resources such as online learning and virtual laboratories, enabling students to learn in a broader and more open environment (Yu, 2023). One of the main goals of education is to improve the critical-thinking skills of students. Science courses depend on evidence and logic, it should provide exemplary exposure and training on critical thinking (Rowe et al., 2015). Learning in the twenty first century is concerned about information and technology skills of students; in addition, critical thinking which plays a fundamental role in science classrooms by engaging students in critique, and questioning activities to develop their scientific reasoning ability (Zeidan & Khalil, 2022). Researchers claimed that ChatGPT can enhance critical thinking, problem-solving, and develop research skills (Dwivedi et al., 2023), can also suggest unexplored aspects

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and current research topics, giving students a better understanding and analysis of a particular topic (Kasneci et al., 2023); moreover, teachers can employ various teaching methods and strategies to provide students with more efficient, interesting, and practical learning experiences (Else, 2023), Ienca (2023) stated that if this technology is used correctly with established regulations by students and teachers, it will develop independent thinking and innovation skills necessary to adapt to future challenges and opportunities. On the other hand, ChatGPT faces various challenges, including dependence on data quality, exacerbation of ethical issues, and risks of technical dependence and misuse (Alshater, 2022). ChatGPT use in education may lead to problems such as lack of communication, limited understanding ability, inaccurate training data, lack of innovation, insufficient understanding of context, and privacy leakage (Yu, 2023). Over-reliance on this tool by students may affect their ability to think critically, explore, verify, and summarize actively (Kasneci et al., 2023). The literature on the potential use of ChatGPT in teaching science is still relatively new and emerging. This paper will contribute to the already present studies regarding the use of ChatGPT by science teachers in their teaching practices by critically analysing its effectiveness and challenges.

Recent research posited that more than one learning theory can be applied to using ChatGPT in teaching and learning as: constructivist theory, cognitive load theory, self-regulated learning (SRL) theory, and Technology Acceptance Model (TAM). TAM discusses how to accept and use a technology, by perceived usefulness and perceived ease of use that are the basic factors in technology adoption (Davis,1985). In our study, science teachers use ChatGPT in their educational practices. Teaching students occurs when they are given the right opportunities to construct knowledge through their interactions with the learning environment, Piaget claimed that active exploration and discovery in learning is central to constructivist learning, Vygotsky also highlighted the importance of guidance and social interactions in learning (Bhutto & Chhapra, 2013). Instruction should take an organized method, a teacher who explains the material quickly risks confusing the students and decrease their recalling of this material, based on this ChatGPT can control cognitive load by giving personalised explanations and simplifying complex scientific concepts; thus, the student will have no cognitive overload, this will promote his ability to process and retain information. According to Wu (2023), the cognitive load theory stated that efficient teaching strategies should refrain from overloading students' working memory in order to maximize learning. Moreover, Self-Regulated Learning (SRL) theory, focuses on students' ability

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to accomplish their own learning (Zimmerman & Schunk, 2011). These theories combined together provide a comprehensive framework for understanding how ChatGPT can enhance learning (Fig-1- adapted by the researcher) by facilitating technology adoption, supporting active engagement, managing cognitive load, and promoting self-regulation.

Figure 1. ChatGPT Use -Theoretical Framework

2- Methodology

2.1. Sample

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The participants in this research are science teachers for intermediate and secondary classes in different Lebanese public and private schools from different districts, different science subjects, and varied educational backgrounds. A combination of purposive and random sampling techniques is used where ethical considerations are addressed and applied as anonymity and confidentiality. A diverse sample of 45 teachers: biology, physics and chemistry were selected to ensure a broad representation of experiences and perspectives, where ChatGPT was used to understand their perceptions and experiences when using this technology. The participants were informed about the research objectives, procedures, and their voluntary participation, and their consent was obtained to meet ethical considerations.

2.2. Tools

The first research tool is an online questionnaire, which was prepared and validated by the researcher: tackling personal information and 20 Likert scale items ranges from "Strongly Disagree" to "Strongly Agree". This quantitative part aimed to gather the feedback on the effectiveness and challenges of ChatGPT, it investigates various aspects of ChatGPT use, including frequency of use, student engagement, clarification of difficult concepts, personalized support, and improvement in critical thinking skills. Additionally, it studies the challenges and technical issues encountered as time aspects, students' responses, observed improvements in learning outcomes, over-reliance concerns, learning styles accommodation, support and training, recommendation to other teachers, effect on teaching and learning, collaboration and interaction enhancement, development of problem-solving skill, ease of integration, effect on student motivation, and satisfaction with ChatGPT performance. Science teachers in public and private schools who filled the questionnaire and showed willingness to participate in the study were 45; eight out of these teachers were interviewed to obtain qualitative data. The statistical analysis of quantitative data was analysed by using SPSS version.24 Pearson Correlation between variables was tested with a margin of error (alpha) of 5%, and was followed by thematic analysis of qualitative data. Mixed research method is applied in this study, merging the quantitative and qualitative approaches throughout the research process. Both tools: the questionnaire and interviews were prepared and validated by the researcher and then were piloted with seven science teachers, who did not share in the study; then with four experts in educational technology and

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science teaching, where further modifications according to the given notes and recommendations were done to ensure content validity and reliability (Johnson and Christensen, 2008)

The data collected by the researcher from the transcribed online recorded interviews was saved in word documents and traditional tools were used to read and analyse the printed data, these transcripts were used to reflect on science teachers' teaching practices when integrating ChatGPT. To be familiar with the data, transcripts were reviewed few times to be able to develop codes and then to assign these codes to the related themes. Thematic Analysis (TA) is a systematic and accessible procedure for generating codes and themes from qualitative data. The aim of TA is not only summing the data content, but also identifying, and interpreting data key features, but not necessarily all, guided by the research question (Clarke & Braun,2017). The classified codes are deductive, semantic and latent based on theoretical background (theoretical framework and learning theories) and based on the data itself (Braun et al, 2019).

3- Results

3.1. Quantitative Results

The data collected from the distributed online questionnaire, answered the research questions:

What are the effective aspects of ChatGPT use in science teachers' teaching practices?

What challenges are faced by science teachers when using ChatGPT in their teaching practices?

It was noticed that science teachers effective use for ChatGPT in teaching and learning was as follows: 70% increased student engagement, 60% helped students understand difficult concepts, 65% provided personalized learning for students, and 55% improved student learning outcomes. These results are tabulated below (table-1).

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Table 1.Effective uses of ChatGPT in Science Teaching Practices

Effectiveness of Chat GPT Use	increased student engagement	helped students understand difficult concepts	provided personalized learning	improved student learning outcomes
Percentage	70%	60%	65%	55%

The questionnaire results revealed that the challenges faced by science teachers during ChatGPT use in teaching and learning were as follows: 55% technical problems and limitations, the same results (50%) were obtained for system's contextual misunderstanding and irrelevant responses that confuse students, and 38% for overreliance in App use. The obtained results are tabulated (table-2).

Table 2. Challenges of ChatGPT uses in Science Teaching Practices

Challenges for Chat GPT Use	system's contextual misunderstanding	irrelevant responses that confuse students	technical problems and limitations	Overreliance in use
Percentage	50%	50%	55%	38%

Regarding the effective practices for ChatGPT use: Student Engagement items were transformed into SEC total variable, the same procedure was applied to Support Leaning to obtain SLC total variable, and Personalized Learning to obtain PLC total variable. Similarly, the items related to

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the challenges faced by teachers to obtain TC total variable from Technical Challenges, PC total variable from Pedagogical Challenges, and SC total variable from Students' Challenges.

Table 3. Paired Sample Correlation between ChatGPT Use and the Effective Practices in Science Teaching Practices

Paired Samples Correlations		N	Correlation	Sig.
Pair 1	SEC total and Chat GPT use	45	.815	.000
Pair 2	SLC total and Chat GPT use	45	.711	.000
Pair 3	PLC total and Chat GPT use	45	.793	.000

Paired Samples correlations analysis was done and results shown in table 2 for effective practices, the obtained values are SEC total and ChatGPT use (R=0.815), between SLC total and ChatGPT use (R=0.711), and between PLC total and ChatGPT use (R=0.793) which show that a very strong, direct and perfect correlation exists between the measured themes and ChatGPT use. The obtained results showed that there is a perfect, positive, and direct correlation between the variables since the values of R obtained lies within this range (+0.70 ≤ R < +1.00); on the other hand, the results for the paired samples correlations analysis for faced challenges are as follows , TC total and ChatGPT use (R=0.739), between PC total and ChatGPT use (R=0.618), and between SC total and ChatGPT use (R=0.573) which show a moderate, direct and positive correlation between the measured themes and ChatGPT use (Gogtay &Thatte, 2017).

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Table 4. Paired Sample Correlation between the Challenges of ChatGPT Use in Science Teaching Practices

Paired Samples Correlations		N	Correlation	Sig.
Pair I	TC total and Chat GPT use	45	.739	.000
Pair II	PC total and Chat GPT use	45	.618	.000
Pair III	SC total and Chat GPT use	45	.573	.000

3.2. Qualitative Results

The qualitative part data were collected by online interviews done with science teachers' via Zoom application to gain more in-depth information about teachers' experiences for the effectiveness and challenges of ChatGPT use in their sciences teaching practices, this highlighted the issues teachers faced, provides illustrations for certain difficulties teachers faced, and discusses the upcoming solutions used to devastate these challenges. The interviews provided insight into a number of problems or limitations as claimed by teachers while implementing ChatGPT as context understanding, technical challenges, and the lack of real time engagement.

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Table 4. Samples of the Different Codes Obtained from Interviews

Samples of the different codes obtained from interviews			
➤ Lack of the ability to interpret the information correctly sometimes	1- Complex questions are not understood	2- Students can do many practice activities	3- Wrong answers needed correction by the teacher
➤ Lack of real-time interaction	➤ Misunderstanding of complex questions	➤ Any question a student may have, can ask it	➤ Answers are supported by interactive discussions
➤ Technical problems like troubleshooting and long time to generate answers	➤ No interaction dialogues or conversations	➤ It gives detailed lesson plans	➤ Contextual understanding

By referring to the interviews' results, two different sets of themes are obtained from the collected data:

Set I- related to the gathered answers of the various aspects of effective uses for implementing ChatGPT in teaching that are categorized under three themes (see Fig-2):

First Theme: related to Student Engagement, it encompasses three codes (SEC), where the collected answers are categorized under these code:

- SEC -1: gather information easily where all collected answers how they use ChatGPT to search for information.
- SEC -2: ease of use of the application where all collected answers related to App use are categorized under this code.
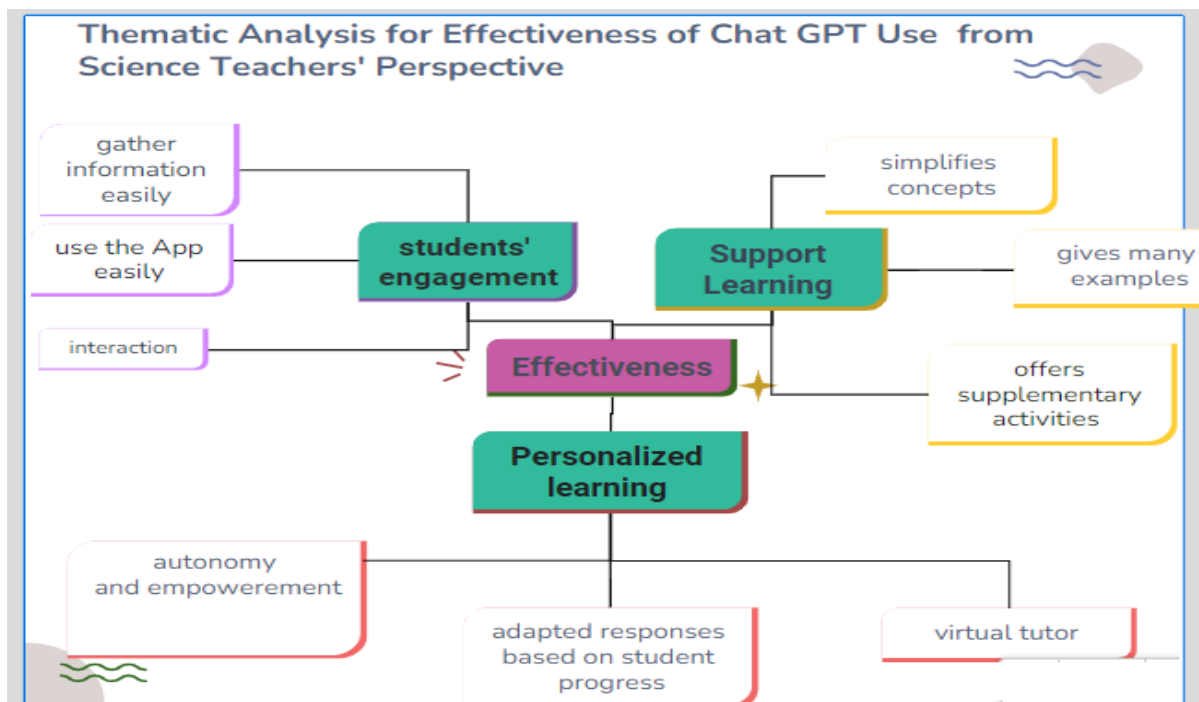- SEC -3: interaction with the application where queries answers are replied.

Second Theme: encompasses how ChatGPT use Supports Learning, mainly composed of three codes (SLC):

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- SLC -1: the way ChatGPT is used to simplify difficult concepts in sciences: physics, chemistry and biology subjects.
- SLC -2: the numerous generated responses given by ChatGPT on a certain learning objective to make it clear to the student.
- SLC -3: the variety of the given practice activities on a certain topic to enable students.

Third Theme: is associated to Personalized Learning of students, it includes three codes (PLC):

- PLC -1: this code is related to students 'autonomy and empowerment in learning by this App use.
- PLC -2: this code discusses the adapted responses based on students' progress in learning and how personal differences are considered.
- PLC -3: this code is related to suggesting that this App acts as a virtual tutor for students, where it can explain and support student in their lessons, homework, projects, and assessment.

Figure 2. Thematic Analysis for Effective Use of ChatGPT in Science Teaching Practices

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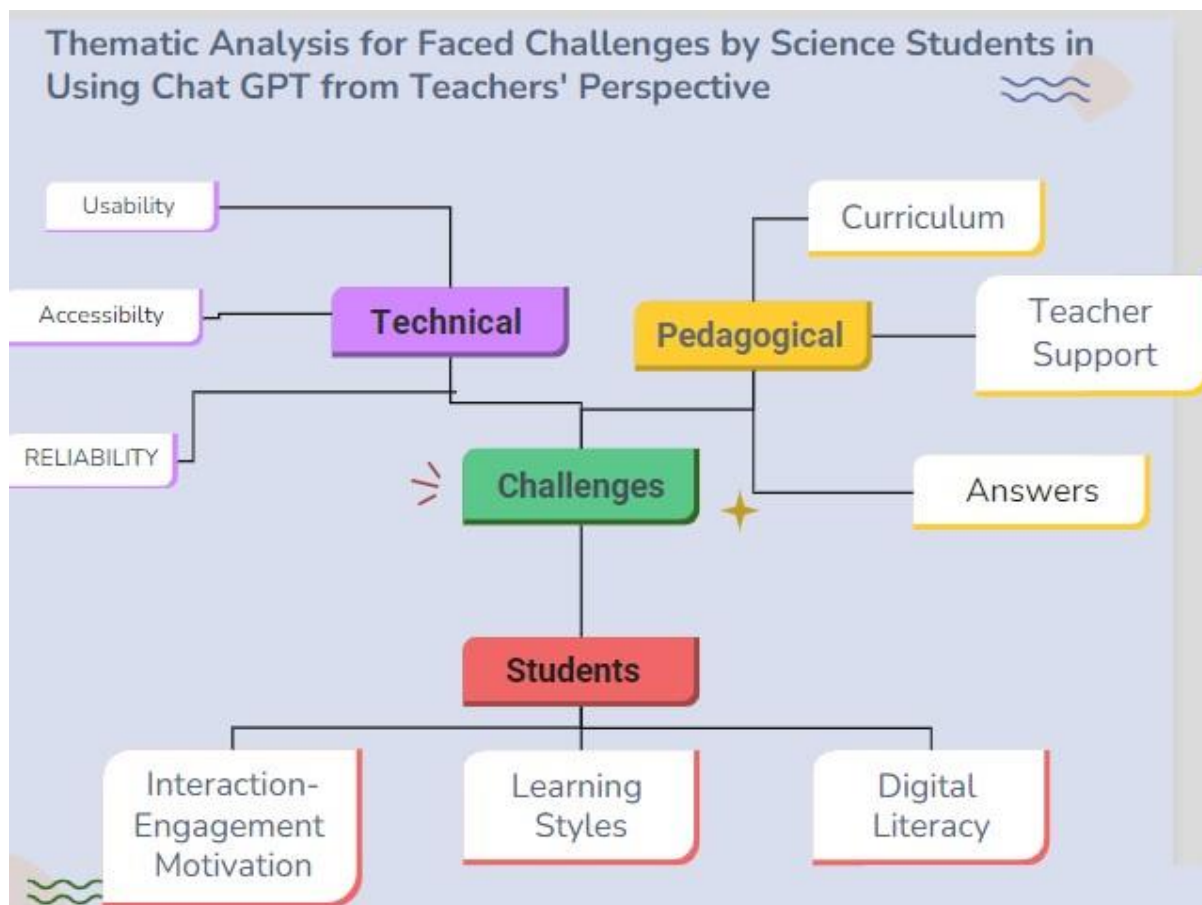كلية التربية - الجامعة اللبنانية - 12 حزيران 2024

Set II- related to the gathered answers regarding the faced challenges during integrating ChatGPT in teaching and are categorized under three themes (see Fig-3):

First Theme: related to technical issues called: Technical Challenges (TC), it encompasses three codes:

- TC-1: Accessibility where all collected answers related to technology use, networking and electronic devices uses are categorized in this code.
- TC-2: Usability related to answers on APP use, networking and devices uses.
- TC-3: Reliability based on if this App use can be relied on.

Figure 3. Thematic Analysis for Faced Challenges in Science Teaching Practices

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Thematic Analysis for Faced Challenges by Science Students in Using Chat GPT from Teachers' Perspective

Second Theme: related to pedagogy called: Pedagogical Challenges (PC), it encompasses three codes:

- PC-1: the way ChatGPT integrated in the curriculum, and the way it is used if it copes with the learning objectives.
- PC -2: the collected or generated responses by ChatGPT are direct to the point, there are no analytical answers.
- PC -3: professional development is revealed by teachers' proficiency in using technology in their teaching practices.

Third Theme: related to challenges faced by students called: Students' Challenges (SC), it encompasses three codes:

- SC-1: this code tackles students' motivation, engagement and their interaction with this platform.

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- SC-2: this code discusses students' learning styles, where this platform doesn't match with the preferences of all students as visual students.
- SC-3: this code tackles students' digital literacy, where not all students are tech-savvy and have the same competencies in using digital devices, software, and programs.

4-Discussion

This study presented three effective teaching practices of ChatGPT use in science teaching that are: students' engagement, supports students' learning, and provides personalized learning (fig-2), and three challenges faced by science teachers in their teaching practices when using ChatGPT: technical challenges, pedagogical challenges and students' challenges (fig-3), which will be discussed below.

Effective Use of ChatGPT in Science Teaching Practices

By referring to the collected results of our study questionnaire, ChatGPT use increases students' engagement, which is in line with previous literature, where Cooper (2023) mentioned in his study that ChatGPT provides a platform for students to ask questions, engage in explanatory dialogue, and receive immediate and personalized feedback due to its ability to construct differentiated assessments and questions that correspond to the students' level of knowledge; Moreover, Lo (2023) asserted in his study on the impact of ChatGPT that it is able to enhance teaching and learning through its knowledge and performance. Additionally, ChatGPT can help students understand difficult concepts, where it promotes discovery and encourages students to ask questions and think critically about the received answers; this is in line with previous research that showed that ChatGPT provide personalized responses satisfying diverse student needs and learning styles and supports personalized learning paths (Dwivedi et al., 2023; Tlili et al., 2023), these interactions promote active learning and support students construct their knowledge through inquiry and reflection (Cooper, 2023). Moreover, Wang (2023) claimed in his study that one of the basic advantages of ChatGPT lies in its interactivity, which originates from the learner's question, and which is beyond any previous media technology where it always acts as a quick positive responder who never ignore the questioner, in this case students are no longer a passive identity. ChatGPT can support learning and provide scaffolding as a virtual tutor or discusser providing social interaction and scaffolding supporting students understanding through

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these discussions, which is line with what Vygotsky noted about scaffolding and social interaction, also it is emphasized by the theory which supports inquiry-based learning, where students explore and discover answers through guided questions, this interaction contributes to cognitive ability development (Cacioppo & Freberg, 2013). Moreover, teachers, when interviewed, mentioned that they will save time and be able to construct more relevant assessments ,questions, activities, and lesson plans by using ChatGPT that support their teaching practices , these findings was supported by research where Cooper (2023) in his exploratory study noted how educators could utilize ChatGPT in their science pedagogy, a helpful way was to generate ideas to design science units, rubrics, and quizzes, and by its capacity to generate a science unit underpinned by the 5Es model, though it needs further modification.

Challenges of ChatGPT Use in Science Teaching Practices

Students are attracted to the use of online-based tools to generate academic content due to its ease of use, one of these tools is ChatGPT; where in our study findings the limitation related to text generation on any topic without clarifications was manifested, which is considered a pedagogical challenge, this is in line with Lo (2023) who posited that ChatGPT use is not entirely satisfactory due to certain potential issues as generating in accurate information and enhancing student plagiarism, which was claimed also by Raschka (2023) that detecting such academic misconduct is due to the probability-based and unreliable nature of AI-generated text detectors. Despite the fact that ChatGPT use support learning, but according to results it may lead to individual differences in learning among students related to tech savvy, network and devices, these reflect technological and students' challenges, this is supported by literature, as cited by Rasul et al.2023 that equitable access to technology and assistive devices must be ensured to make ChatGPT an inclusive technology and address digital inequities. Furthermore, the results showed that one of the pedagogical challenges is that ChatGPT- generated answers contain contextual understanding, this is supported by literature where Karim (2023) posited that factual biases due to biased training data could lead to learners' misconceptions.

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5- Conclusion

This research provides a deeper understanding of the issues and problems that may face science teachers when incorporating ChatGPT into their instruction, as well as the innovative approaches that have helped those teachers to solve these issues. The effective use of ChatGPT in science classrooms by using specific strategies facilitated students' engagement, provided personalized learning, and supported students' learning by overcoming the challenges of understanding difficult concept. Students should not interact with ChatGPT only, and should engage in collaborative learning and discussions to critically evaluate information and construct knowledge based on constructivist theory this is supported by Rasul et al.2023. This was also supported by Yu (2023) who claimed that ChatGPT is efficient in improving learning and promoting interpersonal communication, but on the other hand, it may have a negative impact on interpersonal relationships. Furthermore, the study identified technical challenges as network connectivity, slow generated answers, over-reliance of students, contextual understanding, and wrong answers. We suggest further research to complete this study by doing classroom observations for science teachers' teaching practices and by asking teachers to do logbooks to record their practices, additionally, studying the effects of integrating AI (ChatGPT) as teaching tools on students' learning outcomes and engagement by classroom observations and interviews could be done, this will investigate more both students' engagement and challenges. Moreover, comparative studies could be conducted to explore the effectiveness of ChatGPT and other AI models in instruction, thus shedding more light on the benefits and limitations of these tools in academic subjects other than sciences, and in different educational contexts in order to make use of the potential benefits of ChatGPT in educational settings. The research encountered many challenges as the time limitation where only teachers' practices were only considered and the limited number of interviewed teachers, more valuable insights could be obtained if students' practices, and other educators points of view were considered.

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