

Analysis on the Use of ChatGPT in SIM of Students

Beverly Rom A*, Joshua Soriano T

Technological University of the Philippines, College of Science, Manila City, Philippines. *Corresponding Author's Email: beverly.rom@tup.edu.ph

Abstract

This study analyzes the effect of the use of ChatGPT in answering Strategic Intervention Material (SIM) about Climate Change in Grade 9 science and how this can have a significant effect on the academic performance of the students. The use of artificial intelligence in aid of education and learning has become prevalent in our current age. In this light, the researchers explored if artificial intelligence, particularly, ChatGPT, can aid in their learning experience and can be effectively utilized when answering their Strategic Intervention Material for Science 9. Three setups were done in order to ensure the result of the research: (1) first setup was to rely entirely on their pre-requisite knowledge in order to answer the SIM, (2) second setup was to rely entirely to ChatGPT for answers on their SIM, (3) last setup was to use the ChatGPT in combination with their pre-requisite knowledge on the topic of the SIM. The researchers used analysis of variance as statistical treatment to identify if there is a significant difference among the answers obtained from the 3 setups conducted. The findings of the study were able to prove that the use of ChatGPT can significantly affect the academic performance of the students and the setup that showed mostly the students obtaining high scores was the last setup in which they combined their own answers to the answers prompted from ChatGPT, suggesting that the use of ChatGPT as an educational tool may yield positive results when utilized efficiently without compromising ethical protocols.

Keywords: Artificial Intelligence, ChatGPT, Science, Strategic Intervention Material.

Introduction

Educators around the world are always trying to find different ways and learning new strategies to cater to different needs of the learners. In particular, science education in the Philippines has always been quite the challenge for many educators. According to the results of the latest Program for International Student Assessment (PISA) in 2022, the Philippines was placed 78th among the 80 countries in science and has scored an average of 356 compared to the average 485 scores of other countries (1). Additionally, the EDCOM II Basic Education sub-committee is targeting 3 priority areas: learning resources, measurement of learning outcomes, and curriculum and instruction as a way of contributing to the improvement of the country's basic education moving forward after the effects brought about by the pandemic in 2022 (2). In connection with this result, educators in the Philippines are constantly seeking ways of improvement in science education. One of the ways that teachers use is the integration of Strategic Intervention Material in addressing the learning difficulty of the students in different

concepts. As mentioned, the Strategic Intervention Material (SIM) is an instructional material which aids the teachers in re-teaching a concept or topic in which students are having a hard time understanding (3). SIM gives more focus on the least mastered skills of the students and is utilized to bridge the learning gap of the students in a particular topic. In Sangley Point National High School in particular, some students are having difficulty in grasping scientific concepts, even with the normal classroom setup. In a study conducted in 2018 suggests that the use of SIM in teaching the least mastered topics in Earth Science for Grade 7 students has proven to be effective and displayed satisfactory results (4). Not only for students, but a 2022 study conducted, it was proven that it is also beneficial for teachers to use SIM in teaching the least mastered topics to some students with learning difficulties in science (5). The sense of authority that SIMs provide with students has a significant factor in taking control of their own learning, which means that students feel more motivated to learn because they are in charge of their own

This is an Open Access article distributed under the terms of the Creative Commons Attribution CC BY license (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted reuse, distribution, and reproduction in any medium, provided the original work is properly cited.

(Received 22nd September 2024; Accepted 17th January 2025; Published 31st January 2025)

learning (6). With the hope of further improving the teaching and learning process in teaching science, the researcher is motivated to investigate the effects of SIM in the topic of Climate Change for Grade 9 Students of Sangley Point National High School. Teaching science in the midst of the rise of new technological advancements has both been quite a challenge and a relief. The use of different Artificial Intelligence or AI has become rampant, especially in the field of education. The rise in the use of different AI technology in the field of education has posed both advantages and disadvantages. One of the most prolific AI technologies used by the students is the ChatGPT (7). The use of ChatGPT opens a variety of educational wrongdoings which can be made by the students such as plagiarism, harmful and biased information due to the technology being on its early stage (8). Therefore, this paper will analyze the effect of using ChatGPT in answering a Strategic Intervention Material of Grade 9 Students in science and how will this affect the educational sector moving forward. By definition, ChatGPT (Chat Generative Pre-Trained Transformer) is a form of artificial intelligence that is widely used by many creators that needs fast flow of information and content without the need for any evaluation (9). The prominence of ChatGPT has been highlighted in the education field, as many learners are opting to use this technology in their assignments. According to an article published by Intelligent, 4 out of 10 college students that have been surveyed use ChatGPT for their assignments and for other research purposes (10). With the rise of the usage of this artificial technology, specifically, the ChatGPT, there may have been both the advantages and disadvantages on the use of this technology in line with the education sector. The first impression on the use of ChatGPT in educational setting is mostly negative because of the different ethical concerns that the technology has raised (11). First thing that comes to mind is how accurate are the information coming from the ChatGPT. ChatGPT provides limited accuracy for the reason that only one option of answer is allowed per prompt using the technology (12). A user can never be too sure of the accuracy of the answers that they might get using ChatGPT. Another disadvantage will be the lack of contexts for the given answers. Given the scope of the technology, the answers given may

not be relevant to the topic that you're looking an answer for. Using incorrect prompt might give you incorrect output as well. Therefore, suggesting that the technology is still dependent on the human input for its accuracy (13). The pure dependence on technology will result into inefficiency in a situation where that technology is not available anymore. People, especially learners who are heavily dependent on ChatGPT for answers on their assignments and exams will become inefficient learners given that the dependence on artificial technology will not promote critical thinking and discovery learning. As such, the originality and uniqueness of work of the learners will vanish over time due to the fact that more and more works will be easily plagiarized and falsified given the use of artificial intelligence such as ChatGPT (14). Although, there may be a lot of disadvantages that ChatGPT may have brought, we cannot deny that there are also a lot of advantages this technology may do in the educational field. Artificial intelligence, specifically, ChatGPT has provided us a faster means or access to information with wide range of topics by just a click, which is very beneficial in processing information into simplified version in order to be easily understood by learners (15). ChatGPT supports a more personalized learning style, which supports the diversity of learners who uses ChatGPT. This makes the learners personally in charge of their own learning at their own pace as well (16). The availability and accessibility of ChatGPT has been a significant part as to why a lot of learners are using it for their assignments and activities (17). ChatGPT has been able to provide immediate feedback for learners as well as being available for access all the time has been a great help for learners. The ChatGPT, almost mimicking a natural and human-like language helps in stimulating conversations for learners and making them feel like they are just conversing with their fellow classmates which helps them feel at ease and less intimidated (18). ChatGPT has also been used for generating essays, videos, pictures and other fields of graphics and designs which helps simplifies work at a faster rate. Through this study, the researcher aims to analyze if the use of ChatGPT in doing written work of Grade 9 students in science may provide significant claim that ChatGPT can be advantageous for their student performance and

can serve as a foundation for utilization of ChatGPT in educational field. This study aims to answer these questions moving forward. First, is if the use of ChatGPT in answering the Strategic Intervention Material of Grade 9 Students has a significant effect on their academic performance. This study included three setups and the study aimed to know which of among the three setups is the one being preferred by the students in answering their SIM in science. Lastly, is how does the findings in this study contribute to the future of the education field. The researcher aims to increase the student performance level and contribute to the data emerging from the use of ChatGPT in the education field.

Participants

This study involved five students who are selected in a purposive random sampling technique. The students are all in grade 9 and have covered equal knowledge in their science class and have knowledge and experience in operating ChatGPT. This study focuses on Grade 9 students only but can be applied to other grade levels as well. This purpose is done as to gather comprehensive data for this study.

Scope and Limitations

This section defines the boundaries of the study as well as the challenges that the study may encounter. On this particular note, this study only focuses on the effect of the use of ChatGPT in answering the SIM of grade 9 students in science, and its implications on their academic performance as well as the impact of this study on the utilization of artificial intelligence on education sector. On the other hand, the study doesn't particularly focus on the skills acquired, the conceptual and critical thinking of the learners who participated in the study.

Methodology

This study was conducted at Sangley Point National High School in Cavite City which was participated by five students, who voluntarily agreed to take part in this study. The study ensued during the vacant period of the students in a Face-to-Face learning modality. The students were tasked to answer 3 sets of questionnaires, having the same set of questions but are to be answered using three different setups. First setup is where the students will answer the questionnaire using traditional method: pen and

paper mode of answering based on the students' knowledge of the topic. The second setup is where the students will answer the questionnaire using solely ChatGPT as a source of answer. Last setup will be the combination of both their own answer and the use of ChatGPT in answering their SIM in science. The students were then tasked to answer reflective questions about their experience of answering the SIM using ChatGPT and their preference among the three setups that they were subjected to. This aims to infer in which setup the students felt confident about their answers.

Research Design and Instrument

This study involved a mixed-method research design. The first part of the research consists of questions that are quantifiable and graded objectively as a way of gauging the students' level of academic performance in the three setups conducted. The second part of the study consists of questions that are descriptive in nature and is included to gauge the students' perception of the three setups used. The researcher used a self-made Strategic Intervention Material about the topic of climate change and was validated by the Master Teacher I in Science and the Head Teachers of Science and English. The instrument involved 3 activities that are all about the topic of climate change in the first part of the SIM and a part where they will need to answer in essay in the second part of the SIM.

Data Collection

The students have undergone 3 setups: the first setup would be to answer the questionnaire using only their acquired knowledge from their lessons; the second setup would be to answer the questionnaire using purely the answers obtained from ChatGPT; and the last setup would be to answer the questionnaire using a combination of both answers coming from their own and from the ChatGPT. The answers will be then analyzed and be used as a reference to form a conclusion about the use of ChatGPT in answering SIM of students, from which the results can be used to form a generalize integration across other grade levels. Afterwards, the students were tasked to answer questions about their experience of answering the SIM using ChatGPT.

Data Analysis

The researcher analyzed the answer from the students' using analysis of variance (ANOVA), as a statistical treatment of the 3 setups conducted in

this study which includes: first setup – traditional method of answering the SIM; second setup – reliance solely on ChatGPT; and third setup – the combination of traditional method and ChatGPT. The researcher wanted to infer if there is any significant difference between the answers from the 3 setups conducted which can prove whether or not the use of ChatGPT in answering SIM of Grade 9 students in science would have an effect on the academic performance of the students. This can also help infer the preference of the

students among the three setups, to which they are subjected to.

Results and Discussion

The results of this study were discussed under 3 major headings namely: Scores obtained on the Strategic Intervention Material (SIM) about the topic of Climate Change in three different setups, Results of the Analysis of Variance among the answers of the learners in three different setups and the Opinion of the Learners about the three Different Setups.

Table 1: Scores obtained on the Strategic Intervention Material (SIM) about the Topic of Climate Change in Three Different Setups

	Setup A	Setup B	Setup C
Learner 1	35	35	35
Learner 2	27	33	38
Learner 3	37	37	39
Learner 4	26	35	37
Learner 5	29	33	36
Total	154	173	185
Mean	30.80	34.6	37

The self-made strategic intervention material about the topic of climate change is a 40-item activity-filled worksheet about the different concepts surrounding the central topic of climate change. Table 1 shows the learners' scores obtained on the three different setups. Setup A is where the learners' answered the SIM based on their own knowledge of the topic. As depicted on the table, Learner 1 achieved the highest score of 37 and Learner 4 achieved the lowest score of 26 on this setup. Setup B is where the learners' answered the SIM purely based on the answers from ChatGPT about the topic. As seen on the table, compared to the scores on the Setup A, 4 of the 5 learners obtained a much higher score when they used the ChatGPT on their answers and only

1 learner maintained the score similar to the score on Setup A. Lastly, the Setup C is where the learners answered the SIM by combining both answers from their own and from the ChatGPT. As observed on the table, 4 learners obtained a higher score when compared to their scores from Setup A and Setup B, only 1 learner maintained the score all throughout the 3 different setups. These scores from different setups suggest that the use of ChatGPT and its integration to education has a significant effect on the academic performance of the students. Given that the use of this technology will be regulated by the teachers and academic authorities alike considering all ethical provisions.

Table 2: Analysis of Variance among the Scores Obtained by the Learners in Three Different Setups

ANOVA: Single Factor						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	97.7333333	2	48.8666667	4.96949153	0.02677864	3.88529383
Within Groups	118	12	9.83333333			
Total	215.733333	14				

The scores of the learners obtained from three different setups were treated with analysis of variance (ANOVA), shown in Table 2, to

determine if the integration of ChatGPT can yield a significant effect on the academic performance of the learners based on their scores on Strategic

Intervention Material (SIM) about the topic of climate change. The table suggests that the F value obtained from the treatment is 4.96 exceeds the F Critical Value of 3.88, which means that the usage of ChatGPT in their answers to the Strategic Intervention Material have a significant difference

in their academic performance. We can also look at the P- value of 0.02 which is less than the Alpha Value of 0.05 which can also indicate the significant difference on the scores obtained from the learners' answers to the SIM.

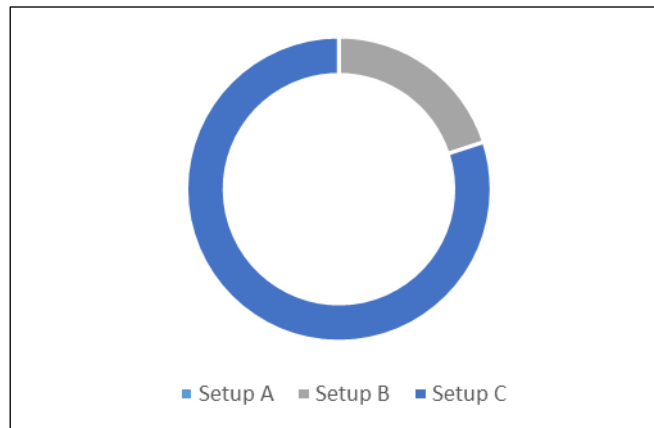


Figure 1: Number of Learners who Preferred Setup A, Setup B and Setup C

The last part of the Strategic Intervention Material was made for the reflection part of the learners. In this section of the SIM, the learners were tasked to evaluate their thoughts on the three different setups that they have done. As shown on Figure 1, 4 out of 5 learners stated that they felt most confident answering during the Setup C, in which they combine both their own answers and the answers obtained from ChatGPT. Still referring to Figure 1, 1 out of 5 learners stated that they felt most confident answering during Setup B, which they rely solely on the answers from ChatGPT.

Implications

The findings of this study suggests that the use of ChatGPT may not always be viewed in a negative light and that, as a collective, can utilize this technology into something that may be beneficial to the education field in the future of this digital age. The teachers, may gain benefit from this technology in a way that this provides fast information that may be utilized in classroom discussions. In a way, this technology can be an asset in education when used keeping ethical provisions and strict implementation in mind.

Recommendations

Based on the findings of this study on the analysis of the use of ChatGPT in answering SIM of grade 9 students, the researchers recommend that this utilization of ChatGPT may be used across all grade levels as well as in different subjects. The researchers would also recommend to the future

researchers of the same scope, that this study may be expanded to measure other acquired skills and critical thinking of the learners.

Conclusion

This study analyzed that the integration of ChatGPT in answering strategic intervention material for grade 9 sciences showed a significant effect on the academic performance of the learners based on the scores obtained from their answers. The learners reiterate that the Setup that they find most confident while answering the SIM is the Setup C in which they combine their own answer to the answers obtained from ChatGPT. This can suggest that the integration of ChatGPT in education doesn't always mean negative and can be utilized in a more positive way given that the utilization of this technology in classroom setting must be regulated and efficiently done with regards to the ethical provisions and concerns to avoid over-reliance to the tool, ChatGPT. Education, moving forward in this digital age, might experience a lot of technological advances and changes that can make or break our learning experience. By using strict and regulated protocols, we may turn these technological advances into our favor and can help our learning experiences be more comprehensive and convenient. Through this study, the researcher aimed to contribute to the establishment of information concerning the use of artificial intelligence in the educational field.

Abbreviations

AI: Artificial Intelligence, ChatGPT: Chat Generative Pre-Trained Transformer, EDCOM: Education Committee, PISA: Program for International Student Assessment, SIM: Strategic Intervention Material.

Acknowledgement

First and foremost, I wish to acknowledge my professor and adviser, Dr. Joshua T. Soriano, for his endless help and support in the process of doing this study, as well as my classmates and co-workers, for their feedbacks, advices, and moral support that helped a lot with this study and to my students, who have agreed to participate in this study, you have my utmost thanks. Lastly, my eternal thanks to my family and friends for being a solid foundation and support for me in achieving this feat and to the Almighty One, my heart is full of gratitude for the opportunity to be able to execute and make this action research.

Author Contributions

The principal author, which name appears first on the title page, was responsible for conceptualization, methodology, and data curation, writing of the original draft. The co-author of this study was responsible for the conceptualization and supervision of the paper as a whole. All authors participated in reviewing and editing the manuscript and approved the final version for submission.

Conflict of Interest

The authors report that there are no competing interests to declare.

Ethics Approval

All subjects gave their informed consent for inclusion before they participated in the study. The study was conducted in accordance with the protocol that was approved by the Committee of Sangley Point National High School, Cavite City.

Funding

This research was not supported under any grant and was pursued solely by the authors' initiative.

References

1. Education GPS - OECD. Oecd.org. 2019. Available from: <http://gpseducation.oecd.org/>
2. EDCOM II Year One Report Miseducation The Failed System of Philippine Education EDCOM II Year One Report Miseducation The Failed System of Philippine Education. Available from: <https://edcom2.gov.ph/media/2024/02/EDCOM-II-Year-One-Report-PDF-022924.pdf>
3. Bunagan, F. (2012). Science Intervention Material. Retrieved from <http://www.slideshare.net/felixbunagan/strategic-intervention-aterial>
4. Villonez GL. Use of SIM (Strategic Intervention Material) as Strategy and the Academic Achievement of Grade 7 Students on Selected Topic in Earth Science. Pupil: International Journal of Teaching, Education and Learning. 2018 Nov 22;2(3):78-88. <https://doi.org/10.20319/pijtel.2018.23.7888>
5. Acedillo R, Lagahit J, Macusang AJ, Bacatan J. Students and Teacher's Perception on the Effectiveness of Using Strategic Intervention Material in Science. International Journal of Research and Innovation in Social Science. 2022;06(03):60-8. <https://doi.org/10.47772/ijriss.2022.6304>
6. Dweck CS. Motivational processes affecting learning. American Psychologist. 1986;41(10):1040-8. <https://doi.org/10.1037/0003-066X.41.10.1040>
7. Trust, T., Whalen, J. and Mouza, C. (2023). Editorial: ChatGPT: Challenges, Opportunities, and Implications for Teacher Education. Contemporary Issues in Technology and Teacher Education, 23(1), 1-23. Waynesville, NC USA: Society for Information Technology and Teacher Education. Retrieved August 12, 2024 from <https://www.learntechlib.org/primary/p/222408/>.
8. Sharma S, Yadav R. Chat GPT – A Technological Remedy or Challenge for Education System. Global Journal of Enterprise Information System. 2022;14(4):46-51. Available from: <https://www.gjeis.com/index.php/GJEIS/article/view/698>
9. Roose K. The Brilliance and Weirdness of ChatGPT [Internet]. Acn.org. 2022. Available from: <https://cacmb4.acm.org/news/267539-the-brilliance-and-weirdness-of-chatgpt/fulltext>
10. 4 in 10 College Students Are Using ChatGPT On Assignments [Internet]. Intelligent. 2024. Available from: <https://www.intelligent.com/4-in-10-college-students-are-using-chatgpt-on-assignments/#:~:text=ChatGPT%20most%20commonly%20used%20for>
11. Vincent J. AI-generated answers temporarily banned on coding QandA site Stack Overflow. The Verge. 2022. Available from: <https://www.theverge.com/2022/12/5/23493932/chatgpt-ai-generated-answers-temporarily-banned-stack-overflow-llms-dangers>
12. Biddle S. The Internet's New Favorite AI Proposes Torturing Iranians and Surveilling Mosques. The Intercept. 2022. Available from: <https://theintercept.com/2022/12/08/openai-chatgpt-ai-bias-ethics/>
13. Walsh Toby. "Everyone's having a field day with ChatGPT – but nobody knows how it works". The Conversation. Archived from the original on December 30, 2022. Retrieved August 12, 2024. Available from: <https://theconversation.com/everyones-having-a->

- field-day-with-chatgpt-but-nobody-knows-how-it-actually-works-196378
14. Lakshmanan Lak. "Why large language models like ChatGPT are bullshit artists". *Becominghuman.ai*. Archived from the original on December 17, 2022. Retrieved August 12, 2024. Available from: <https://becominghuman.ai/why-large-language-models-like-chatgpt-are-bullshit-artists-c4d5bb850852>
 15. Milmo D. ChatGPT reaches 100 million users two months after launch. *The Guardian*. 2023 Feb 2; Available from: <https://www.theguardian.com/technology/2023/feb/02/chatgpt-100-million-users-open-ai-fastest-growing-app>
 16. Holmes Aaron. "Microsoft and OpenAI Working on ChatGPT-Powered Bing in Challenge to Google". *The Information*. Archived from the original on January 18, 2023. Retrieved August 12, 2024. Available from: <https://www.theinformation.com/articles/microsoft-and-openai-working-on-chatgpt-powered-bing-in-challenge-to-google>
 17. Perrigo Billy. "AI Chatbots Are Getting Better. But an Interview With ChatGPT Reveals Their Limits". *Time*. Archived from the original on January 18, 2023. Retrieved August 12, 2024. Available from: <https://time.com/6238781/chatbot-chatgpt-ai-interview/>
 18. Whannel Kate. "Could a chatbot answer Prime Minister's Questions?". *BBC News*. Archived from the original on January 17, 2023. Retrieved August 12, 2024. Available from: <https://www.bbc.com/news/uk-politics-64053550>