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# Utilization of AI Chatbot (Chatgpt-powered) as a Technology-Support Learning Tool for Understanding Aquatic Life Zones

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## Abstract

In the 21st century, there is a growing recognition of the potential of AI chatbots in transforming education and revolutionizing the way students learn. While several studies recognize the potential of AI in learning, its impact on science education is yet to be demonstrated, thus requiring further exploration to understand how modern technology can inspire students to learn and effectively motivate them to utilize technology for educational purposes. This study utilized an AI chatbot (ChatGPT-Powered) as an assistant learning tool and determined its usefulness in understanding aquatic life zone of Grade 10 students. This employed a one-group pretest-posttest research design, with (34) students engaged in a five-day session focused on aquatic life zones, incorporating an AI chatbot (ChatGPT-Powered). Results showed a significant improvement in students' understanding of aquatic life zones. For the group with exposure to the chatbot, a Wilcoxon signed-rank test revealed a significant mean difference of 5.583 ($p < .001$). Similarly, the group with no exposure showed a significant improvement of 5.400 ($p < .001$) as determined by a paired-sample t-test. The findings highlight the potential of AI chatbots to address educational challenges, offering recommendations contributing to more innovative, personalized, and engaging learning experiences for students.

**Keywords:** AI Chatbot; Aquatic Life Zone; Chatgpt; Technology-Supported Learning

## 1. Introduction

Aquatic life zone comprehension is essential for conducting in-depth studies and acquiring important insights into the complex dynamics of marine ecosystems on our planet. Aquatic ecosystems are critical components of the global environment, and understanding their complex interactions is crucial (Heinrichs et al., 2019). From vast oceans to freshwater lakes and rivers, these intricate and diverse habitats are home to various species. They are vital for preserving global biodiversity and sustaining human livelihoods. However, research findings demonstrate that students have a relatively limited grasp of marine knowledge (Mokos et al., 2019). Some ocean literacy (OL) investigations performed in Taiwan revealed that the average OL score remained at approximately 50% of the total possible score, indicating a general lack of understanding of marine science. These results are consistent with those of studies conducted in Taiwan, Japan, Canada, and the United States (Chang 2015; Guest et al. 2015; Tsai et al. 2021). Consequently, developing and implementing an essential educational approach that effectively enhances their understanding of this crucial subject matter within the modern classroom is imperative.

In the ever-evolving educational landscape of the 21st century, transformative changes have been witnessed, primarily driven by technological advancements, including Artificial Intelligence (AI) powered chatbots. AI chatbots are now being utilized in a wide range of industries, including education. The majority of advanced AI chatbots available today are web-based platforms that dynamically adjust to the behaviors of both educators and students, thereby improving the overall educational experience (Chassignol et al., 2018).

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One of the most popular AI-based tools/chatbots used in education is ChatGPT. The ChatGPT is a recently developed conversational chatbot created by OpenAI that is powered by natural language processing and has garnered global recognition for its remarkable ability to generate coherent, systematic, and informative responses, closely resembling those of a human. Its proficiency in simulating human-like interactions has captivated attention worldwide (Zhai, 2022). Within the realm of education, it offers a range of benefits including personalized learning, instant feedback, and round-the-clock accessibility (Oranga, 2023). Moreover, its seamless integration into educational settings can effectively automate mundane tasks, enrich the learning journey for students, and ultimately boost productivity and efficiency while facilitating adaptive learning (Elbanna and Armstrong, 2024).

Certain educational institutions are progressively embracing AI-driven chatbots, acknowledging their significance. However, others exercise caution and refrain from hastily implementing them in contemporary educational environments, posing a challenge to be addressed (Labadze et al., 2023). While several studies recognize AI's potential in learning, its impact on science education is yet to be demonstrated (Williamson and Eynon, 2020). The field of chatbot development is continuously evolving, necessitating timely and updated analysis to ensure that information and assessments reflect the latest advancements, trends, or developments in chatbot technology. Therefore, further exploration is required to understand how modern technology can inspire students to learn and effectively motivate them to utilize technology for educational purposes (Ryan and Deci, 2020). Additional research on the effects of integrating chatbots can provide insights into their long-term sustainability and enduring benefits, which are crucial for educators and policymakers to make well-informed decisions regarding their ongoing integration into educational systems.

This study utilized and determined the usefulness of an AI chatbot (ChatGPT-Powered) as an assistant learning tool in understanding aquatic life zones with varying exposure durations of the students with the chatbot, which contributed to their ecological awareness and environmental stewardship. Additionally, this study sought to contribute to the existing body of research on effective technology-supported learning tools and their impact on academic achievement. By examining the effects of this educational tool, educators can gain insights into technology-supported learning tools to facilitate learning and improve students' understanding of aquatic life zones.

### 1.1. Theoretical Framework

This study is grounded in Technology-Enhanced Learning (TEL), a broadly defined concept that encompasses all technologies designed to make learning more effective, efficient, and engaging (Goodyear and Retalis, 2010). This theory highlights the role of digital tools in enhancing educational experiences by making learning more interactive and immersive. In this study, TEL serves as the foundation for examining how an AI chatbot, specifically ChatGPT, influences students' understanding of aquatic life zones. By incorporating AI chatbots into the learning process, students can engage in a more dynamic and technology-driven educational environment that extends beyond traditional teaching methods. TEL helps frame this study by highlighting how AI-powered tools contribute to better engagement, comprehension, and retention of information. By assessing students' scores before and after using ChatGPT, this study evaluates the chatbot's impact as a learning tool. Additionally, examining different exposure durations allows for a deeper understanding of how prolonged interaction with AI affects learning outcomes. Therefore, this study aims to apply this theory to explore how AI chatbots can enhance learning experiences by creating an interactive and immersive environment that support students' understanding of aquatic life zones.

This study is also grounded on the Constructivism theory. From a constructivist perspective, learning is perceived as an active and social process, where individuals actively construct their own knowledge through interactions with their surroundings and others (Ertmer and Newby, 2013). Through meaningful interactions facilitated by the AI chatbot, learners can actively engage with the content on aquatic life zones and develop their understanding. The AI chatbot offers opportunities for exploration, experimentation, and collaboration, empowering learners to construct their own knowledge regarding the intricate concepts linked to aquatic life zones. Therefore, this study aims to apply this learning theory in examining how the AI chatbot facilitates knowledge construction and promotes collaborative learning experiences that enhance understanding of aquatic life zones.

### 1.2. Conceptual Framework

This section shows the conceptual framework of the study. The conceptual framework is like the blueprint for a research study. It defines important ideas, connections, and theories. According to Creswell (2014), it is a vital part of research design. It helps researchers understand the ideas behind the study and shapes the creation of hypotheses or research questions. Furthermore, the conceptual framework serves as a guide for data collection and analysis, providing a clear structure for organizing and interpreting the findings of the study.

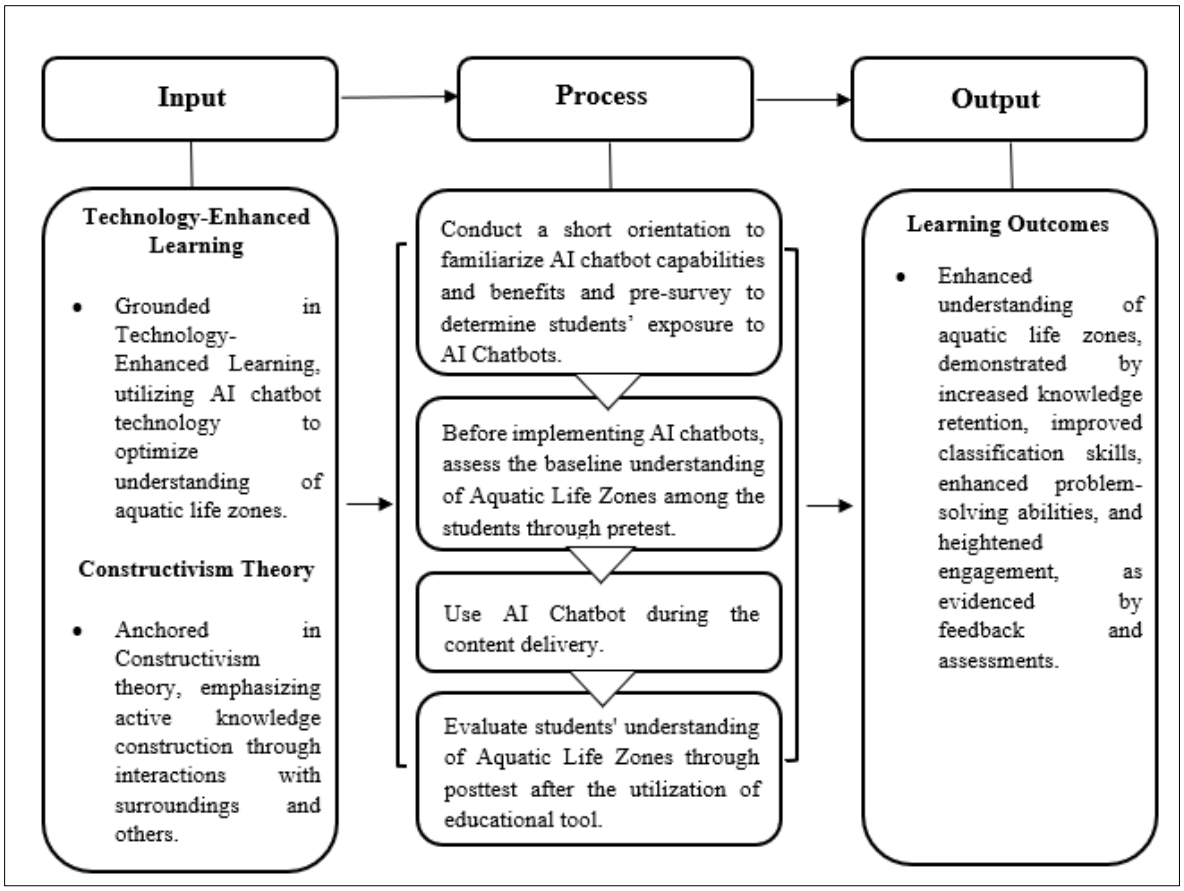


**Figure 1** Input-Process-Output (IPO) Model on AI Chatbot (ChatGPT-Powered) as a Technology-Support Learning Tool

Figure 1.1 depicts an input-process-output (IPO) model that illustrates the study. This model outlines three core components: Input, Process, and Output, each contributing to the study's objectives. The Input components are firmly anchored in two essential theories: Technology-Enhanced Learning (TEL) describes the utilization of information and communication technologies in the realm of education and instructional methods (Kirkwood and Price, 2013), and Constructivism theory posits that learning is an active process shaped by interactions with surroundings and others (Ertmer and Newby, 2013).

In the Process phase, students first undergo a brief orientation to familiarize them with the AI chatbot's functionalities and benefits. This is followed by a pre-survey to determine their prior exposure to AI chatbots, and then a pretest to assess their baseline understanding of aquatic life zones. The AI chatbot is then used for content delivery, fostering engagement through interactive, conversational learning experiences. Teacher oversight ensures guidance throughout the learning process. The process concludes with a posttest to evaluate students' understanding of aquatic ecosystems.

The Output phase focuses on learning outcomes, aiming to demonstrate enhanced understanding through increased knowledge retention, improved classification skills, heightened problem-solving abilities, and greater engagement, as evidenced by feedback and assessments. Insights gleaned from this phase inform advancements in AI-powered educational tools, aligning with the principles of Technology-Enhanced Learning and Constructivism to optimize learning outcomes and understanding of aquatic life zones.

### 1.3. Statement of the Problem

Despite the recognition of AI's potential in learning, evidence regarding its specific impact on science education remains limited and inconclusive (Williamson and Eynon, 2020). To enhance student learning, educators must use appropriate learning tools. This study aimed to utilize and determine the usefulness of an AI chatbot (ChatGPT-powered) as an assistant learning tool in understanding aquatic life zones in one of the laboratory schools of Tacloban City. Furthermore, this research sought to answer the following research questions:

What are the mean scores of students with and without exposure to the AI chatbot (ChatGPT-Powered) in understanding aquatic life zones before the utilization of the AI chatbot in the discussion?

What are the mean scores of students with and without exposure to the AI chatbot (ChatGPT-Powered) in understanding aquatic life zones after the utilization of the AI chatbot in the discussion?

Is there a significant difference between the mean scores of the students with and without exposure to the AI chatbot (ChatGPT-Powered) in terms of their understanding aquatic life zones before and after the utilization of the AI chatbot in the discussion?

## 2. Review of related literature

This chapter provides an overview of the relevant literature and studies that contribute valuable insights to the utilization of the AI chatbot (ChatGPT-Powered) as a technology-supported tool for understanding aquatic life zones. By examining these studies, this chapter aims to deepen the understanding of the subject matter and uncover practical implications that hold significance for educators and researchers in this field.

### 2.1. Issues in Marine Education

Ocean environments are under exceptional pressure by anthropogenic activities leading to climate change, marine pollution, and overexploitation of fish stocks, with their severe negative impacts on marine ecosystems and humans, particularly in densely populated coastal regions (Lubchenco et al., 2016). The generally worse state of the oceans, with no area unaffected by human influence and a large fraction (41%) strongly affected by multiple drivers, requires urgent, comprehensive, and efficient actions to save the oceans and prevent even more mis- and overuse (Gattuso et al., 2018). However, public knowledge about the importance of the ocean or marine life is low (Fauville et al., 2018).

The lack of ocean literacy has been partially attributed to the limited marine education taking place in schools. Similarly, the lack of research on the effectiveness of marine education programs for students as well as the dearth of ocean science topics in K-12 classrooms are mentioned all over the world, including Europe (Markos et al., 2017). In line with this, in Brazil, difficulties were reported in including themes related to the ocean and marine environments in classes including the absence of ocean literacy (OL) in the school curriculum and university education, as well as the limited time to work on these subjects in classes, which is in line with the challenges faced by teachers from other countries (Pazoto et al., 2024). A study by Guest et al. (2015) explored how familiar students and other citizens are with the marine environment. The findings provided evidence that citizens are often unfamiliar with ocean science and marine-related environmental issues. Previous research by Hapidin et al. (2022) states that low knowledge and awareness about marine and maritime learning is still relatively foreign and not familiar so it also has an impact on the low understanding of early childhood literacy maritime or marine.

Implementing effective educational tools can play a vital role in enriching students' understanding and fostering greater ecological awareness. In the context of maritime education, literacy can be developed through activities such as reading maritime-themed stories, writing logbooks, or engaging in discussions about ocean exploration. These activities not only enhance reading and writing skills but also deepen children's understanding of marine environments and maritime culture (Nuryati, 2025). By incorporating these interactive and immersive approaches, students can develop a stronger connection to marine environments, fostering a sense of responsibility and appreciation for ocean conservation.

### 2.2. Existing Learning Tools in Education and Their Limitations

In the field of education, there are certain learning tools that have long been integral to the teaching and learning process. Traditional resources like textbooks and chalkboards, along with modern technologies such as computers, have been essential in supporting students' knowledge acquisition and comprehension across different subjects (Bhute et al.,2021). Over time, they have been adapted to meet the changing needs of students and advancements in technology. Despite the emergence of new teaching methods, these traditional tools remain essential for engaging students, facilitating active learning, and supporting deep comprehension (Al-Anqoudi et al., 2023). Their continued effectiveness across generations highlights their enduring value in providing a strong foundation for academic success and future growth (Chan and Lee, 2023).

Various learning tools are utilized in education, including visual representations, worksheets, and multimedia resources. Visual aids, such as drawings, photographs, and models, are particularly effective in making abstract concepts more tangible and simplifying complex ideas (Chutami and Suhartini, 2021). Moreover, worksheets that have been widely used demonstrate improvement in thinking skills (Sudarmin et al., 2019). Additionally, the application of new

technologies can convert educational institutes into learning rather than teaching institutes with vast implications for curricular and instructional methods. Furthermore, multimedia provides the teacher with many possibilities in creating teaching strategies. Using the internet, pupils can quickly find the required information. In addition, formats of stored information are smaller in comparison with video cassettes (e.g., CD, DVD, and USB). Multimedia educational tools are conceived on the principle of play, as extremely powerful techniques of learning, making teaching easier (Kapri, 2017).

Existing educational tools in science classrooms have certain limitations that hinder their effectiveness. While visual representations are valuable, they may not always support learning, especially when depicting abstract or complex phenomena that are difficult to visualize accurately (Presmeg, 2020). Additionally, despite the use of multimedia teaching methods and other techniques, these tools may not fully uncover the true extent of students' learning abilities, as they may not cater to diverse learning styles and preferences. Additionally, these tools may have limitations in fostering higher-order thinking skills, such as critical thinking and problem-solving, which are essential for deeper understanding and application of knowledge (Aljawarneh, 2020). This is why, it is crucial to carefully design materials, employ personalized approaches, and integrate activities that encourage critical thinking to enhance the effectiveness of educational tools in science classrooms. Additionally, access to learning resources remains a significant challenge, particularly for students with disabilities or those facing socioeconomic barriers (Jones et. al, 2021). Traditional tools frequently ignore universal design principles, denying certain groups of the student population access to vital learning resources. This exclusionary attitude undermines efforts to promote inclusion and equity in educational environments, worsening academic achievement gaps.

Using new and creative methods and making the most of technology, we can make learning more exciting and interactive. Addressing these limitations necessitates a paradigm shift toward more inventive and flexible teaching technology. AI chatbots powered by models such as ChatGPT offer promising ways to improve the efficiency of learning tools for understanding aquatic life zones by capitalizing on advances in Artificial Intelligence (AI) and natural language processing. As we keep improving and adjusting educational tools, they can keep getting better and help us learn even more. This will help students gain the knowledge and skills they need to succeed in a world that is always changing.

### 2.3. Role of Artificial Intelligence (AI) in Education

In today's modern world, AI technologies are rapidly advancing, transforming how people communicate and learn. Education has become one of the most impacted domains, as digital advancements continue to shape various industries. Schools and universities are now exploring AI to enhance both teaching and learning experiences. From automating administrative tasks to offering personalized learning, AI's role in education is expanding at an unprecedented pace. The potential of AI in education is immense, offering opportunities to improve teaching methods and expand access to learning (Reynolds et al., 2020; Roschelle et al., 2020; Zawacki-Richter et al., 2019). With the increasing demand for technology-assisted learning environments, AI applications like ChatGPT are helping bridge gaps in education, making knowledge more accessible to students. Among AI technologies, chatbots have emerged as valuable educational tools that can enhance student learning outcomes in various areas (Wollny et al., 2021).

One of the key reasons for the growing adoption of AI in education is the versatility of chatbots. Chatbots serve multiple purposes in education, including information dissemination, inquiry response, feedback provision, tutoring support, gamification of learning, and facilitation of social interaction (Wollny et al., 2021). ChatGPT, in particular, has gained popularity among students as it offers a more engaging and interactive learning experience (Tlili, 2023). In addition to providing learning experiences, chatbots offer instant feedback, personalized learning experiences, and increased student motivation (Kuhail et al., 2022). They also enhance student engagement and interaction by assigning group projects, similar to teachers, and assisting teachers with tasks like answering questions and checking homework (Albayrak, 2018). In this way, AI chatbots effectively act as virtual assistants, fulfilling the roles and responsibilities of the teachers (Chen et al., 2020). However, it is crucial to exercise caution when integrating AI chatbots into education. Overreliance on AI-generated information can hinder students' critical thinking and problem-solving skills (Kasneci et al., 2023). Additionally, AI chatbots may provide biased or inaccurate information, making it challenging for teachers to assess the originality of students' work (Kasneci et al., 2023; Sedaghat, 2023). Therefore, responsible integration of AI chatbots in education requires a balance between the advantages they offer and the concerns they pose.

### 2.4. Utilization of AI Chatbots in Education

Integrating AI chatbots in education has brought about a transformative shift in how students and educators engage with technological tools. These chatbots offer various benefits, such as providing instant responses, personalized learning experiences, and assistance with administrative tasks. Many educators and researchers acknowledge the potential of AI chatbots to enhance learning and streamline teaching processes. However, despite their promising advantages, some experts emphasize the need for further research to fully understand their effectiveness. A more

thorough and systematic investigation can help determine how AI chatbots influence student engagement, academic performance, and overall learning outcomes.

Several scholarly studies have consistently showcased significant enhancements in academic achievement because of AI technologies (Khan et al., 2021; Kim et al., 2021). It can improve learning outcomes, productivity, and student engagement by opening new avenues for individualized education, feedback, and assistance (Adiguzel et al., 2023). Moreover, students are not only offered individualized tasks (Hirankerd and Kittisunthonphisarn, 2020) but also the advantage of receiving instant and customized feedback by analyzing their work and learning process (Okonkwo and Ade-Ibijola, 2020; Porter and Grippa, 2020). By integrating AI technologies into education, students are equipped with essential twenty-first-century skills such as critical thinking and creativity, enabling the assessment and evaluation of complex skills (Luckin et al., 2016). Additionally, AI fosters deep thinking by providing opportunities for advanced cognitive processes (Chiu et al., 2023).

Educators can greatly benefit from the current capabilities and future potential of AI-powered chatbots, like ChatGPT, as they have the power to significantly enhance existing instructional practices. These chatbots offer educators valuable tools and resources that can revolutionize their teaching methods, providing them with innovative ways to engage and support students (Cooper, 2023). From the perspective of educators, it saves their time and energy on instructional planning and engaging with students. For instance, ChatGPT excels at generating diverse question types and answer keys across various disciplines. However, it is crucial for educators to critically evaluate and customize these resources to align with their unique teaching contexts. While AI has made significant advancements, the expertise, experience, and understanding of teachers remain indispensable, as AI is not yet capable of fully replacing the role of a teacher in subjects like science.

Utilization of AI chatbots can also improve educator's pedagogy. Teachers can use ChatGPT in different ways to improve their teaching methods and assessments (Herft, 2023). One example is using ChatGPT to create questions that fit exactly with the specific goals and criteria of the lessons. This allows teachers to customize the learning materials for each student, taking into account their unique needs, interests, and preferences (Al Ka'bi, 2023; Fariani et al., 2023). Using AI chatbots in education offers personalized learning for students and helps teachers. However, it's important to find a balance between these benefits and the concerns associated with AI integration in education to ensure responsible use.

In the context of science education, the AI chatbot (ChatGPT-Powered) made a significant impact. In the study conducted by Huesca (2024), it examined how ChatGPT enhances flipped learning in higher education, focusing on engineering courses where the intervention lasted ten weeks, with two sessions of two hours each week. Using an experimental design, they compared learning gains between ChatGPT-assisted flipped learning (focus groups) and traditional video-based flipped learning (control groups). Pretest–posttest analysis showed that focus groups had significantly higher learning gains than control groups, confirming that integrating ChatGPT into flipped learning improves student performance through a more interactive and personalized learning experience. Similarly, in the study by Alneyadi and Wardat (2023), the impact of ChatGPT on the academic performance and learning perception of 11th-grade students in a UAE school studying electromagnetism was explored, with the intervention spanning four weeks. Quantitative data were gathered through pre-/posttest surveys, measuring participants' course achievement and perception of learning with ChatGPT. Results showed that ChatGPT positively influenced student achievement and learning perception, with the experimental group scoring significantly higher on posttests across all subscales.

Another study by Alneyadi and Wardat (2024) explored the impact of chatbot applications on student achievement in Quantum Theory courses. The experimental group received ChatGPT-enhanced instruction, while the control group experienced traditional teaching. Significant posttest score improvements in Knowing, Applying, and Reasoning sub-skills were observed in the experimental group, showcasing ChatGPT's potential to enhance learning experiences and integrate them into curricula. In a separate study, Suleiman (2024) utilized a quasi-experimental design to assess the effects of AI-blended learning and AI-personalized learning on undergraduate biology students' attitudes and performance in climate change education. Comparing AI-blended learning and AI-personalized learning, both incorporating ChatGPT-3.5, with traditional classroom instruction over four weeks, the analysis included mean, standard deviation, and ANCOVA tests. Results demonstrated that AI-blended learning significantly improved student attitudes and performance compared to AI-personalized learning and Traditional Classroom Instruction. Lecturers are encouraged to adopt AI-blended learning with ChatGPT-3.5 to enhance student engagement and learning outcomes in environmental education.

ChatGPT made also a significant impact in other disciplines. Clark (2023) examined the application of an Artificial Intelligence chatbot with General Chemistry exam questions. The findings indicated that ChatGPT exhibited remarkable language processing abilities and excelled in answering questions based on general knowledge as opposed to those

demanding specialized skills, especially if these skills were predominantly taught through lectures. Additionally, incorrect responses and flawed explanations provided by ChatGPT could appear logically sound and persuasive to individuals lacking expertise in the subject. Understanding biology concepts became easier also with the help of AI Chatbots. ChatGPT offers numerous benefits that can influence various aspects of biology and environmental science, such as education, research, publishing, outreach, and practical applications. One notable advantage is its ability to simplify and speed up complex and difficult tasks (Agathokleous et al., 2023). Moreover, ChatGPT can create practice exercises and quizzes, which allow students to assess their understanding of physics concepts and reinforce their learning (Bruneau, 2023).

While AI chatbots offer significant contributions to education, they also present challenges that can impact the teaching and learning process. Students may begin relying heavily on this tool to answer questions rather than actively engaging with the provided learning materials. Students need to develop independent thinking skills to identify, analyze, and synthesize information on themselves (Choi et al., 2023). Additionally, using chatbots raises concerns about academic dishonesty, as students might utilize the tool to generate written assignments and pass them off as their work. Educators play a vital role in educating students on academic integrity and the importance of critical thinking. They must highlight the repercussions of misusing AI-generated content to cultivate a deeper understanding of the ethical considerations involved (Vargas-Murillo et al., 2023).

In summary, in the era of AI-assisted learning, the evolution of digital assessments is set to become increasingly innovative and engaging. Consequently, adaptability becomes crucial for the education sector to effectively embrace these technologies and leverage AI systems like ChatGPT to create developmental opportunities. It is essential to raise awareness of the potential misuse of AI and continually enhance the learning process through its responsible utilization. While numerous studies acknowledge the potential of AI in learning, its specific impact on science education remains relatively unclear. Therefore, further investigation is necessary to gain a deeper understanding of how AI chatbots can inspire students to learn and effectively motivate them to utilize technology for educational purposes.

## 3. Methodology

### 3.1. Research Design

This study utilized a one-group pretest-posttest research design, which is a pre-experimental research design. It involved measuring the dependent variable in a single group of participants before and after they received the treatment (Choueiry, 2023). The researchers utilized this design to assess the impact of the AI chatbot (ChatGPT-Powered) as a technology-supported learning tool for understanding aquatic life zones. This design enabled the comparison of participants' understanding before and after interaction with the chatbot, providing insights into its usefulness within the constraints of a real-world educational context. The use of a one-group design allowed for an examination of the changes within the same group over time, offering a practical approach to evaluating the usefulness of the AI chatbot within the instructional methods.

### 3.2. Research Locale

This study was conducted in one of the laboratory schools in Tacloban City, which is known for its innovative and technology-driven approach to education. It is one of the schools in the Eastern Visayas region that not only focuses on developing and molding students' behavior but also places a strong emphasis on fostering excellence in both their intelligence and character. The school aims to provide a relevant and enriching curriculum that trained students to conduct research and utilize the knowledge gained to improve learning for all. Within this nurturing educational environment, the chosen research locale offered an ideal setting to investigate the usefulness of the AI chatbot and establish causal relationships. Equipped with state-of-the-art technological resources, the school enabled teachers to proficiently utilize these tools, enhancing the learning experience for both students and educators. The integration of technology into the curriculum created a dynamic and engaging educational environment, empowering all stakeholders. Moreover, the school's commitment to staying at the forefront of educational advancements presented a unique opportunity to explore the impact of technology-supported tool on student learning outcomes.

### 3.3. Research Respondents

The study utilized purposive sampling, a non-random sampling technique. In purposive sampling, participants are selected based on specific characteristics that align with the research objectives (Campbell et al., 2020). In this study, the Grade 10 students from a laboratory school in Tacloban City were chosen as respondents, as the focus of the research was to examine the effects of different instructional methods on understanding aquatic life zones. These students were

selected based on their accessibility and availability of technological resources, such as mobile phones, tablets, or laptops, which were essential for their participation in the study.

Purposive sampling was used for this study to ensure that the participants met the specific criteria required for this research. The goal was to utilize and determine the usefulness of an AI chatbot (ChatGPT-Powered) as an assistant learning tool in understanding aquatic life zones. Hence, selecting participants from the target population who shared similar characteristics ensured the validity and relevance of the findings. Also, since random assignment was infeasible in a typical school setting, purposive sampling allowed the researchers to work within the existing classroom structure while still making meaningful comparisons. Furthermore, this approach also increased the practicality of implementing the study in a real-world educational context.

The inclusion criteria required that students be enrolled in Grade 10 during the 2024-2025 school year at a laboratory school in Tacloban City. Students who had access to the necessary technological resources actively participated in the research activities, including pre- and post-assessments, and were considered eligible. Conversely, students who lacked access to these resources were absent during key research activities, or failed to complete the required assessments were excluded. These exclusion criteria helped maintain the integrity of the study's results, ensuring that only students who fully participated and had the necessary resources were included in the analysis.

### 3.4. Research Instrument

The study utilized a lesson plan to evaluate the usefulness of the AI chatbot (ChatGPT-Powered) in enhancing students' comprehension of aquatic life zones. The lesson plan used the 7Es (Elicit, Engage, Explore, Explain, Elaborate, Evaluate, and Extend) format strategically designed to investigate how AI Chatbots will enhance students' mean scores in understanding aquatic life zones. The lesson plan outlined a set of tasks and inquiries assigned to the students. Furthermore, this research tool incorporated a Table of Specifications (TOS) and utilized a multiple-choice test for pretest and posttest evaluations. The data collected from these assessments offers a quantitative analysis of the AI chatbot's efficacy in comprehending aquatic life zones.

### 3.5. Data Gathering Procedure

In this study, specific steps and protocols were followed to effectively implement and assess the utilization of an AI chatbot (ChatGPT-Powered) as a technology-supported learning tool for understanding aquatic life zones. This included the methods for data collection, processing, and analysis to ensure the reliability and validity of the findings. By providing a clear and comprehensive description of the procedure, this study allows for replication and further exploration in similar educational settings. The researchers have devised the following flowchart to summarize the research procedure of the study.

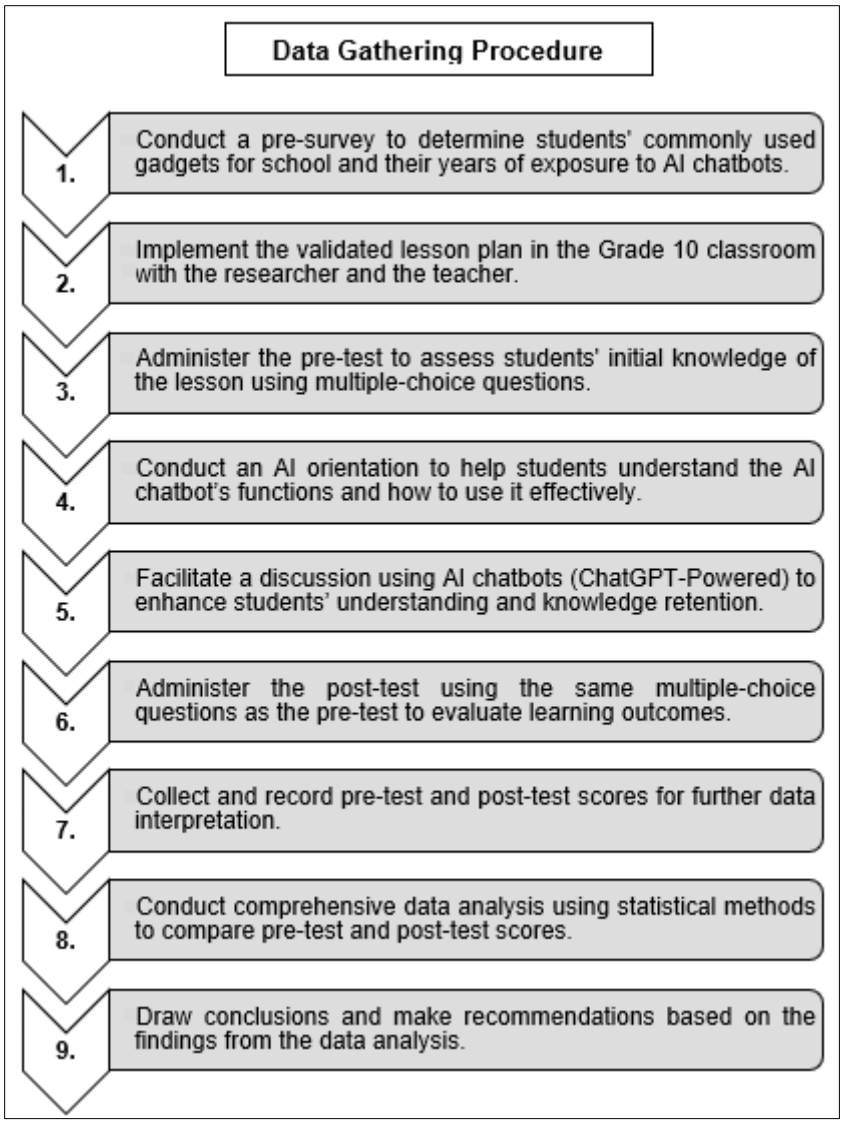


**Figure 2** Research Flowchart

This study followed specific procedures to gather data. Initially, the researchers conducted a pre-survey to determine the types of gadgets students commonly used for school purposes and their years of exposure to AI chatbots. In the actual Grade 10 classroom, the researcher, along with the teacher, implemented the validated lesson plan. Prior to the implementation, the pretest was administered to the students to assess their initial knowledge of the lesson. The pretest consisted of multiple-choice questions designed to measure the targeted learning outcomes. An AI orientation took place before the lesson to help students understand the AI chatbot's functions and how to use it effectively throughout the lesson. Following the lesson, a thorough and engaging discussion, incorporating the use of AI chatbots (ChatGPT-Powered), took place to enhance students' understanding and knowledge retention. After the discussion, the posttest was administered to the students.

The posttest utilized the same set of multiple-choice questions used in the pretest, ensuring consistency and comparability. Its purpose was to evaluate the students' learning outcomes and determine the usefulness of utilizing AI chatbots (ChatGPT-Powered) in the lesson. The researchers collected and recorded the pretest and posttest scores of the section for further data interpretation. Based on the collected data, the researchers conducted comprehensive data analysis, utilizing appropriate statistical methods to compare the pretest and posttest scores and assess the usefulness of AI chatbots (ChatGPT-Powered) in enhancing student learning outcomes. Finally, based on the findings from the data analysis, the researchers drew conclusions and made relevant recommendations for incorporating AI chatbots (ChatGPT-Powered) into future classroom settings.

### 3.6. Analysis of Data

To determine the usefulness of utilizing an AI chatbot (ChatGPT-Powered) as a technology-supported learning tool for understanding aquatic life zones, this study employed appropriate statistical tools to analyze the collected data. The analysis focused on comparing students' understanding of aquatic life zones before and after using the AI chatbot by evaluating their pretest and posttest scores. The statistical tool used was the paired-sample t-test, which is designed to compare the means of two related groups. Before applying this test, a normality test was conducted to determine whether the data followed a normal distribution. The Shapiro-Wilk test was used as the normality test to assess whether the data were normally distributed. Conducting a test of normality is essential in statistical analysis, particularly when using parametric tests like the paired-sample t-test. Normality testing ensures that the data meet the assumptions of the test, allowing for accurate and reliable conclusions. If the data are normally distributed, the paired-sample t-test is appropriate. However, if the data do not follow a normal distribution, a non-parametric alternative, such as the Wilcoxon signed-rank test, will be used instead.

To determine the students', mean scores before using the AI chatbot, the pretest scores were collected and analyzed. Descriptive statistics, including the mean and standard deviation, were used to summarize the data and provide insights into their baseline understanding of aquatic life zones. These scores served as a reference point for comparison with the posttest results.

After the utilization of the AI chatbot, posttest scores were gathered to assess changes in students' understanding of aquatic life zones. The same descriptive statistical analysis was applied to determine whether there was an improvement in their comprehension after engaging with the AI chatbot. By comparing the pretest and posttest results, the study aimed to evaluate the chatbot as a technology-supported learning tool for understanding aquatic life zones.

## 4. Presentation, analysis and interpretation of data

This chapter presents the data obtained from the study. The researchers analyzed and interpreted the usefulness of the AI chatbot (ChatGPT-Powered) as an assistant learning tool in understanding aquatic life zones. The results focused on the mean scores of the students in both the pretest and posttest, as well as the comparison of students' mean scores. The data collected underwent statistical analyses and interpretations to offer insights into the AI chatbot's efficacy in addressing the study's objectives and research questions.

### 4.1. The Mean Scores of Students Before the Utilization of the AI Chatbot (ChatGPT-Powered)

This section provides the results of the student's academic performance before the utilization of AI chatbot in understanding aquatic life zones. After collecting the data, descriptive statistics, including the mean and standard deviation, were used to summarize students' academic performance before the utilization of the AI chatbot. The table below shows the mean results of the pretest.

**Table 1** Descriptives of Students' Exposure to AI Chatbot (ChatGPT) Pretest Scores

| Grouping Variable Pretest | N | Mean | Mean Difference | SD |
|---|---|---|---|---|
| With Exposure | 24 | 8.292 | -0.908 | 2.368 |
| Without Exposure | 10 | 9.200 | | 2.573 |

*Note.* N = number of students. SD = standard deviation.

The pretest scores of students with varying levels of exposure to the AI chatbot (ChatGPT) reveal differences across the groups. The group with exposure to the chatbot (1-4 years) comprising 24 students had a mean pre-test score of 8.292 with a standard deviation (SD) of 2.368. On the other hand, the group with no exposure to the chatbot comprising of 10 students, had a mean pretest score of 9.200 with a standard deviation (SD) of 2.573. Additionally, a mean difference of −0.908 was observed between the two groups. The normality of the data was tested using the Shapiro-Wilk test, where a p-value below 0.05 indicates a significant deviation from normality. The group with exposure (1-4 years) had a p-value of 0.032, which is below 0.05, suggesting that their scores were not normally distributed. In contrast, the group without exposure had a p-value of 0.814, which is above 0.05, indicating that their scores were normally distributed (see appendix N).

Prior to the utilization of the chatbot in the discussion, the pretest scores were analyzed to identify topics with which students were already familiar and those requiring further clarification. The scores revealed that students

demonstrated a solid understanding of major marine communities, open ecosystems, and various methods for protecting marine ecosystems. This suggests that these concepts were either previously covered in their curriculum or were intuitive based on prior knowledge and experiences.

However, certain topics, such as the factors affecting aquatic ecosystems, their impact on marine species and their characteristics, and the significance of open ecosystems, posed challenges for the students. This result aligns with the studies by Guest et al. (2015), which state that students and other citizens are unfamiliar with ocean science and marine-related environmental issues. The lower scores in these areas indicate the need for more in-depth discussion and instructional reinforcement to enhance comprehension. These gaps highlight potential areas where the chatbot's integration could provide targeted explanations, interactive discussions, and real-time feedback to address misconceptions and improve learning outcomes. Overall, the mean pretest scores of students with varying exposure durations to the chatbot suggest a moderate level of understanding of the topic before the utilization.

### 4.2. The Mean Scores of Students After the Utilization of the AI Chatbot (ChatGPT-Powered)

This section provides the results of the student's academic performance after the utilization of AI chatbot in understanding aquatic life zones. After collecting the data, descriptive statistics, including the mean and standard deviation, were used to summarize students' academic performance after the utilization of the AI chatbot. The table below shows the mean results of the posttest.

**Table 2** Descriptives of Students' Exposure to AI Chatbot (ChatGPT) Posttest Scores

| Grouping Variable Pretest | N | Mean | Mean Difference | SD |
|---|---|---|---|---|
| With Exposure | 24 | 13.875 | -0.725 | 2.112 |
| Without Exposure | 10 | 14.600 | | 2.066 |

*Note.* N = number of students. SD = standard deviation.

The posttest scores of students with different levels of exposure to the AI chatbot (ChatGPT) also reveal distinct differences across the groups. The group with exposure to the chatbot (1-4 years) comprising 24 students had a mean posttest score of 13.875 with a standard deviation (SD) of 2.112. In contrast, the group with no exposure to the chatbot comprising of 10 students, had a mean posttest score of 14.600 with a standard deviation (SD) of 2.066. Additionally, a mean difference of −0.725 was observed between the two groups. The normality of the data was tested using the Shapiro-Wilk test, where a p-value below 0.05 indicates a significant deviation from normality. The Shapiro-Wilk test for normality resulted in p-values of 0.275 for the group with exposure (1-4 years) and 0.447 for the group without exposure, both of which are greater than 0.05. This indicates that the posttest scores for both groups follow a normal distribution and meet the assumption of normality (see appendix N).

After the utilization of the chatbot in the discussion, the posttest scores were analyzed to identify topics that students had mastered and those that still required further clarification. The results indicated an overall improvement in students' understanding of concepts related to aquatic life zones. Specifically, notable improvements were observed in topics such as major marine communities, open ecosystems, factors affecting aquatic ecosystems, and various methods for protecting marine ecosystems and their organisms. These improvements suggest that the AI chatbot effectively reinforced key concepts and helped students grasp the topic. This aligns with the study by Bruneau (2023), in which the AI chatbot (ChatGPT) allows students to assess their understanding of science concepts and reinforce their learning. Similarly, the study by Adiguzel et al. (2023) revealed that AI chatbots improve learning outcomes and student engagement, as they offer new avenues for feedback and assistance.

However, certain topics, including marine species in high-salinity environments and the dynamics of open ocean ecosystems, remained challenging. This aligns with the study by Fauville et al. (2018), which indicates that knowledge about the ocean and marine life remains low. Similarly, the study by Hapidin et al. (2022) revealed that low knowledge and awareness of marine and maritime learning are still relatively uncommon and unfamiliar, affecting the overall understanding of marine education. Some topics showed little to no improvement in posttest scores, suggesting additional instructional support was needed. Persistent difficulties indicate a need for deeper discussions, enhanced chatbot interactions, and supplementary materials like visual simulations or interactive exercises. Overall, the increase in mean posttest scores with varying exposure durations highlights significant improvement in understanding after the utilization of the AI chatbot.

### 4.3. The Difference in the Mean Scores of Students Before and After Utilization of the AI chatbot (ChatGPT-Powered)

This section presents the comparison of the students' academic performance before and after utilization of AI chatbot in understanding aquatic life zones. The paired observations of the pretest and posttest scores were analyzed using statistical tests to determine if there was a significant difference. The Shapiro-Wilk test was applied to assess the normality of the data distribution. Depending on the normality results, either the Wilcoxon signed-rank test or the paired-sample t-test was used to compare the scores. The table below shows the mean difference and significance of the results.

**Table 3** Comparison of Pretest and Posttest Academic Performance Scores

| Paired Observations | Shapiro-Wilk Test of Differences between Paired Observations | | Type of Test | MD | p-value | Interpretation |
|---|---|---|---|---|---|---|
| | p-value | Interpretation | | | | |
| E Pretest – E Posttest | < .001 | Deviation from normality | Wilcoxon signed-rank | 5.583 | < .001 | Significant |
| NE Pretest – NE Posttest | 0.172 | Normal distribution | Paired-sample t-test | 5.400 | < .001 | Significant |

*Note.* E = students with exposure. NE = students with no exposure. MD = mean difference.

The Shapiro-Wilk test was conducted to assess whether the differences between the pretest and posttest scores in the group with exposure (1-4 years) to AI chatbot followed a normal distribution. The test yielded a p-value of < .001, indicating a significant deviation from normality. Since the data did not meet the assumption of normality, the Wilcoxon signed-rank test was applied to compare the paired observations. The results of the Wilcoxon test showed a mean difference of 5.583 between the pretest and posttest scores, which corresponds to an increase of 67.33%. The mean pretest score in the exposure group was 8.292 and is equivalent to 41.46%, which increased to 13.875 or 69.38% in the posttest. This 67.33% increase in mean difference between the pretest and posttest scores of the group who were exposed to the AI chatbot indicates that it effectively enhanced the students' comprehension of aquatic life zones. Moreover, the p-value for this difference was < .001, confirming that the increase was statistically significant and not due to random chance. For the group of students who were not exposed to the AI chatbot, the Shapiro-Wilk test showed a p-value of 0.172, indicating no significant deviation from normality. Since the data followed a normal distribution, a paired-sample t-test was used to compare their pretest and posttest scores. The results of the paired-sample t-test revealed a mean difference of 5.400 between the pretest and posttest scores, which corresponds to an increase of 58.70%. The mean pretest score in the no exposure group was 9.200 which is equivalent to 46.00% and increased to 14.600 or 73.00% in the posttest. This 58.70% increase in mean difference between the pretest and posttest scores of the group who were not exposed to the AI chatbot indicates that despite the absence of the chatbot, the students still showed a notable improvement in their academic performance. This suggests that factors other than the chatbot may have contributed to their enhanced scores. Moreover, the p-value for this difference was < .001, indicating that the increase in scores was also statistically significant.

The results of this study reveal a significant improvement in students' academic performance after being exposed to an AI chatbot technology-supported tool. The significant difference in the mean scores between the pretest and posttest for students with exposure highlights the chatbot's usefulness in reinforcing their understanding of aquatic life zones. This aligns with the findings of Suhonen (2024), who emphasized that AI tools offer personalized guidance, making it easier for students to grasp complex topics and enhance their problem-solving skills. Similarly, Albadarin et al. (2024) found that ChatGPT serves as an intelligent learning assistant by providing instant feedback, answering queries, and offering on-demand access to educational materials that promote active learning and deeper comprehension.

Moreover, the significant difference between the students with exposure and with no exposure to the AI chatbot reflects the positive influence of AI-driven instruction. This is supported by Labadze, Grigolia, and Machaidze (2023), where they emphasized that AI-powered chatbots facilitate learning by giving detailed feedback, guiding students through complex concepts, and enabling self-assessment through interactive quizzing. These findings correspond with the principles of Technology-Enhanced Learning (TEL), which emphasize the role of digital tools in personalizing education and making learning more flexible. From a Constructivist perspective, the AI chatbot encourages students to engage with the material actively, allowing them to build their knowledge through interaction and inquiry rather than passively absorbing information.

The positive impact of AI chatbots on academic performance is also evident in the study by Iyamuremye and Ndihokubwayo (2024), in which a significant improvement in students' mastery of atomic structure and chemical bonding is shown after incorporating AI-assisted learning. Similarly, Valeri, Nilsson, and Cederqvist (2024) found that students in STEM subjects valued ChatGPT for its ability to provide quick responses and engage them in discussions that deepened their understanding of key concepts. Overall, these findings highlight the strong potential of AI chatbots as a useful tool in science education. Its ability to deliver immediate feedback, clear explanations, and interactive learning experiences supports the principles of TEL and Constructivism, which focus on technology-driven and student-centered learning. This makes AI chatbot (ChatGPT-Powered) a valuable tool for teaching complex scientific concepts by fostering a more engaging and personalized learning environment.

## 5. Summary of the findings, conclusions, and recommendations

This chapter summarizes the study's findings, conclusions, and recommendations. It evaluates the usefulness of an AI chatbot (ChatGPT-Powered) as a learning tool for understanding aquatic life zones based on students' pretest and posttest scores. The results highlight the chatbot's impact on learning, providing insights for educators and future researchers on integrating AI in education.

### *Summary of Findings*

This study utilized an AI chatbot (ChatGPT-Powered) as an assistant learning tool and determined its usefulness for understanding aquatic life zones among Grade 10 students. The results indicated a significant improvement in students' understanding of aquatic life zones after using the AI chatbot during the five-day session, as demonstrated by a statistically significant mean difference between their pretest and posttest scores. Specifically, for the group with exposure to AI chatbots, a Wilcoxon signed-rank test revealed a significant mean difference of 5.583 ($p < .001$), showing a meaningful improvement after the utilization of the AI chatbot. Similarly, the group without prior exposure also exhibited a statistically significant improvement of 5.400 ($p < .001$) as determined by a paired-sample t-test, suggesting that while the AI chatbot had a positive impact for the exposed group, other factors might have contributed to the improvement in the unexposed group as well. Overall, the findings highlight the potential of AI chatbots to enhance students' learning and comprehension of scientific topics like aquatic life zones. Additionally, the significant gains in both groups suggest that engagement with educational content, whether AI-assisted or traditional, plays a crucial role in knowledge acquisition.

## 6. Conclusion

The findings of this study indicate that exposure to the AI chatbot (ChatGPT) had a notable impact on students' academic performance. The comparison of pretest and posttest scores showed an overall improvement in both groups with exposure and with no exposure. However, students exposed to the AI chatbot showed significant progress, suggesting that the tool effectively supported their learning. In the pretest, students with exposure had slightly lower scores compared to those with no exposure. Despite this initial difference, the posttest results revealed that the students with exposure to the AI chatbot made a significant improvement to their scores. This suggests that the AI chatbot played a role in helping students enhance their understanding of the topic. Meanwhile, the group with no exposure also improved, but their progress was comparatively smaller. The statistical analysis further confirmed the significance of the improvement in both groups. The Wilcoxon signed-rank test for the with exposure group and the paired t-test for the without exposure group revealed statistically significant improvement, indicating that the AI-powered learning tool contributed to enhanced knowledge retention and academic performance.

Overall, this study shows that AI chatbots can be useful tools in helping students understand their lessons better and improve their academic performance. The significant increase in posttest scores suggests that AI-powered learning tools can make lessons more engaging, improve students' knowledge and understanding, and provide clear explanations that support effective learning. These findings suggest that AI-assisted learning can play a key role in science education by helping students understand difficult topics more easily. As AI technology continues to evolve, its role in education will likely grow, creating more personalized and flexible learning experiences.

### *Recommendations*

Based on the findings of this study, several recommendations are put forth to leverage the potential of AI chatbots in education. The researchers recommend integrating AI chatbots into educational settings, particularly in science education, to enhance student learning and engagement. Future researchers may also explore their use in other subject areas to broaden their application in diverse learning environments. Additionally, providing training for both teachers

and students on the effective use of AI chatbots can maximize learning outcomes. AI chatbots should be utilized to deliver personalized learning experiences while balancing AI use with activities that promote critical thinking and uphold academic integrity to prevent over-reliance on technology.

The researchers further recommend conducting longitudinal studies to assess the long-term effects of AI chatbot use on student learning and development and expanding research across different grade levels and educational institutions to enhance the generalizability of findings. Future studies should also examine the ethical implications and potential risks associated with AI integration in education to ensure responsible use. Additionally, further research should explore how AI chatbots can support diverse learning styles and be integrated into existing curricula without disrupting traditional teaching methods. By addressing these gaps, the potential of AI chatbots as effective educational tools can be fully realized, contributing to more innovative, personalized, and engaging learning experiences for students.

## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

In this study, the researchers prioritized ethical considerations. Prior to participation, all respondents received clear and comprehensive information about the study's purpose, objectives, and how their responses would be utilized. The potential risks and harms associated with their involvement were thoroughly assessed and explained by the researchers to ensure informed consent. Furthermore, the researchers provided detailed explanations of the study's methodology, data collection procedures, and potential outcomes to the respondents. A consent form was provided, and respondents had the choice to withdraw their permission at any point during the study. Confidentiality and privacy of all gathered information were strictly maintained by the researchers. The identities of the respondents were protected, and data were used solely for research purposes. Additionally, the researchers adhered to the requirements of the Data Privacy Act to ensure the confidentiality and protection of all data.

Moreover, the Research Ethics Committee (REC) was involved in this study. The REC reviewed the ethical aspects of the study, oversaw the informed consent process, potential risks, confidentiality and privacy, and the data collection practices in a responsible manner. The researchers also understood the importance of transparency and knowledge dissemination. As such, the thesis paper resulting from this study was published to contribute to the academic community. By upholding these ethical considerations, the researchers ensured the rights and well-being of the respondents, protected their privacy, and maintained the standards of research integrity throughout the study.

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