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AI-ASSISTED LEARNING: A CORRELATION STUDY IN THE USE OF CHATGPT, GEMINI AND THE SCIENCE SCORES OF GRADE 10 STUDENTS AT SAMAKKHIWITTHAYAKHOM SCHOOL

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ABSTRACT

This study investigates the correlation between the utilization of Artificial Intelligence (AI) tools, specifically ChatGPT and Gemini, and the academic performance in Science among Grade 10 students at Samakkhiwitthayakhom School. Driven by the rapid integration of generative AI into modern learning environments, the research aims to quantify the relationship, if any, between students' engagement with these tools and their recorded Science scores. A quantitative correlational research design was employed, involving a targeted sample of Grade 10 students. Data were collected on the frequency and manner of AI tool usage, alongside the students' official academic results in Science. The study seeks to determine whether AI-assisted learning contributes positively, negatively, or negligibly to student achievement, providing crucial evidence for educators, administrators, and curriculum planners. The findings offer significant implications for developing responsible, ethical, and effective strategies for integrating generative AI technologies into secondary science education, thereby optimizing learning outcomes in the 21st century.

Keywords: *ChatGPT, Gemini AI tool, Science scores, Gender, Grade 10 students*

INTRODUCTION

Artificial Intelligence (AI) has gained widespread acceptance as it increasingly becomes an integral part of everyday life. It rapidly transforms various sectors, including healthcare, transportation, retail, and finance (Russell and Norvig, 2018). To better understand AI's influence on society and how to leverage its potential for transformative change in education, the first step is to clarify the definition of AI and distinguish it from human intelligence (HI). Once this foundation is established, it is essential for teachers, schools, and universities to become proficient in AI to deliver effective AI education. Organizations

that embed AI into their educational programs are better positioned to prepare students for advanced studies and future employment opportunities. The UNESCO International Institute for Educational Planning (IIEP) provides support in policy formulation and capacity development to help educational systems incorporate AI competencies. When educators possess AI literacy, they can design hands-on projects, facilitate meaningful debates, and foster an environment that makes complex topics more accessible. By empowering teachers in this way, students are more likely to approach AI with interest and self-assurance rather than uncertainty (Xandra, 2024).

Interest in AI has been growing significantly over the past decade, derived from advancements in technology, increased utilization across various industries, and the potential for AI to revolutionize many aspects of daily life. According to a study by Lee et al. (2020), there has been a marked increase in research publications and public interest related to AI, indicating a rising global curiosity and investment in this field. For example, a bibliometric analysis by Lee et al. (2020) highlights that the number of AI-related publications has grown exponentially, reflecting heightened academic and industry interest. Additionally, surveys such as the one conducted by Pew Research Center (2018) reveal that a considerable portion of the public express's curiosity and concern about AI's implications, further underscoring its significance.

According to a report by McKinsey & Company (2021), approximately 50 percent of organizations worldwide have adopted AI in at least one business function, and this adoption is expected to increase as AI technologies become more accessible and cost-effective. The UNESCO Institute for Statistics (2020) reports that the global literacy rate for adults (ages 15 and above) has increased from 81 percent in 2000 to approximately 86 percent in 2019, indicating steady progress in education worldwide.

AI usage in Asia, particularly among developing countries, has been growing steadily as these nations recognize AI's potential to drive economic growth and address development challenges. According to a report by the Asian Development Bank (ADB, 2021), many developing Asian countries are increasingly adopting AI technologies in sectors such as agriculture, healthcare, and finance to improve efficiency and outcomes. For example, countries like India, Indonesia, and Vietnam have launched national AI strategies and invested in AI infrastructure to promote innovation and development (ADB, 2021). However, the level of AI adoption varies across these nations, influenced by factors such as technological infrastructure, policy support, and human capital.

Thailand's formal education system has its roots in the 19th century, during the reign of King Rama IV and Rama V, who initiated modernization efforts that included the establishment of formal schools. The modern Thai education system began to take shape in the early 20th century, influenced by Western models introduced through colonial and missionary efforts. The Education Act of 1921 laid the foundation for the current educational structure, emphasizing universal primary education and the expansion of secondary and higher education (Khaemba, 2018). Over the decades, Thailand has continuously reformed its education policies to improve access, quality, and relevance.

Today, Thailand's education structure is organized into multiple levels: pre-primary, primary, secondary, and tertiary education. The Ministry of Education oversees the system, which aims to provide universal access and improve quality. The country has made significant progress in increasing enrollment rates, with near-universal primary education, but challenges remain in ensuring equitable quality across regions (UNESCO,

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2020). The curriculum emphasizes Thai language, cultural studies, and increasingly, science and technology. Higher education institutions, including universities and vocational colleges, are expanding, with a focus on research and innovation to support Thailand's economic development (OECD, 2020).

Among these innovations, conversational AI models such as ChatGPT and learning platforms Gemini have gained eminence for their potential to assist learners' engagement, provide tailored digital assistant, and foster learning processes. Since these technologies become significantly incorporated into classroom settings, understanding their influence on students' academic performance is crucial. They significantly affect how teaching and learning are conducted in senior high schools.

The aims of this study is to explore the correlation between the usage of ChatGPT and Gemini and the science test performance of Grade 10 students. By having a thorough understanding of how these AI tools are utilized and their impact on learners' comprehension and application of science intellectual concepts, the study aims to provide insights into the usefulness of AI-assisted learning. The findings will contribute to the discussion about technology in education, providing educators, policymakers, and stakeholders with best practices for using innovative digital tools to optimize student achievement.

According to a Western Australia University (2024), they conducted the evaluation of their incorporation of AI tools within classes by collecting data via two organized interviews with course coordinators and an online survey conducted among 1,500 students. The findings showed that lessons incorporating digital technology assisted students in preparing for laboratory tasks, encouraged active participation in class discussions, boosted engagement, enhanced the participants demonstrated strong engagement and teamwork, benefiting from timely advice and helpful critiques provided by their instructors. The integration of AI tools such as Gemini AI and ChatGPT into science lessons in higher education has garnered significant interest (Castro, 2019; Crompton & Burke, 2018; Lacka et al., 2021). Student learning has expanded beyond the conventional lecture and subsequent tutorial, now involving innovative learning settings.

Student-centered approach, especially in science learning, improves learners' academic performance in line with self-regulation, autonomy, flexibility with diversity and changes, enhancing engagement, learners' power, and effective learning outcomes. Learning science requires students to do loads of research to reinforce their understanding of basic concepts as science itself is quite a challenging course. Thus, with the help of AI-assisted learning tools, it would be of great value to learners. This method also aims to foster students' deep learning and comprehension, while encouraging greater responsibility for their interdependence within a setting of mutual respect (Zairul, 2020).

However, it is necessary to confirm that the technology is used properly in the classroom or that reliable trainings in terms of managing with technology is available to both learners and teachers. For example, some teachers in Thailand were not prepared to use online education, and most pupils were unable to access it as well (Fakcharoenphol et al. 2020). Approximately 55 percent of Thailand's underprivileged schools, out of the total number of government schools, faced a shortage of resources, equipment, materials, digital devices, and teachers for implementing a STEAM-centric curriculum (Thailand Development Research Institute 2015).

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Whether science lessons integrated with technologies arouse learners' attention, help thorough understanding of complex subject matter, and increase engagement are essential for them to utilize conceptual reasoning and creativity. Academic generated AI conversational bots and AR-supported lesson plans for students. Six science units were delivered to 166 students in Ningbo, China, who were selected non-randomly. Of these, 82 students received instruction through AI chatbots and AR-based activities, while the remaining 84 were taught using traditional methods.

This study used the "Attitude on Science in School Assessment (ATSSA)" and the "Attitude on AR Activities Scale (ARAAS)" to examine the impact of virtual manipulatives using augmented reality (AR) in comparison to physical manipulatives on students' academic achievement and outlook. The findings revealed that the AR-enhanced science education platform promoted more engaged learning behaviors and improved students' perceptions and attitudes toward the learning process. The emergence of digital technologies in the classroom prompts learners to become independent, boost their study skills such as discriminating between sources or shifting information to locate specific topics etc. With the help of digital stimulation and models, teachers are provided chances to explain more abstract terms sans difficulties.

Regarding learners, digital classes consolidate their comprehensive understanding of the difficult concepts as well as stimulate their know-how to exploit it in the near future since students have been granted the privilege of being born in this digital era. ChatGPT and Gemini were chosen for this comparative correlation study for some reasons that strengthen the relevance and reliability of the findings: ChatGPT (OpenAI) and Gemini (Google) are recognized as the leading **conversational AI models**. Their immense popularity and large user base make them the most relevant tools to study, as their findings can be broadly applied to the current student population. Both are **easily accessible** to students, which reflects real-world usage and makes the research findings practical for educational institutions. By comparing ChatGPT and Gemini, researchers can analyze the effects of two competing, yet distinct, AI models on student performance. This allows for a deeper understanding of whether the **underlying technology or specific model strengths** have a differential impact on science learning. In the questionnaire the following were included as the reasons why ChatGPT were singled out among AI tools: (1) Understanding and Explanation: Both models are chosen to see how effective they are at generating clear explanations and summaries of complex science topics. This tests their primary function as AI tutors. (2) Problem Solving and Assignment Help: Both AI tools, ChatGPT and Gemini, are models that has the ability to assist with practical academic work, such as homework, assignments, and calculations. This is a crucial area of research, particularly in STEM fields like science, to gauge how students use the AI as a resource when they are "stuck." (3) Test Preparation: Assessing the models' utility in preparing for exams is essential, as this is a common student use. (4) Measuring Impact on Scores. The core research question is often about the effectiveness of the tool. The researchers can directly quantify the perceived impact on test performance, allowing for a head-to-head comparison of which tool, if either, is more associated with an increase in scores. (5) Perceived Usefulness: measures the user's subjective evaluation of the tool's effectiveness, which is a key component of adoption. (6) Frequency of use, helps establish the level of dependence or integration of

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the tool into the student's study routine and (7) Review and Reflection: assesses the student's self-regulation and metacognitive awareness regarding the AI's impact.

ChatGPT has garnered significant global attention and has shown promise in supporting students' educational progress (Kasneci et al., 2023; Kohnke et al., 2023; Tlili et al., 2023). Recent studies suggest that learners are becoming more confident in the potential of generative AI tools to improve their academic performance and assist them in developing efficient learning approaches (e.g., Afzaal et al., 2021; Hsu et al., 2023; Wang & Lin, 2023). Regarding the study, the data show a *weak but statistically significant positive* correlation between frequency of AI use (ChatGPT & Gemini) and science test scores — users tended to score slightly higher. This implies AI can support learning gains but is not a sole cause. AI provides immediate feedback, personalized explanations, practice items, scaffolding for problem-solving, and multimodal visualizations — all of which support understanding and higher-order thinking when embedded into instruction. Both AI tools, ChatGPT and Gemini, act as efficient channels for autonomous learning. An independent t-test analysis of the post-test results from both groups showed that students who used ChatGPT achieved substantially higher scores. Thus, it can be inferred that ChatGPT is a more effective tool for self-directed learning compared to Gemini (Daniella & Delia, 2025).

In Thailand context, high-achieving science students proactively engage with the subject, showing both a solid understanding of principles and the critical skills needed for data analysis and drawing valid conclusions. Their success stems from consistent effort, attention to detail, and a keen curiosity demonstrated through active participation. They actively leverage a range of resources, including digital tools and AI assistants like C hatGPT and Gemini, to boost their learning and deepen their mastery of scientific topics.

The background explicitly notes a scarcity of localized studies on AI in *science education in Thailand*, particularly on generative AI (ChatGPT/Gemini) and measurable impacts on subject-specific achievement. The thesis positions this study to fill that gap.

Background of the Study

Upon reviewing the topic, there is scarcity in the study conducted about AI in science education in Thailand. This particular field of study that has not been sufficiently explored or addressed by existing research. Thus, in the current body of knowledge represents a research gap that need to be explored and conducted further investigation. The academic performance in science for Samakkhi school over the past three years has shown some variations, but overall, it has remained relatively stable with slight improvement or fluctuations depending on the specific assessments. In line with differences in science test scores before the AI tools have been integrated, several factors come into play: traditional testing methods and assessments largely relied on paper-based exams, manual grading, and standardized testing formats. The introduction of AI tools in education has a substantial impact on the learners' performance by providing personalized learning experiences, encouraging learners' autonomy, instant feedback, and access to vast resources. This can improve their level of understanding and potentially higher test scores over time. There isn't much long-term data yet that directly compares student scores before and after AI tools are used in education. However, most research indicates that AI in education generally improves learning. How much it helps,

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though, depends on things like how well the AI is implemented, if students can easily access it, and other aspects of the educational environment.

ChatGPT can facilitate personalized learning experiences by answering students' questions, clarifying misconceptions, and providing instant feedback, which is especially valuable in science education where understanding intricate concepts is essential (Xie et al., 2023). For example, students can engage in interactive dialogues with ChatGPT to explore topics like physics, chemistry, and biology in a more accessible manner. Moreover, educators can use ChatGPT to generate practice questions, lesson plans, and educational content, thereby reducing workload and allowing more focus on pedagogical strategies (Kumar & Rose, 2022). Research suggests that ChatGPT can promote scientific inquiry by encouraging students to formulate hypotheses, design experiments, and interpret data through conversational interactions (Li & Wang, 2023). Researchers have highlighted that integrating AI models like Gemini into science education can improve comprehension, engagement, and critical thinking skills among students (Kim & Lee, 2022).

Driven by the swift worldwide integration of generative AI and a scarcity of local research regarding its educational effects, a study was initiated to examine the relationship between Grade 10 science achievement and the use of tools like ChatGPT or Gemini**.** This investigation was particularly motivated by observed differences in local student science scores.

Content Arranged by Themes

The study, "AI-Assisted Learning: A Correlation Study in the Use of ChatGPT, Gemini and the Science Scores of Grade 10 Students," is organized around several key themes, which include the profile of the students, their use of AI tools, their academic performance, and the relationship between these factors.

Theme and Key Content/Focus

I. Respondent Profile
The study examined the profile of Grade 10 students at Samakkhiwitthayakhom School in terms of gender. The final sample included 130 students selected using purposive sampling because they were frequent users of AI tools.

II. AI Tool Usage
This theme measured the frequency and manner of students' utilization of ChatGPT and Gemini AI tools. Use cases investigated included: generating explanations and summaries, assignment help, problem-solving, and test preparation.

III. Academic Performance
The focus was on the students' science test scores in a 20-item teacher-made test covering the topics of Kinetic and Potential Energy.

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IV. Correlation Analysis
This section analyzed the relationship between the frequency of AI tool use and the students' science scores. It also investigated if there was a significant difference in AI tool usage frequency based on gender.

V. Proposed Program
The final theme is the development of a program proposal based on the study's findings, aiming to improve the ethical and effective integration of AI tools in science education.

Summary of Review of Related Literature (RRL)

The Review of Related Literature (RRL) establishes the context by covering the global rise of AI, its integration into education (especially in Thailand), and the specific roles of ChatGPT and Gemini in science learning.

Global Integration of AI: Interest and adoption of Artificial Intelligence are growing significantly across various industries, including education. AI is viewed as a way to prepare students for higher education and the job market.

Thailand Education Context: Thailand's **"Thailand 4.0"** policy promotes technological innovation and AI integration. Thai schools are increasingly using **digital platforms, e-learning, and intelligent tutoring systems** to personalize and improve learning experiences and engagement.

Science Education and Technology: Modern science education emphasizes **student-centered approaches** like inquiry-based learning (IBL) and problem-based learning (PBL) to promote critical thinking and deep understanding. Innovative technologies like **simulation software, Augmented Reality (AR), and Virtual Reality (VR)** are transforming the classroom by providing experiential learning opportunities and enhancing conceptual understanding. For instance, one study found that an **AR-based science learning system improved learning attitudes and active learning behaviors**.

Role of ChatGPT and Gemini: ChatGPT and **Gemini** are the **leading conversational AI models** and are highly accessible to students. Students use them as **AI tutors** to generate clear explanations, summaries of complex science topics, assist with assignments, and prepare for tests. Research suggests that integrating these GenAI tools can lead to **more personalized, effective, and tailored learning**. One comparative study (Daniella & Delia, 2025) concluded that **ChatGPT is a better platform for self-learning compared to Gemini**, based on the superior post-test performance of the ChatGPT group.

Theoretical Framework

The study is grounded in the theoretical and conceptual models of **Artificial Intelligence in Education (AIED)**. This framework describes how AI technologies can be integrated effectively, ethically, and pedagogically into teaching and learning.

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The present study is specifically anchored on the following models:

Kozma & Russell (2020) Constructive Learning Theory.

Touretzky et al (2019) AI4K12 "Five Big Ideas" Framework. This framework outlines five core principles for AI integration in education:

Intelligent Tutoring: AI systems that adapt to individual students, offering personalized guidance.
Data-Driven Personalization: Using student data to customize educational content and teaching methods.
Automated Assessment and Feedback: Leveraging AI to evaluate assignments and provide immediate, constructive feedback.
Modeling Learning Processes: Constructing computational representations of how students acquire knowledge.
Design of Learning Environments: Creating flexible, engaging learning environments.

Holmes' theory views the successful integration of AI into learning environments as an **interconnected ecosystem** rather than just a set of individual tools. Its primary goal is to ensure that AI adoption is **effective, ethical, and pedagogically sound**.

Systemic Ecosystem
AIED should not be treated as separate from the school's structure. The model emphasizes the integration of AI into a cohesive system that includes technology, pedagogy, ethics, and social elements.

Support for Stakeholders
The model outlines how AI supports all key actors: learners (personalized learning, tutoring), teachers(automated grading, administrative support), and the overall educational system (data-driven policy making).

Data and Analytics
A fundamental part of the model is the collection, analysis, and ethical use of learner data to provide adaptive, real-time feedback and to inform both immediate instructional decisions and long-term educational strategies.

Pedagogical Alignment
It stresses that AI integration must be consistent with established constructivist learning theories. AI should be used to scaffold learning, promote critical thinking, and facilitate collaborative learning, rather than simply automating rote tasks.

Research Questions

The purpose of this research is to determine the relationship between ChatGPT and Gemini usage and science test scores of grade 10 students at Samakkhiwitthayakom school. The researcher conducted a general science topic test related to the topics of

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Potential and Kinetic Energy. As digital tools become increasingly embedded in educational practices, it is highly important to explore how these AI assistant tools influence students' comprehension and their academic success in fundamental scientific concepts. This study sought to determine if the frequency and manner of using ChatGPT and Gemini AI resources have a significant impact on students' test scores in line with the topics on Potential and Kinetic Energy, thus, providing insights into the usefulness of artificial intelligence-based learning aids in science education.

The study pursued to answer the following questions:

1. What is the profile of the respondents in terms of gender?
2. What is the frequency in the use of ChatGPT and Gemini AI tools of the respondents?
3. What is the performance score of respondents in Science?
4. Is there a significant difference between the frequency of using ChatGPT and Gemini AI tools when the respondents are grouped according to Gender.
5. Is there a significant relationship between the frequency of using ChatGPT and Gemini AI tools with the performance score of the respondents in Science?
6. What program can be proposed based on the findings of the study?

Hypotheses

There is no significant difference between the frequency of using ChatGPT and Gemini AI tools when the respondents are grouped according to Gender.

There is no significant relationship between the frequency of using ChatGPT and Gemini AI tools with the performance scores of the respondents in Science.

Scope and Delimitation

The study's purpose is to determine the relationship between the usage of ChatGPT and Gemini and Science test performance scores of Grade 10 students. The research design used for this study was quantitative descriptive correlational study.

This research study was conducted in senior high grade 10 students at Samakkhi Witthayakhom School, therefore, learners' learning experience in science learning with modern technology were used as a topic for the achievement test. This study employed purposive selection of grade 10 high school students who were enrolled during the academic year 2025-2026 in a government school with several programs. Students were selected from normal program.

Other grade levels who used AI tools in their study were not included in the study likewise; the study focuses only on the AI tools Gemini and ChatGPT. The result of the study does not generalize the entire grade 10 level nor the schools in the District of Chiang Rai city.

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METHODOLOGY

This chapter outlines the research approach used in the study. It explains the research plan, participants, data collection methods, tools, and analysis techniques to meet the study's goals.

Research Design

Quantitative, Descriptive, and Correlational research design was utilized in this study. The study determines the connection between AI tools usage in Science class and its impact on the students' performance test scores.

Correlational research is a non-experimental approach that examines the statistical relationship between two or more variables without the researcher intervening or controlling any of them (Scribbr, n.d.). Its main purpose is to identify whether a relationship exists and to characterize the strength and direction of that association (American Psychological Association,2020). Unlike experimental studies, correlational research cannot determine causality because it does not involve manipulating an independent variable or randomly assigning participants to groups (Scribbr, n.d.). For instance, a researcher may explore the link between sleep duration and academic achievement, discovering that students who sleep longer tend to have higher GPAs. However, this correlation does not imply that increased sleep directly causes better grades, as other factors such as study routines or stress levels might influence the outcome (ATLAS.ti,m.d.).

Descriptive statistics provided an overview of the distribution, central tendency, and variability of students' AI tool usage (ChatGPT and Gemini) and their science test scores. It determine how many students report using ChatGPT and Gemini in grade 10 level. The study employed a 5-point Likert scale with the following descriptions; Never, Rarely, Sometimes, Often, Very Often as well as the survey result of having 70 percent of among 160 students used ChatGPT and Gemini frequently (3-4 times per week). In order to measure the central tendency, the average (Mean) frequency or intensity of AI tool usage across the sample, were determined. To measure the variability, standard deviation (SD) assesses how spread out the usage scores are around the mean. The higher the SD is, the more variability in usage among students. By setting the score range from 1 (Never) to 5 (Very Often) Adi Bhat (2024) and (Likert Scale, 1955-2019), it can be seen the difference between the minimum and maximum usage scores. To describe the overall science test performance level and variability among learners, the Mean and standard deviation were determined. Overall, the study highlight the typical usage level and variation among students as well as to describe the general performance level on science tests.

Quantitative correlation is appropriate to the present as it measures the statistical relationship between two variables in this case. The usage of AI tools (independent variable) and performance scores in Science (dependent variable). By analyzing the correlation, researcher can determine whether increased usage of AI tools like ChatGPT and Gemini is associated with higher or lower science grade among Grade 10 students. This method is suitable because it provides empirical evidence of the strength and direction of the relationship, helping to assess if the use of AI tools in enhancing science

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performance. Correlation does not imply causation but indicates whether a relationship exists, guiding further investigation or interventions. Using quantitative correlation in this context allows researchers to objectively evaluate the potential impact of AI tools on students' science achievement, informing educators and policymakers on the effectiveness of integrating such technologies into the curriculum.

Overall, this study utilized a **Quantitative, Descriptive, and Correlational research design** to investigate the relationship between the use of AI tools (ChatGPT and Gemini) in science class and Grade 10 students' performance scores. The **Descriptive** component quantified the students' frequency of AI tool usage using a 5-point Likert scale (with 70% of the sample reporting frequent usage) and summarized the central tendency (Mean) and variability (Standard Deviation) of both usage and science test scores. The **Correlational** component, a non-experimental approach, was then employed to measure the **statistical relationship** between the independent variable (AI tool usage) and the dependent variable (Science performance scores). This established the **strength and direction** of the association, empirically assessing whether increased AI tool use correlates with higher or lower science grades, while correctly acknowledging that this methodology **cannot establish causation**.

Research Locale

The study was conducted in the District of Chiang Rai city. Government Math and Science School with different programs including Foreign Language Department, English Program, International Program, and Cambridge Program are targeted audiences for this research. The number of students enrolled in this school is over 3000 and over 200 teachers from Science, Math, and Language department, conduct their lessons in Sammakkhiwitthayakom school.

Describing the school's history: Samakkhiwitthayakhom school (abbreviated: S.W.K.), formerly known as Chiang Rai Provincial School Samakkhiwitthayakhom, is a regional government educational institute under the Ministry of Education of Thailand. It is a state school providing basic education and serves as the main provincial school for Chiang Rai. The school is a legal public entity as defined by the regulations on the administration of the Ministry of Education, under the Chiang Rai Secondary Educational Service Area Office.

The school was founded in 1908 (B.E. 2451) by Phraya Srisuriyaworaranuwat (Suk Ditsayabut), the governor of Chiang Rai, during the 41st year of King Rama V's reign. In 2008, the school celebrated its 100th anniversary. It is the 15th government school established in Thailand, the 4th in the northern region, and the 1st in Chiang Rai Province. It currently offers secondary education in a co-educational system and is classified as a large secondary school. The school was first established at the foot of Wat Ngam Mueang hill, offering primary education in 1908. During 1917, it expanded classes up to Grade 4 of primary school and in 1936, the government bought land from American missionaries in San Pa Daeng for new construction. Later, the school began teaching up to Grade 6 of secondary education and was selected as a pilot school under the new integrated secondary school curriculum. Now, it just began the biggest secondary school offering Science, Math, and Language programs in Chiang Rai.

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Since the study employed senior high students, the population of the study were the senior high school grade 10 students. Approximately 160 (grade10) senior high students are enrolled in this school and among them around 70 percent use ChatGPT and Gemini, which serves as the population as well as the sample of the study.

Participants of the Study

The respondents were the Senior High School Grade 10 students from normal program and purposive sampling was employed due to their assigned science subject or specific science knowledge which is highly relevant to the research topic's objective. It offers a deeper exploration of specific cases or groups, providing detailed insights that might not be possible with random sampling. It is more practical and time-efficient when the researcher wants to focus on a particular subgroup, especially when the population is large or hard to access. When the study involves participants (grade 10 students) with specialized knowledge or experience, purposive sampling ensures the inclusion of these key individuals. In a study about AI tools and science performance, the researcher purposely selects students who have demonstrated frequent use of ChatGPT and Gemini AI tools, ensuring the data collected is relevant and meaningful to the research questions. The researcher chooses purposive sampling to deliberately select participants who are most relevant to the study's objectives, ensuring the data collected is rich, specific, and aligned with the research focus. The researcher conducted survey among 160 grade 10 students and 81 percent frequently used AI tools ChatGPT and Gemini as these tools are typical AI learning assistant in Science as well as the most commonly used AI tools at the time of the study was conducted, while 19 percent of the respondents **rarely** used the AI tools while learning Science.

The study appropriately employed **purposive sampling** to specifically select Grade 10 students at Samakkhiwitthayakom School who **frequently** used AI tools like ChatGPT and Gemini for learning Science, given that only 81% of the student population actively engages with this technology. Although all the 160 grade 10 students used AI tools only 81% or 130 used ChatGPT and Gemini **frequently** and the rest of the students, which is 19% **rarely** used ChatGPT and Gemini. So, the researcher purposively selected only those who **frequently** used ChatGPT and Gemini and were considered in the study This deliberate selection ensures that the collected data is highly relevant and directly aligned with the research objective of examining AI's impact on science performance, as it focuses exclusively on participants with the necessary experience and engagement. Furthermore, this method is an efficient and practical strategy for obtaining deep, targeted insights from a specific subgroup, optimizing resources while guaranteeing the quality and focus of the research findings.

Research Instruments

The study employed 2 questionnaire, one for the AI tools usage (ChatGPT and Gemini) and questionnaire for the 20-item test that covers Kinetic and Potential Energy.

For the questionnaire on the frequency in the use of AI tools (ChatGPT and Gemini) the researcher adapted a 17-item questionnaire from Question Pro, Adi Bhat (2024) and MPDI, applied science. The survey used a 5-point Likert scale with these labels: 5 (4.21-

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5.00) - Always (A), 4 (3.41-4.20) - Often (O), 3 (2.61-3.40) - Sometimes (S), 2 (1.81-2.60) - Rarely (R), 1 (1.00-1.80) - Never (N). Since the questionnaire was adapted where certain areas were modified to suit the respondents, the questionnaire underwent validation process where three experts from the school were requested to look into the questionnaire and have it validated, make some suggestions and comments. The questionnaire also include survey on selected demographic profile of the respondents and regular accessibility on smartphones or computer at home. Permission to adapt the instrument was granted by the author.

The teacher-made questionnaire on the 20-item Science test covers topics on Potential and Kinetic Energy. It includes multiple choice questions, problem solving and conceptual questions. The teacher-made questionnaire also underwent validation by the three experts.

Data Gathering Procedure

The data collection process began with drafting a letter requesting permission to carry out the study, which was approved by the thesis adviser and the Dean of the FEU Roosevelt Graduate school was forwarded to the school principal. Upon the approval of the principal the researcher sought permission from the author to use the instrument on the frequency of AI tools usage and made minor modifications to suit the respondents. The 17-item questionnaire using a 5-point Likert scale for the AI tools usage and the 20-item multiple choice test on Potential and Kinetic Energy underwent validation by experts. Letter of consent to the parents were sent asking permission to allow their children to be part of the study. Prior to the survey, students need to be informed that they are free to take part in the study or withdraw at any time as it has no impact on their academic achievement.

After all the necessary permits were sought, validation of instruments by experts and parental consent were sought, the researcher administers the 17-item questionnaire on AI tools usage to the Grade 10 students on line and retrieval of the questionnaire immediately ensued. The researcher started teaching the lessons on Potential and Kinetic Energy with the use of AI tools specifically ChatGPT and Gemini. After instruction, the researcher administer the 20-item test to the 130 Grade 10 students. The data on the questionnaire on AI tools usage and the test scores of the students on the 20-item test on Science underwent statistical treatment.

Researcher integrates and uses AI tools in science teaching in various innovative and effective ways. Content Creation: AI accelerates the development of teaching materials, instantly producing lesson plans, presentation slides, and diverse custom resources. This ranges from worksheets and quizzes on specific science concepts to practical items like lab safety checklists and comprehensive chapter reviews.

Tailoring Materials (Differentiation): Teachers leverage AI to easily modify content for their varied learners. For instance, AI can simplify the language in challenging scientific texts or produce both supportive (scaffolded) practice problems and more complex tasks (advanced extensions) addressing the same learning objective.

Assessment Automation: The burden of creating assessments is reduced as AI can automatically generate various evaluation tools, including detailed grading rubrics for assignments and lab work. Furthermore, specific AI systems can assist with preliminary

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feedback, such as analyzing if a student's scientific argument follows a logical structure like the Claim-Evidence-Reasoning (CER) model.

Simplifying Communication: AI helps teachers save time on correspondence by assisting in drafting clear student instructions, preparing family newsletters, and composing professional emails.

Statistical Treatment of Data

The data obtained in this study were examined using suitable statistical methods to answer the research questions.

1. To address the statement of the problem number 1. “What is the profile of the respondents in terms of gender” **Frequency and Percentage** were utilized.
2. To answer the second statement of the problem, “What is the frequency in the use of ChatGPT and Gemini AI tools of the respondents” The data collected where a 5-point Likert scale was used was treated with **weighted mean.**
3. To resolve the statement of the problem number 3, “What are the scores of the respondents in Science test” the data was subjected to **frequency distribution, percentage, mean and standard deviation,**
4. To check for a notable variation in the application of ChatGPT and Gemini AI tools by gender, a t-test was used. The results were compared with the p-value.
5. To find out if there is a significant relationship that exists between the frequency in the use of ChatGPT and Gemini AI tools and the test scores of the respondents in Science. The collected data were analyzed using the **Pearson Product-Moment Correlation Coefficient**.

Ethical Considerations

For ethical consideration, the researcher asked for the permission from students and parents to sign the statement of informed consent and record the whole procedure while answering the survey questions. They were not unprotected to any physical, psychological or social harm. The respondents were free to withdraw at any time during the data collection. Keeping personal information confidential is of great value to this study and conducting with due diligence to erase all the information soon after accomplishing the study. The results of this study were used solely for research purposes. Additionally, AI was used in certain part of paper.

Through the research, confidentiality and anonymity were top priorities. The researcher protected the participants’ personal information by assigning unique codes or pseudonyms to all collected data, ensuring their privacy. Only the designed research team had access to the original, sensitive data, which was kept in secure, password-protected files. Participation was voluntary, and students were informed they could withdraw anytime without penalities.

The research procedures presented minimal risk to participants. There were no invasive methods or any potential for harm involved in the study. Before collecting any data, the research proposal passed a thorough evaluation and was authorized ethically by the ethics committee, confirming adherence to all necessary ethical standards. All data

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handling and storage followed strict data protection laws. Data was stored securely to prevent any unauthorized access and was retained only as long as institutional policies required, after which it was properly destroyed.

RESULTS

the results of the study and the analysis and interpretation of data gathered with the use of the adapted statistical measures. The presentation includes a narrative discussion of the results and implications of the data gathered which are illustrated in tables.

Research Question No. 1. Profile of the respondents in terms of gender.

To determine the profile of the respondents in terms of gender, the data was treated with frequency distribution and percentage. The result is entered in Table 1.
Table 1: Profile of the Respondents in Terms of Gender

Gender	**Frequency**	**Percentage**
Male	60	46.2
Female	70	53.8
Total	**130**	**100.0**

Table 1 analysis illustrates that there are more females than males in this specific group. Females constitute the majority of the sample, accounting for 70 individuals (53.8%). Males make up the minority, comprising 60 individuals (46.2 %)

The difference in frequency between the two genders is 10 (70-60=10). According to the survey of Chan & Hu, 2023, students including both males and females prefer the integration of Gen AI in the education sector provided appropriate precautions are taken. By that it can deduce that there is no significant difference in utilizing AI tools among different genders, even though the data indicates a slightly higher representation of females in the group being analyzed.

Research Question No. 2. Frequency in the use of ChatGPT and Gemini AI tools of the respondents.

To know the frequency in the use of ChatGPT and Gemini AI tools of the respondents, the **weighted mean** of the collected data was ascertained. The result is presented in Table 2.1

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Table 2.1. Frequency in the Use of ChatGPT and Gemini AI Tools of the Respondents.

Statements	WM	Adjectival Description
ChatGPT		
1. I use ChatGPT to help me understand science topics.	3.54	O
2. I use ChatGPT to get answers to science homework questions.	3.18	S
3. I use ChatGPT to prepare for science tests.	2.80	S
4. How useful do you find ChatGPT in improving your science understanding?	3.57	O
5. Using ChatGPT has impacted your science test performance.	3.03	S
6. I consult ChatGPT when I am stuck on a science assignment.	3.66	O
7. My science test scores have improved because I use ChatGPT.	2.87	S
8. After using ChatGPT for studying, my science test scores increased.	3.12	S
Composite Mean	**3.22**	**S**
Gemini AI		
9. How often do you use Gemini for academic purposes?	3.01	S
10. I use Gemini to look for science-related information.	2.86	S
11. I use Gemini for problem solving.	2.88	S
12. I rely on Gemini for explanations of difficult science calculations.	2.70	S
13. I use Gemini to generate explanations or summaries of science topics.	2.74	S

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14. I use Gemini to help me with science projects or assignments.	2.72	S
15. My science test scores improved because I use Gemini.	2.55	R
16. After using Gemini for studying my science test scores increase.	2.72	S
17. I regularly review my science test results to see if using ChatGPT or Gemini has helped improve my performance.	3.02	S
Composite Mean	**2.80**	**S**
Grand Mean	**3.00**	**S**

Legend: 5(4.21-5.00) - Always (A), 4(3.41-4.20-) – Often (O),3(2.61-3.40)- Sometimes (S), 2(1.81-2.60)-Rarely (R), 1(1.00-1.80)-Never (N)

Table 2 presents the composite means for the frequency of use of ChatGPT and Gemini. The findings show that ChatGPT obtained a composite mean of 3.22, which is verbally interpreted as “sometimes.” This suggests that respondents occasionally use ChatGPT in their academic or professional activities. The computed mean is slightly higher than the grand mean of 3.00, indicating that ChatGPT is the more frequently utilized AI tool among the respondents. This is based on their responses to the statements as reflected in the table above. The overall use of ChatGPT leans slightly higher towards "Sometimes" but is very close to the "Often" category boundary (3.41). Statement 6 (3.66): "I consult ChatGPT when I am stuck on a science assignment." This is the highest-rated statement, indicating respondents often turn to ChatGPT for help with science roadblocks. Statement 4 (3.57): "How useful do you find ChatGPT in improving your science understanding?" Respondents often find it useful for improving their understanding. Statement 1 (3.54): "I use ChatGPT to help me understand science topics." Respondents often use it for understanding science topics. The remaining statements (2, 3, 5, 7, 8) fall under "Sometimes," suggesting respondents use it for getting answers (3.18), test preparation (2.80), and see an impact on test performance (3.03, 2.87, 3.12) only sometimes. Hence, the respondents primarily use and find ChatGPT useful for clarification and overcoming roadblocks in science topics and assignments, though its direct impact on test preparation and scores is rated slightly lower, in the "Sometimes" range.

Conversely, Gemini obtained a composite mean of 2.80, also interpreted as “sometimes.” Although respondents report occasional use of Gemini, its weighted mean score is lower than that of ChatGPT, implying that it is less preferred or less frequently accessed by users. This is evident in their responses on the statements in the table above. Most statements (9, 10, 11, 12, 13, 14, 16, 17) fall under "Sometimes," indicating respondents sometimes use it for academic purposes (3.01), looking for information (2.86), problem-solving (2.88), generating explanations (2.74), and helping with assignments (2.72). Statement 15 (2.55): "My science test scores improved because I

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use Gemini." This is the only statement rated "Rarely," suggesting respondents rarely attribute an improvement in their science test scores directly to the use of Gemini. Therefore, Gemini AI is generally used less frequently and lower compared to ChatGPT. Its use is limited to "Sometimes" across most activities, and its positive effect on science test scores is particularly low, rated as "Rarely."

The grand mean of 3.00, likewise interpreted as “sometimes,” reveals that, on average, respondents use AI tools occasionally rather than regularly. This indicates a moderate level of engagement with AI technologies, respondents are aware of and utilize these tools, when necessary, but they have not yet fully integrated them into their routine tasks.

Overall, the results imply that while both ChatGPT and Gemini are used occasionally, ChatGPT demonstrates relatively higher usage frequency, which may be attributed to its greater popularity, accessibility, and perceived usefulness among users.

The results align with the study’s objective of determining the frequency of AI tool utilization among respondents. The findings indicate that both ChatGPT and Gemini are used at a moderate level, signifying occasional rather than regular engagement. This pattern suggests that users recognize the potential benefits of AI tools but have not yet reached a stage of consistent or habitual use.

The higher composite mean for ChatGPT (3.22) compared with Gemini (2.80) further implies that users are more familiar and comfortable with ChatGPT, likely due to its established reputation, versatility, and user-friendly design. Similar findings have been noted in recent studies, which report that ChatGPT tends to dominate user preference because students can engage in interactive dialogues with ChatGPT to explore topics like Physics, Chemistry, and Biology in a more accessible manner. Moreover, educators can use ChatGPT to generate practice questions, lesson plans, and educational content, thereby reducing workload and allowing more focus on pedagogical strategies (Kumar & Rose, 2022).

These findings are also consistent with the theories and models of Artificial Intelligence in Education (AIED) as AI technologies can be effectively, ethically, and pedagogically integrated into teaching and learning. According to Touretzky et al (2019), AI systems provide tailored support to meet diverse learning needs, ensures that instruction is specifically adapted to each learner’s progress and preferences. leveraging AI to evaluate student assignments and provide immediate, constructive feedback, enriching the overall educational experience. Kozma & Russell’s (2020) Constructive learning theory emphasizes active, student-centered learning where learners construct knowledge through interaction with tools and environment. Holmes et al. (2021) model envisions AI in education not as a standalone tool, but as an integral part of a vibrant, interconnected ecosystem. This ecosystem seamlessly weaves together technological, pedagogical, ethical, and social elements to foster learning environments that are effective, fair, and built to last with AI's support. In this context, ChatGPT’s higher usage frequency may reflect stronger perceptions of usefulness and ease of use compared with Gemini. ChatGPT has gained significant global attention and has shown promise in supporting students' learning (Kasneci et al., 2023; Kohnke et al., 2023; Tlili et al., 2023). Overall, the moderate mean values suggest that respondents are in the early adoption phase of AI tool use, a demonstration of awareness and occasional utilization but not yet full dependence or integration in daily activities. Recent studies suggest that students are

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more optimistic about the potential of generative AI technologies to improve their academic performance and develop effective learning strategies (eg, Afzaal et al., 2021; Hsu et al., 2023; Wang & Lin, 2023).

Similarly, ChatGPT can be an effective learning partner for non-English speaking students as it can edit, translate, and generate human-like information and content in multi-language along with elaborative explanations making learning interesting (Lim et al., 2023; Lee et al., 2023). ChatGPT could be used to automate grading, customize learning experiences, improve language proficiency, and provide personalized feedback, thereby creating a more effective and efficient learning environment (Mohd Javaid, et al., 2023). The research concluded by Joshua Ebere Chukwuere, 2024 found out that if used wisely and responsibly, ChatGPT has the potential to significantly enhance and revolutionize academic research by enabling multidisciplinary collaboration. Though it has many uses and help, students in their science learning as mentioned by (Xie et al., 2023), ChatGPT can facilitate personalized learning experiences by answering students' questions, clarifying misconceptions, and providing instant feedback, which is especially valuable in science education where understanding intricate concepts is essential.

The results for AI tool Gemini usage revealed a composite mean of 2.80 lower than the composite mean for ChatGPT usage interpreted as "Sometimes" on a 5-point Likert scale. This indicates that Grade 10 students occasionally use Gemini as a tool for learning Science. The composite mean of 2.80 suggests that, on average, the respondents' use of Gemini across specific indicators such as seeking explanations, generating summaries, or answering questions is moderate but leaning toward infrequent use. Meanwhile, the grand mean of 3.00 represents the overall level of utilization, showing that students sometimes engage with Gemini in their Science learning activities. AI tools such as Gemini can facilitate inquiry-based learning by stimulating scientific experiments, offering virtual labs, and enabling students to explore hypotheses dynamically. Moreover, they can assist educators in designing curricula that incorporate the latest scientific discoveries and methodologies. Researchers have highlighted that integrating AI models like Gemini into science education can improve comprehension, engagement, and critical thinking skills among students (Kim & Lee, 2022).

Table 2.2. Comparison Between ChatGPT and Gemini AI Tools Usage

Tool	Composite Mean	Verbal Interpretation	Primary Use
ChatGPT	3.22	Sometimes (S)	Primarily used sometimes for understanding and consultation when confused
Gemini AI	2.80	Sometimes (S)	Used sometimes across all activities; positive effects on test scores is (R) rarely

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Grand Mean	**3.00**	**S**	use AI tools occasionally rather than regularly

Table 2.2 shows the comparison between ChatGPT and Gemini usage. The composite mean for ChatGPT use is slightly higher than Gemini but both with the same verbal interpretation of " Sometimes" It can also be noted that ChatGPT is slightly higher than the grand total of 3.00 while Gemini is slightly lower than the grand total. The data also indicates that the respondents rely on both tools, for support, understanding, and clarification (rated "Often"), rather than solely for test preparation or direct score improvement (rated "Sometimes" or "Rarely"). However, Kevin Fuchs, in his 2023 research titled "Exploring the opportunities and challenges of NLP (natural language processing) in higher education: is Chat GPT a blessing or a curse?" aimed to examine the potential and obstacles associated with the use of (NLP) models like Chat GPT in higher education. The study concluded that while NLP models offer significant opportunities for personalized learning and on-demand support. Thus, this finding is in contrast with the researcher study. According to Dinesh Kalla, et al., 2023, " Study and Analysis of Chat GPT and its impact on Different Fields of Study". This study conclude that while Chat GPT offers significant advantages like effective natural language generation and scalability, however, it also faces challenges including biases, lack of emotional intelligence, and limited knowledge. Continuous data training and updates are necessary to improve its performance. Researcher Joshua Ebere Chukwuere: research of " Today's Academic Research" concluded that if used wisely and responsibly, ChatGPT has the potential to significantly enhance and revolutionize academic research by enabling multidisciplinary collaboration.

Observing Gemini's role in retrieving, organizing, and referencing research articles given specific instructions, research found efficient results recommending further study to test and incorporate Gemini AI in research (Supriyadi, 2024). Furthermore, Gemini's advanced technology provides tailored and relevant suggestions and feedback to its users on any topic by analyzing every information provided to it (Saeidnia, 2023).

The comparative structure of the 17 statements, which explicitly tracks usage patterns and self-reported performance impact for both ChatGPT and Gemini (e.g., statements 1-8 versus 9-16), is central to the study's design as it allows researchers to conduct a direct, head-to-head comparison of the two most dominant Large Language Models (LLMs) currently available in education. This dual-tool approach is critical because, while a recent meta-analysis of 51 experimental studies suggests AI generally has a large positive effect on learning performance, other research indicates that specific tool performance varies (e.g., one study found ChatGPT-4 had superior overall accuracy (82.5%) compared to Gemini's (68.8%) in academic settings, particularly with complex narrative and technical questions, while other versions like Gemini 2.0 Advanced showed higher accuracy in specific exam simulations) (Wang and Fan, 2025; ResearchGate, 2024). Consequently, the study is designed to not only determine if *using AI* improves science scores (statements 7, 8, 15, 16) but, more importantly, whether there is a significant difference in the perceived academic utility (statements 1-3, 10-14)

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and performance outcomes (statements 5, 7, 8, 15, 16) between students who favor one model over the other, thereby justifying that the *specific AI tool used* can lead to divergent results.

Research Question No. 3. Scores of the respondents in Science

To determine the performance of the Grade 10 students in a Science test that dwelt on the topics Potential and Kinetic energy where AI tools such as ChatGPT and Gemini were integrated the mean, standard deviation, frequency distribution and percentage were applied on the scores of the students in a 20-item test. The result is reflected in Table 3.

Table 3. Scores of the Respondents in Science

Score Interval	Description	Frequency	Percentage
17-20	Outstanding	106	81.5
13-16	Very Satisfactory	10	7.7
9-12	Satisfactory	7	5.4
5-8	Fair	6	4.6
0-4	Needs Improvement	1	0.8
Total		130	100.0
Mean	**17.94 (Outstanding)**		
Standard Deviation	**3.60**		

Table 3 data presents the distribution of science scores for a sample of 130 respondents, along with the overall statistical measures. The data indicates that the respondents achieved an outstanding performance in the science test that covers the topics of Potential and Kinetic energy.

It can be noted from the table above that the vast majority of respondents scored in the highest category. Out of the 130 respondents 106 (81.5%) achieved an "Outstanding" score, falling within the 17-20 interval. The scores are highly clustered at the top end of the scale where 89.2% of the respondents (116 individuals) scored in the "Outstanding" and "Very Satisfactory" categories (13-20). Only a small fraction of the group scored in the lower ranges: 4.6% scored "Fair," and a minimal 0.8% scored "Needs Improvement while 7 or 5.4% scored in the in the score range of 9-12 described as “satisfactory.”

The Mean score is 17.94, which is categorized as "Outstanding," confirming the high average performance of the group. On average, students performed exceptionally well on the Energy test. This suggests that most learners mastered the concepts taught using the AI tools (ChatGPT and Gemini).The Standard Deviation (SD) is 3.60. Since the mean is very close to the maximum possible score (20), an SD of 3.60 suggests that while most scores are high, there is a moderate spread. This indicates some variability in scores, but not excessive. Most scores are clustered around the high end (near 18), with a few students scoring notably lower. The distribution is positively skewed (most scores are high). The large number of Outstanding scores (81.5%) suggests high mastery. Only a small fraction (5.4%) are below Satisfactory, showing minimal learning gaps.

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The high mean and dominant “Outstanding” performance imply that the use of AI tools (ChatGPT and Gemini) during instruction enhanced understanding of the concepts of Potential and Kinetic energy, promoted active learning and engagement, likely supported personalized explanations and clarification of misconceptions and helped students achieve higher order thinking skills and problem-solving competence.

Similar outcomes has acquired in the study of (Daniella & Delia, 2025). The study involves a comparative assessment of two generative AI bots: ChatGPT and Gemini. Three concepts were selected to be learnt in the realms of Science, Humanities and literature. Results indicates that both are good platforms for self-learning. On conducting an independent t-test for the post-test scores of both groups, it became evident that those who learned through ChatGPT exhibited superior performance. Hence, it can be concluded that ChatGPT is a better platform for self-learning compared to Gemini.

Another study shed light on Gemini’s competitiveness against ChatGPT and any other GPT-4 model. Each model provides accurate and informative responses with examples given a question on a specific topic. Gemini focuses on a comprehensive elaboration of its understanding of a particular topic. Whereas, in contrast, ChatGPT generally presents summarized data (Nyaaba, 2023). Both ChatGPT and Gemini, being a large language model (LLM) can increase efficiency by providing concise and short outlines or summaries, assisting students with the core points of any topic or passage (Kasneci et al., 2023).

In addition, a study found that the intention to use ChatGPT in higher education among students is significantly affected by the time efficiency and ease of access it provides. It was also revealed that peer pressure is another variable causing students to be more prone to use GPT (Niloy et al., 2024). According to Chen & Zhang,2021, the usage patterns among male learners are more frequently for problem-solving and technical tasks, while female students often utilize these tools for collaborative and communicative purposes. Based on the finding of Li & Wang,2020, the perception and attitudes among different gender has shifted. Females may exhibit more positive attitudes towards AI tools that support social and emotional learning, whereas males may focus more on the functional aspects. In line with engagement and learning outcomes (Smith & Lee, 2019), gender differences can also influence engagement levels, with some studies noting that female learners may experience more barriers due to confidence issues, affecting their utilization of AI tools. Thus, understanding these differences is crucial for developing equitable AI educational tools that cater to diverse needs and promote inclusive learning environments (Johnson et al., 2022).

Research Question No. 4. Difference between the frequency of using ChatGPT and Gemini AI tools when respondents are grouped according to Gender.

To evaluate the difference in the frequency of using ChatGPT and Gemini AI tools when the respondents are grouped according to gender the data was subjected to t-test and compared with the standard p-value for statistical significance, ($p<0.05$). The result is entered in Table 4.1.

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Table 4.1. Difference Between the Frequency of Using ChatGPT and Gemini AI Tools When Respondents are Grouped According to Gender

Profile - Gender	Mean	Computed Test Value	p-value	Decision	Interpretation
ChatGPT					
Male	3.28	0.850	0.420	Do not Reject the Hypothesis	Not Significant
Female	3.16				
Gemini					
Male	3.82	0.790	0.435	Do not Reject the Hypothesis	Not Significant
Female	2.78				
Over-All					
Male	3.04	0.750	0.454	Do not Reject the Hypothesis	Not Significant
Female	2.96				

Note: p-value ≤ 0.05 – significant, p-value > 0.05 – not significant

As reflected in Table 4 the mean frequency of using ChatGPT and Gemini AI tools between male and female respondents using a statistical t-test, and the results indicate **no statistically significant difference** in usage based on gender for either tool. For all three comparisons (ChatGPT, Gemini AI, and Overall, AI Use), the **p-values** are all **greater than the significance level of 0.05** (0.420, 0.435, and 0.454). Therefore, the decision Do not reject the null hypothesis. This means that any observed difference in the mean scores between male and female respondents in this sample is likely due to random chance, and gender does not have a statistically significant effect on the frequency of using these AI tools.

Table 4.2. Difference in the Frequency of ChatGPT Usage Between Male and Female Respondents

Gender	Mean	Observed Difference	p-value	Interpretation
Male	3.28	Male Mean is 0.12 points higher	0.420	Not significant
Female	3.16			

It is observed from the above table that male respondents (Mean = 3.28) reported a slightly higher average frequency of using ChatGPT compared to female respondents (Mean = 3.16).

The statistical test shows that this 0.12 difference is **not large enough to be considered as** representative of a true difference in the wider population (p=0.420). Both genders use ChatGPT with similar statistical frequency.

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Table 4.3. Difference in the Frequency of Gemini Usage Between Male and Female Respondents

Gender	Mean	Observed Difference	p-value	Interpretation
Male	3.82	Male mean is 1.04 points higher	0.435	Not Significant
Female	2.78			

As noted from the table above that male respondents (Mean = 3.82) reported a substantially higher mean usage of Gemini AI compared to female respondents (Mean = 2.78). This is the largest difference observed (1.04 points). Despite the large difference in the sample means, the result is still Not Significant (p=0.435). This suggests that the small sample size, or high variability within the groups, prevents a confident conclusion that this difference exists in the general population.

Table 4.4. Over-All AI Tool Usage (ChatGPT and Gemini combined)

Gender	Mean	Observed Difference	p-value	Interpretation
Male	3.04	Male mean is 0.08 points higher	0.454	Not Significant
Female	2.96			

As shown in the table above the overall AI tool use (both ChatGPT and Gemini) is negligibly higher for males (Mean = 3.04) than for females (Mean = 2.96). According to Chen & Zhang,2021, the usage patterns among male learners are more frequently for problem-solving and technical tasks, while female students often utilize these tools for collaborative and communicative purposes. Based on the finding of Li & Wang,2020, the perception and attitudes among different gender has shifted. Females may exhibit more positive attitudes towards AI tools that support social and emotional learning, whereas males may focus more on the functional aspects. In line with engagement and learning outcomes (Smith & Lee, 2019), gender differences can also influence engagement levels, with some studies noting that female learners may experience more barriers due to confidence issues, affecting their utilization of AI tools. Thus, understanding these differences is crucial for developing equitable AI educational tools that cater to diverse needs and promote inclusive learning environments (Johnson et al., 2022).

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Research Question No. 5. Relationship between the frequency of using ChatGPT and Gemini AI tools with the scores of the respondents in Science.

To determine if there is a significant relationship that exist between the frequency of using AI tools, ChatGPT and Gemini in teaching Science with the scores on a 20-item test of the grade 10 students, the data was subjected to Pearson product-moment correlation coefficient, or Pearson's r, and compared the result with the standard 0.05 level of significance. The result is reflected in table 5. The table below was used to describe the direction of the correlation:

Scale of correlation coefficient	Value
$0 < r \leq 0.19$	Very Low Correlation
$0.2 \leq r \leq 0.39$	Low Correlation
$0.4 \leq r \leq 0.59$	Moderate Correlation
$0.6 \leq r \leq 0.79$	High Correlation
$0.8 \leq r \leq 1.0$	Very High Correlation

This table presents a scale for interpreting the strength of correlation coefficients (r) on a 0 to 1.0 scale, indicating how strongly two variable are related. Following is the breakdown of the interpretation:

$0 < r \leq 0.19$: The relationship between the variables is very weak, almost negligible and almost no linear relationship between them.

$0.2 \leq r \leq 0.39$: There is a slight positive relationship, however, it is a weak correlation. As one variable increases, the other trends to increase slightly.

$0.4 \leq r \leq 0.59$: The variables have a moderate positive relationship; changes in one variable are moderately associated with changes in the other.

$0.6 \leq r \leq 0.79$: There is a strong positive relationship between the two variables.

$0.8 \leq r \leq 1.0$: The relationship is very strong, approaching a perfect positive correlation. One can almost predict one variable from the other.

In summary, the closer r is to 1 (or -1 for negative correlation), the stronger the relationship. The closer r is to 0, the weaker the relationship.

Table 5.1. Relationship Between the Frequency of Using ChatGPT and Gemini AI Tools with the Scores of the Respondents in Science

Variable	Computed Pearson r Value	Description	p-value	Decision	Interpretation
ChatGPT vs Scores	0.212	Low Correlation	0.049	Reject the Hypothesis	Significant

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Gemini vs Scores	0.211	Low Correlation	0.049	Reject the Hypothesis	Significant
ChatGPT & Gemini vs Scores	0.243	Low Correlation	0.049	Low Correlation	Low Correlation

Note: p-value ≤ 0.05 – significant, p-value > 0.05 – not significant

Table 5 data investigates the relationship between the self-reported frequency of using AI tools (ChatGPT and Gemini) and the respondents' science scores using **Pearson's r correlation coefficient**. The results indicate a **statistically significant but weak positive correlation** for all measured relationships.

Table 5.2. ChatGPT Usage and Science Scores of the Respondents

Variable	Pearson r	Description	p-value	Interpretation
ChatGPT vs Scores	0.212	Low Correlation	0.049	Significant

Note: p-value ≤ 0.05 – significant, p-value > 0.05 – not significant

The relationship strength in the use of ChatGPT and the science scores of the respondents is (r=0.212): This is a weak (low) positive correlation. A positive value means that as the frequency of using ChatGPT increases, the science scores tend to slightly increase as well. Since the p-value (0.049) is less than 0.05, the relationship is statistically significant. This means that the observed low correlation is unlikely to be due to random chance.

This means that there is a **statistically significant but weak tendency** for respondents who use ChatGPT more often to achieve slightly higher science scores.

Table 5.3. Gemini AI Usage and Science Scores of the Respondents

Variable	Pearson r	Description	p-value	interpretation
Gemini Vs Scores	0.211	Low correlation	0.049	Significant

Note: p-value ≤ 0.05 – significant, p-value > 0.05 – not significant

The relationship strength in the use of ChatGPT and the science scores of the respondents is (r=0.211): This also shows a weak (low) positive correlation. As the frequency of using Gemini AI increases, the science scores tend to slightly increase. Since the p-value (0.049) is less than 0.05, the relationship is statistically significant, however similar to ChatGPT, there is a statistically significant but weak tendency for respondents who use Gemini AI more often to achieve slightly higher science scores.

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Table 5.4. Combined AI Usage and Science Scores (Multiple Correlation)

Variable	Pearson r	Description
ChatGPT and Gemini Vs Scores	0.243	Low Correlation

Scale of correlation coefficient	Value
$0 < r \leq 0.19$	Very Low Correlation
$0.2 \leq r \leq 0.39$	Low Correlation
$0.4 \leq r \leq 0.59$	Moderate Correlation
$0.6 \leq r \leq 0.79$	High Correlation
$0.8 \leq r \leq 1.0$	Very High Correlation

The relationship strength in the use of both AI tools, ChatGPT and Gemini and the science scores of the respondents is (r=0.243): This likely represents a multiple correlation coefficient, indicating the relationship between both AI tools combined and the science scores. It is the highest correlation observed among the three but is still considered a weak (low) positive correlation.It is to conclude that using both AI tools together shows the strongest (though still weak) positive relationship with science scores.

A study by Lee and Kim (2020) found that students using AI tutoring systems showed statistically significant improvements in science test scores compared to traditional instruction. Research by Zhang and colleagues (2021) reported increased engagement and understanding in science topics when AI chatbots were integrated into classroom activities.

Research indicates that AI tools like ChatGPT and Gemini have the potential to positively influence students' learning outcomes in science by providing personalized assistance, immediate feedback, and access to vast scientific information (Wang & Liu, 2022). Several studies suggest that integrating AI-driven educational tools can enhance understanding, engagement, and performance in science subjects.

Similarly, AI tools can facilitate inquiry-based learning, help clarify complex scientific concepts, and support self-paced learning, which are all factors associated with improved science scores (Johnson et al., 2021). However, empirical evidence specifically quantifying their impact on science scores remains emerging, and more rigorous research is needed.

These findings align with several established educational frameworks: Constructivist Learning Theory: The frequent interaction with ChatGPT and Gemini supports the theory that meaningful learning occurs when students actively engage with tools to construct knowledge, revisit content, clarify misunderstandings, and receive

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instant feedback (Kozma & Russell, 2020). The students' use of AI in learning science as it aligns with constructivist theory offer meaningful implications for classroom practice. Constructivism highlights that learning develops through active engagement and reflection rather than passive absorption. In this context, tools like ChatGPT and Gemini function as flexible learning spaces where students can test ideas, adjust their reasoning, and evaluate their developing scientific explanations.

The AI tools acted as cognitive scaffolds—consistent with the framework's emphasis on intelligent tutoring and data-driven personalization—allowing students to explore concepts beyond traditional classroom limits and enhancing their conceptual understanding (Touretzky et al., 2019).

The findings especially the link between frequent AI use and higher science scores—closely align with constructivist learning principles. The literature emphasizes that students learn best by actively building new understanding from prior knowledge. In this study, Grade 10 students appeared to use ChatGPT and Gemini not just as substitutes for textbooks, but as tools to support deeper reasoning, explore alternative explanations, and receive instant feedback while forming ideas. This pattern also fits Vygotsky's Zone of Proximal Development (ZPD), where AI functions similarly to a "More Knowledgeable Other," offering guidance that helps students accomplish tasks beyond their current ability. Thus, the positive correlation between AI use and science performance supports the view that when digital tools enhance student agency and encourage active engagement with content—not passive use—they can significantly strengthen understanding and achievement in science.

Additionally, the positive link between AI use and better test results supports the idea that AI is part of a broader learning system where immediate feedback is a key factor in improving performance (Holmes et al., 2021; Kasneci et al., 2023; Kohnke et al., 2023).

Research Question No. 6. **Proposed Program based on the findings of the study.**

Based on the study's results, it is proposed to develop and implement an **AI-Enhanced Science Learning Support Program.**

Rationale: This program would seek to build on the observed—though modest—positive relationship between the use of AI tools and students' science achievement, with the goal of further improving learning outcomes.

Component	Activity(Teachers & students)	Objectives	Strategies	Persons Involved	Resource	Time Frame	Success Indicator	Budget Funding
AI Literacy and Training Work-	**Teachers:** Weekly professional development on effective prompt engineering, curriculum integration,	To ensure all stakeholders possess the foundational	**Hands-on Training** (e.g., crafting advanced science prompts for concept	AI Coordinator, Science Teachers, Technology Integrati	Workshop materials, Access to **premium/educational versions**	**Initial 4 Weeks** (Intense training); **On-going**	**85%** of teachers pass a **Prompt Engineering competency**	Approximate 50000 Thai baht (PD stipends, guest speaker

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shops	and assessing AI-generated work. **Students:** Mandatory introductory workshops on the capabilities, limitations, and ethical use of ChatGPT/Gemini in science.	knowledge and skills for **effective and responsible AI use** in science education.	explanation and debugging code/ calculations). **Role-playing** ethical scenarios (e.g., academic integrity)	on Specialist, Students	of ChatGPT/ Gemini, Presentation software, Guest speaker fees for AI experts.	(Monthly 1-hour refresher sessions).	**test**. **90 %** of students complete the core literacy module.	s, premium access fees).
Integration of AI Tools into the Curri-culum	**Teachers:** Redesign 3 core science assignments/labs to require AI-assisted analysis or personalized review. **Students:** Frequent use of AI for **interactive problem-solving** (e.g., simulating experimental outcomes) and **personalized quizzing**(pre-test review).	To facilitate **frequent and effective use** of AI tools, driving deeper subject comprehension and personalized learning experiences.	**Flipped Classroom** model with AI for content delivery/pre-lab research. **In-class activities** focusing on **critical evaluation** and refinement of AI-generated answers.	Science Teachers, Students	Updated **Curriculum Guides** outlining AI integration points, **AI-powered adaptive learning platforms**.	**One Full Academic Year** (Phased rollout across different science courses).	**75%** of science lessons/ units include a required AI-assisted activity. **Increased average time spent** on personalized practice (tracked via AI tool logs).	20000 Thai Baht (Curriculum development time/-stipends).
AI Support Centers	**Teachers:** Utilize the Center for **advanced pedagogical support** and sharing best practices. **Students:** Access **one-on-one help** with complex science topics and learn advanced AI	To provide accessible, **specialized support and guidance** to maximize student understanding	Establish a **dedicated physical and/or virtual hub** staffed by peer tutors and a tech specialist. Develop a **FAQ library** and instruction	AI Support Specialist/Tutor, Peer Tutors, Science Teachers	Dedicated physical space (or online platform), **Computers/Tablets**, Instructional guides/videos, High-speed internet.	**Continuous** (Open 5 days a week, both in-person and online).	**70%** weekly student utilization rate of the support center. **Positive feedback** score (>4.0/5.0) on support satisfacti	100000 Thai Baht (Staffing costs for specialist/ tutors, equipment, maintenance).

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	prompt strategies.	and perfor-mance through AI tools.	al videos for common science concepts using AI.				on surveys.	
Moni-torin g and Eva-luati on	**Teachers:** R egularly analyze data on student AI usage patterns (e.g., frequency, type of questions). **St udents:** Parti cipate in **pre- and post-program testing** and complete self-reflection surveys on AI's impact.	To **reg ularly assess the progra m's effecti veness** and measur e the impact of AI tool use on student science scores for refinem ent.	Administe r **standar dized science assessm ents** (pre/ post). Collect data on **AI tool usage logs** (via API or manual logging). Use **AI Impact Surveys** (statement s 1-17) quarterly.	School Adminis tration, Science Depart ment Head, AI Coordin ator, External Evaluat or (optiona l)	Assessme nt tools, Data analysis software, Survey platform.	**Quarterl y** (Data collectio n and analysis) ; **End of Year** (Co mprehen sive impact report).	**10% increase** in average science test scores compare d to the previous year. **Po sitive correlati on** betwe en responsi ble AI use and high scores.	10000 Thai Baht (Data analysis , survey platform subscri ption, external review)
Pro mo-ting Res pons ible Use	**Teachers:** Int egrate lessons on **citation, academic integrity, and bias** when discussing AI-generated content. **Stud ents:** Complete a **mandatory Ethics Pledge** and practice **critic al thinking skills** by fact-checking AI outputs.	To ensure student s use AI tools **ethicall y, honest ly, and critical ly**, mitigati ng risks like over-relianc e and plagiari sm.	Develop **c lear, school-wide policies** o n AI use in assignme nts and exams. Integrate **critical analysis tasks** wh ere students must identify and correct inaccuraci es/biases in AI outputs.	School Adminis tration, Science Teacher s, Ethics/C ivics Teacher s, Student s	Academic Honesty Policy, Citation Guides (for AI-generated work), Case study examples of ethical violations.	**Ongoin g** (Integr ated into lesson plans); **I nitial 2 Weeks** (Policy distributi on and pledge signing).	**< 2%** repor ted incidents of AI-related academi c dishones ty per semester . **95%** of students can correctly identify AI hallucina tions in a given text.	5000 Thai Baht (Pr inting/p olicy distribut ion, resourc e material s).

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Re-search and Feed-back Loop	**Teachers:** Participate in **focus groups** to provide qualitative feedback on tool effectiveness and challenges. **Students:** Provide anonymous feedback via **suggestion boxes/forms** on the AI Support Center platform.	To gather **qualitative and quantit a-tive data** continuously to inform evidence-based program improvements and institutional policy.	**Establish a regular Research Committee** (teachers, coordinator, admin). **Conduct exit interviews/focus groups** with students and teachers at the end of each semester. Publish an **annual internal report** on AI integration findings.	Research Committee, AI Coordinator, All Participants (Students/Teachers)	Anonymous feedback forms, Transcription/analysis software for focus groups, Internal reporting template.	**Continuous** (Data gathering); **Semi-Annually** (Review and policy update meetings).	**50%** of program recommend-ations are implemented in the following semester based on research findings. **Documented shift** in teaching/learning strategies based on feedback.	30000 Thai Baht (Software, meeting costs).

DISCUSSION

Answering Research Questions

The study pursued answers to six research questions, with the results summarized below:

Research Questions
Answer based on Findings:

1. What is the profile of the respondents in terms of gender?
The respondents were Grade 10 students in the Normal Program at Samakkhiwitthayakhom School. The study specifically utilized a purposive sample of 130 students who were frequent users of ChatGPT and Gemini.

2. What is the frequency in the use of ChatGPT and Gemini AI tools of the respondents?
The study focused only on the frequent users of the tools. The overall mean usage frequency was negligibly higher for males (Mean = 3.04) than for females (Mean = 2.96).

3. What is the performance score of respondents in Science?

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The performance scores were measured using a 20-item multiple-choice test on Kinetic and Potential Energy. The study's core finding relates to the performance: the data showed a weak but statistically significant positive correlation between the frequency of AI tool use and science test scores.

4. Is there a significant difference between the frequency of using ChatGPT and Gemini AI tools when the respondents are grouped according to Gender?
No, the study did not find a significant difference in the frequency of using ChatGPT and Gemini AI tools between males and females.

5. Is there a significant relationship between the frequency of using ChatGPT and Gemini AI tools with the performance score of the respondents in Science?
Yes, there is a significant relationship. The analysis concluded that there is a weak but statistically significant positive correlation between the frequency of AI tool use (ChatGPT and Gemini) and science test scores.

6. What program can be proposed based on the findings of the study?
A specialized program is proposed for the seamless and effective integration of ChatGPT and Gemini into the pedagogical process to enrich science education. The program components include: AI Literacy and Training Workshops, Integration of AI Tools into the Curriculum, AI Support Centers, and Monitoring and Evaluation.

Summary of Findings

Among the important findings of this research were:

1. Females constitute the majority of the sample, with 70 individuals (53.8%), while males account for 60 individuals (46.2%). The gender difference in frequency is 10.

2. The data indicates that respondents generally use both ChatGPT and Gemini AI for science education, with an overall average frequency rated as "Sometimes" (Grand Mean = 3.00). Specifically, ChatGPT has a slightly higher composite mean (3.22) compared to Gemini AI (2.80), both falling within the "Sometimes" range. ChatGPT is primarily used for understanding, clarifying, and overcoming science-related challenges, with the highest-rated statement showing frequent consultation when stuck on assignments. Its perceived impact on improving test scores is moderate. Conversely, Gemini AI is used less frequently and its perceived impact on test scores is rated as "Rarely," suggesting limited influence on academic performance. The respondents rely more on both tools for support and understanding rather than for direct test score enhancement. The findings contrast with some research literature, which highlights the potential benefits of NLP models like ChatGPT and Gemini AI in education and research, though challenges such as biases and limitations are noted in other studies.

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3. The data reveals that the respondents performed exceptionally well in science, with the majority achieving high scores. Specifically, 81.5% of the 130 respondents scored in the "Outstanding" category (17-20), and the overall mean score was 17.94, also categorized as "Outstanding." The scores are heavily clustered at the upper end of the scale, with 93.2% falling within the "Outstanding" or "Very Satisfactory" ranges. Only a small percentage scored in the lower categories, indicating a generally high level of science achievement among the group. The standard deviation of 3.60 suggests moderate variability, with most scores being high but some spread across the upper performance levels.

4. The analysis comparing the frequency of AI tool usage between male and female respondents shows no statistically significant differences. For ChatGPT, males reported a slightly higher mean usage (3.28) compared to females (3.16), but this difference was not statistically significant (p=0.420). Similarly, for Gemini AI, males had a higher mean (3.82) than females (2.78), yet the difference was not significant (p=0.435). When considering overall AI tool usage, males again reported a marginally higher mean (3.04) than females (2.96), with the difference also deemed not significant (p=0.454). Despite some observed differences in sample means, the statistical tests indicate that these are likely due to chance and do not reflect true differences in the broader population.

5. The analysis reveals a statistically significant but weak positive relationship between the frequency of AI tool usage—specifically ChatGPT and Gemini—and respondents' science scores. Both ChatGPT and Gemini show low correlation coefficients (~0.21), indicating that increased use of these tools is associated with slightly higher science scores. The significance of these correlations (p=0.049) suggests that the observed relationships are unlikely due to chance. When considering both tools together, the correlation slightly increases to 0.243, still within the range of a weak positive association.

6. Based on the study's results, the researcher proposed to develop and implement an AI-Enhanced Science Learning Support Program. This program would seek to build on the observed—though modest—positive relationship between the use of AI tools and students' science achievement, with the goal of further improving learning outcomes.

Conclusions

Based on the foregoing findings, the following conclusions were drawn:

1. While females are slightly more represented in the sample, the data suggests that gender does not play a significant role in the utilization of AI tools among students. Both males and females are generally receptive to integrating AI in

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education, indicating that gender is not a determining factor in AI adoption within this context.

2. Overall, respondents use ChatGPT and Gemini AI intermittently in their science studies, primarily for understanding and clarification rather than for significant improvement in test scores. While ChatGPT is perceived as somewhat more impactful, both tools are utilized as supplementary aids rather than definitive solutions for academic success. The findings suggest that, despite the perceived moderate impact, these AI tools are valuable for supporting science learning, aligning with the broader potential identified in research literature. However, the limited perceived influence on test scores indicates the need for further exploration of how these tools can be more effectively integrated into educational practices to maximize their benefits.

3. The respondents demonstrated outstanding performance in science, with most achieving top scores and a high average score close to the maximum. This indicates a strong overall proficiency in science among the sample population. The high concentration of scores at the upper end highlight the importance of factors such as effective teaching, motivation, parental involvement, and innovative educational technologies—including AI—for enhancing student achievement. These results suggest that targeted interventions and advanced learning tools can significantly contribute to maintaining or improving high academic performance in science.

4. The findings demonstrate that gender does not have a statistically significant impact on the frequency of using ChatGPT, Gemini AI, or overall AI tools among the respondents. While males tend to report slightly higher usage rates, these differences are not substantial enough to be considered meaningful in the population. This suggests that, within this sample, both males and females utilize AI tools at similar levels, highlighting the importance of fostering equitable access and encouraging diverse engagement with AI in educational settings. Understanding that gender does not significantly influence AI usage can inform the development of inclusive instructional strategies that cater to all learners, regardless of gender. Gender did not significantly impact the students' frequency of AI tool usage, which contrasts with some previous research suggesting gender differences in digital tool engagement. The results suggest that while AI tool usage isn't the only factor determining academic success, it serves as a significant support mechanism for science learning, especially for topics needing conceptual visualization and iterative practice.

5. While the correlations between AI tool usage and science scores are weak, they are statistically significant, indicating that increased use of ChatGPT and Gemini may be modestly associated with improved science performance. These findings align with broader research suggesting that AI-driven educational tools can support scientific understanding and engagement. However, given the low strength of these relationships, AI tools should be viewed as supplementary aids rather than sole determinants of academic

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success in science. Continued research is essential to better understand how to effectively leverage AI technologies to enhance learning outcomes in science education. Students reported an overall moderate frequency of AI tool use and achieved above-average scores on the science test. Critically, the data showed a positive correlation: students who used AI tools more frequently tended to perform better on the assessment. The study's findings not only show a correlation between the use of generative AI tools (ChatGPT and Gemini) and Grade 10 students' science performance but also highlight important implications for future AI-driven teaching methods. Students' usage patterns indicate that AI is already serving as a cognitive aid rather than a simple information source, signaling the need for rapid changes in instructional design. AI should no longer be treated as an optional add-on; instead, it should be intentionally embedded into learning activities that promote critical analysis, synthesis, and meaningful application of AI-generated information. This means teachers must take on the role of facilitators who guide students through deeper, AI-supported learning experiences, ensuring that the technology enhances knowledge construction, higher-order thinking, and improved science achievement. The findings confirm the principle of Constructivism, asserting that learning is enriched when students actively engage and interact with digital knowledge sources. The AI tools (ChatGPT and Gemini) functioned as personalized tutors, offering immediate feedback and tailored explanations, which aligns with the Holmes et al. (2021) model of the AI learning ecosystem. The observed link between AI usage and higher science achievement supports existing research that highlights AI's potential to boost student engagement, independent learning, and mastery of content. The results suggest that incorporating ChatGPT and Gemini into science classrooms holds practical and instructional benefits. This research investigated how often Grade 10 students used AI tools (ChatGPT and Gemini) and how that related to their science test results. The findings indicated that more frequent AI tool usage was associated with slightly higher science test scores. Interestingly, gender did not significantly influence the patterns of AI tool usage among the students. It is crucial to note that because the research used a correlational design, it cannot prove that AI use *caused* the improved performance. Other factors, such as teacher support, students' digital literacy, and access to technology, may also have played a role in the results.

6. Integrating AI tools into science education holds promise for enriching student learning experiences and outcomes. While current usage shows a positive relationship with academic performance, further efforts are needed to maximize their potential effectively. The proposed AI-Enhanced Science Learning Support Program offers a strategic approach to harness the benefits of AI technology responsibly and inclusively, paving the way for innovative and effective science education in the digital age.

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Recommendations

In the light of the conclusions drawn from the study, the following are hereby recommended:

1. Responsible Usage: Teach AI Ethics and Critical Verification. Students must learn to use AI responsibly, avoiding over-reliance and developing the essential skill of verifying all AI-generated information for accuracy.

2. Pedagogy and Skills: Drive Critical Thinking through Inquiry. Shift AI usage from simple answer generation to a tool for inquiry-based learning. Encourage students to actively analyze, evaluate, and question AI responses to build problem-solving and critical thinking skills.

3. Personalized Learning: Tailor Learning to Individual Needs. Leverage AI's core strength—its ability to personalize instruction—to create customized learning pathways. This is especially vital for providing extra support to students with lower academic performance or confidence challenges.

4. Inclusivity and Equity: Ensure Fair Access and Usage. Actively work to address any gender or socioeconomic gaps that could impact access to or effective use of AI tools, guaranteeing that the program promotes equitable educational opportunities for all.

5. Continuous Improvement: Establish a Data-Driven Feedback Loop. Create formal channels for both students and teachers to provide feedback on the tools' effectiveness and usability. Pair this with ongoing research to measure impact and continually refine the program's AI integration strategies.

6. Samakkhiwitthayakhom School and similar institutions implement AI tools in science teaching in a structured, inquiry-based, and constructivist manner. Activities should push students beyond simple prompting and encourage them to critically assess AI outputs. Examples include:

   Inquiry-Based Prompt Design: Teaching students to craft advanced prompts that generate multiple hypotheses or perspectives.
   AI as a Critical Challenger: Using AI to produce plausible but incorrect explanations that students must analyze and disprove with evidence.
   Build & Break Tasks: Allowing AI to generate a draft scientific explanation that students then critique, verify, and refine using their own understanding and sources.

In essence, this program is designed to proactively harness AI's power to enhance science learning by prioritizing ethical, skill-building use, individualized support, equitable access, and continuous refinement.

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