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Utilization of AI Research Assistant on Creativity and Efficiency in Science Investigatory Projects Among Science, Technology, and Engineering (STE) Students

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ABSTRACT

The rapid advancement of Artificial Intelligence (AI) has significantly influenced educational practices, particularly in science-oriented programs where inquiry, innovation, and analytical thinking are essential. This study examined the relationship between the utilization of AI research assistants and the creativity and efficiency of Science, Technology, and Engineering (STE) students in developing their Science Investigatory Projects (SIPs). A quantitative descriptive–correlational research design was employed to analyze the extent of AI use and its association with students' research performance. Data were gathered from STE students using a structured questionnaire that measured the utilization of AI tools in terms of quality, frequency of use, practicability, and instructional value, as well as students' levels of creativity and efficiency in project development. The findings revealed that STE students demonstrated a generally frequent and positive utilization of AI research assistants across all measured dimensions. AI tools were perceived as accurate, coherent, and helpful in supporting research outputs. Students regularly used these tools to search for information, generate ideas, clarify concepts, and review academic content. AI research assistants were also considered accessible, convenient, and time-saving in organizing research tasks. In terms of instructional value, students acknowledged that AI facilitated understanding of concepts and enhanced research and writing skills; its contribution to higher-order thinking and independent learning was slightly less emphasized. Furthermore, the results indicated that students exhibited a very satisfactory level of creativity and efficiency in their Science Investigatory Projects. They demonstrated originality in research ideas, effective problem-solving, clear elaboration of concepts, and meaningful synthesis. In addition,

students showed strong efficiency in time management, resource utilization, and productivity during project development. Correlational analysis revealed a moderate, statistically significant positive relationship between the utilization of AI research assistants and the level of creativity and efficiency in SIP development.

Keywords: technological integration, inquiry-based learning, digital academic support, student research productivity

I. INTRODUCTION

Background of the Study

The rapid advancement of Artificial Intelligence (AI) has significantly transformed educational practices, particularly in science, technology, and engineering education, where inquiry, innovation, and problem-solving are essential competencies. Among emerging AI applications, AI research assistants—such as intelligent literature search tools, automated data analysis systems, and generative writing aids—have gained prominence for their potential to support students in conducting research-based academic tasks.

Globally, studies from technologically advanced education systems indicate that AI-powered research tools can improve students' research productivity, idea generation, and time management by automating routine tasks such as information retrieval, summarization, and formatting (Luckin et al., 2022; Zhai et al., 2021). Research conducted in Europe, North America, and parts of East Asia suggests that AI research assistants positively affect learners' creative thinking by exposing them to diverse perspectives and enabling rapid iteration of research ideas (Holmes et al., 2022). Despite these advancements, international literature reveals a notable gap: most studies focus on higher education or professional research environments, with limited attention given to secondary-level STE students engaged in Science Investigatory Projects.

In the Philippines, the integration of AI in education is still in its early stages, largely shaped by the Department of Education's push toward digital transformation and innovation under the K–12 curriculum (DepEd, 2022). Local studies suggest that technology-assisted learning tools can enhance students' engagement, research skills, and academic performance in science subjects (Santos & De Guzman, 2021; Reyes et al., 2023). However, there remains a clear literature gap in the Philippine setting regarding the systematic use of AI research assistants in Science Investigatory Projects.

In South Central Mindanao, educational research highlights persistent challenges in science education, including limited research resources, time constraints, and uneven access to advanced technologies, particularly in public secondary schools (Manalo et al., 2021; Alonto & Salic, 2022). While STE programs in the region aim to cultivate scientific inquiry and innovation, students often struggle with literature review, research design, and data analysis during Science Investigatory Projects due to resource limitations and insufficient research mentoring. Nevertheless, there is a significant research gap concerning AI-based research assistants in South Central Mindanao.

In the province of Sultan Kudarat, where schools cater to diverse learners and often operate under constrained resources, Science Investigatory Projects are recognized as essential yet challenging academic requirements for STE students. Local educational reports indicate that students face difficulties in generating innovative research topics, organizing scientific literature, and completing SIPs within limited timelines (Division of Sultan Kudarat, 2023). While access to digital tools has gradually improved, the utilization of AI research assistants remains largely unexplored and undocumented in the local educational landscape.

This study was aligned with Sustainable Development Goal 4 (Quality Education), which emphasizes inclusive, equitable, and quality education through the integration of innovative learning technologies. It also supported SDG 9 (Industry, Innovation, and Infrastructure) by promoting technological innovation and research capacity among young learners, and SDG 10 (Reduced Inequalities) by exploring how AI tools could help address disparities in access to research resources, particularly in regional and resource-limited contexts such as Sultan Kudarat.

The primary goal of this study was to determine the extent to which the utilization of AI research assistants influences the creativity and efficiency of Science, Technology, and Engineering (STE) students in conducting Science Investigatory Projects among selected secondary schools in Tacurong City, Sultan Kudarat. Specifically, it aimed to assess how AI-assisted research tools support idea generation, research organization, time management, and overall project completion, thereby providing empirical evidence to guide educators, school administrators, and policymakers in the responsible and effective integration of AI in secondary science education.

Statement of the Problem

Generally, the study aimed to determine the extent to which the utilization of AI research assistants influences the creativity and efficiency of Science, Technology, and Engineering (STE) students in conducting Science Investigatory Projects among selected secondary schools in Tacurong City, Sultan Kudarat

Specifically, the study was guided by the following specific questions:

1. What is the level of utilization of AI research assistants by the different grade levels of STE students, in terms of
    1.1. Quality of AI;
    1.2. frequency of use,
    1.3. practicability, and
    1.4. instructional value?
2. What is the level of creativity and efficiency demonstrated by STE students in their Science Investigatory Projects in terms of:
    2.1. Creativity indicators:
    2.1.1. Novelty of ideas
    2.1.2. Problem-solving fluency
    2.1.3. Elaboration of concepts
    2.1.4. Synthesis of ideas
    2.2. Efficiency indicators:
    2.2.1. Time management
    2.2.2. Resource optimization
    2.2.3. Productivity during SIP development?
3. Is there a significant relationship between the utilization of AI research assistant and the level of creativity and efficiency in Science Investigatory Projects among STE students?

II. METHODOLOGY

Research Design

This study adopted a quantitative-descriptive correlational research design to comprehensively examine the relationship between the utilization of AI research assistants and the creativity and efficiency of STE students in developing their Science Investigatory Projects (SIPs).

The quantitative approach is appropriate when the goal is to collect and analyze numerical data to determine how variables relate without manipulating them, ensuring objectivity of surveys to respondents' experiences and behaviors. Surveys are widely recognized in quantitative research for efficiently gathering large amounts of data from participants at a single point in time, which supports the description and analysis of the variables of interest within a specific population.

The descriptive component of the design allowed the study to provide a clear snapshot of current conditions regarding how AI research assistants were used and how students exhibited creativity and efficiency during SIP development, without altering the natural research setting. Coupled with this, the correlational component was necessary to determine the extent and direction of relationships between the AI tools and the outcome measured (creativity and efficiency), recognizing patterns and associations that exist among variables as they naturally occur.

This non - experimental framework is particularly suitable for educational research where variables cannot be manipulated for ethical or practical reasons, yet understanding their interrelationships is essential.

Respondents of the Study

The respondents were 72 STE Grade 10 students who engaged in Science Investigatory Projects (SIPs), with a focus on those who used AI research assistants during their projects.

Sampling Techniques

This study used total enumeration, a non-probability sampling; researchers examine the entire population of interest rather than a subset. It provided a complete picture of the population, ensured high accuracy, and eliminated sampling error.

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Data Gathering Instrument

The primary instrument for data collection was a structured questionnaire based on the study's objectives. It included Likert-scale items, multiple-choice questions designed to measure students' AI usage patterns, perceptions on creativity and efficiency, and self-assessed outcomes. The questionnaire was validated before being transcribed and formatted into an online survey questionnaire in Google Forms.

Data Gathering Procedure

To ensure reliable and authentic findings, the researcher adhered to a methodology aligned with the study to determine the relationship between the utilization of AI research assistants and the creativity and efficiency of STE students in developing their Science Investigatory Projects (SIPs).

Initially, the study's implementation required the endorsement of the DepEd-Division Superintendent and the CGS Dean. An additional letter of authorization was dispatched to the school principals and to the department head of the secondary schools. To ensure the accuracy of the data collected for this study, a survey questionnaire was utilized, developed, and assessed. The researcher employed a census sampling technique.

The study underwent ethical considerations. The researcher sought approval from the EWMCI Research Ethics Committee (EREC).

The researcher initiated the face-to-face dissemination of the Survey Questionnaire. The outcomes derived from the distributed survey questionnaire were compiled, assessed, and analyzed.

Scope and Limitations of the Study

This research focused exclusively on measuring the impact of Artificial Intelligence assistants on two key dimensions: creativity and efficiency. It also explored the challenges and ethical concerns associated with their use. The study was confined to the context of Science Investigatory Project (SIP) development. The study was conducted at Tacurong National High School.

The respondents were limited to students enrolled in the Science, Technology, and Engineering (STE) program specifically grade 10 students who are currently developing or have recently completed a SIP. The data collection for this study was conducted during the Academic Year 2025-2026. The research captured the students' experiences and perceptions of AI use within this specific academic period.

The study primarily relied on data from self-administered surveys. This method was subject to biases such as social desirability bias, where respondents may answer questions they believe are more socially acceptable, and recall bias, an inaccurate recollection of their experiences. The core constructs of "creativity" and "efficiency" were measured through participants' perceptions rather than through direct, objective metrics. What one student perceives as a major efficiency gain, another may not perceive. The study measured this perceived impact, not an absolute, objective value. The findings were based on a single public high school and its specific STE program. Therefore, the results could not be generalized to all students in the Philippines, to other academic tracks within the same school, or to private institutions. The findings were indicative of the local context.

This study was primarily correlational in nature. While it could identify relationships and associations between AI use and various outcomes, it could not definitively establish a cause-and-effect relationship. Other factors not measured by the study could influence both the use of AI and the outcomes.

The study focused on the impact of AI but does not control for other variables

that could affect SIP quality and learning, such as the quality of teacher mentorship, availability of laboratory resources, individual student motivation, or prior academic achievement.

III. RESULTS AND DISCUSSIONS

The rapid advancement of Artificial Intelligence (AI) has significantly transformed educational practices, particularly in science, technology, and engineering education, where inquiry, innovation, and problem-solving are essential competencies. This study adopted a quantitative-descriptive correlational research design to comprehensively examine the relationship between the utilization of AI research assistants and the creativity and efficiency of STE students in developing their Science Investigatory Projects (SIPs).

The study revealed that STE students generally demonstrate a frequent and positive utilization of AI research assistants across all dimensions. In terms of quality, AI tools were perceived as accurate, coherent, and supportive in enhancing research outputs. Regarding frequency, students regularly used AI to search for information, generate ideas, clarify concepts, and review academic content. Concerning practicability, AI research assistants were considered accessible, time-saving, and convenient for organizing and completing research tasks.

For instructional value, students acknowledged that AI facilitated understanding of concepts, improved research and writing skills, and supported guided learning, though higher-order thinking and independent learning benefits were slightly less emphasized. Overall, the findings indicate consistent and meaningful integration of AI in students' research activities.

Also, it was shown that STE students demonstrated a very satisfactory level of creativity and efficiency in their Science Investigatory Projects across all indicators. Students showed originality in creativity, in research ideas, strong problem-solving skills, clear elaboration of concepts, and effective synthesis of ideas, reflecting thoughtful and innovative scientific thinking. For efficiency, students exhibited very satisfactory performance in managing time, optimizing available resources, and maintaining consistent productivity during project development, indicating organized, diligent, and goal-oriented research practices.

Finally, the analysis revealed a moderate but statistically significant positive correlation between STE students' utilization of AI research assistants and their creativity and efficiency in Science Investigatory Projects, indicating that greater engagement with AI tools is associated with higher levels of creative thinking and more effective project management.

Conclusion

The following conclusions were made considering this study's findings: The transformative potential of AI in fostering academic efficiency and comprehension, while highlighting the need for complementary teacher guidance to maximize independent and critical thinking skills, concluded that strategic integration of AI, aligned with pedagogical support, can enhance both

learning outcomes and student engagement in research tasks.

Also, STE students possessed a balanced combination of creative thinking and practical efficiency, which supports successful scientific investigation. Strengthening these skills further through guided mentoring, structured project planning, and exposure to diverse research methodologies could enhance both the quality and impact of student research outputs in future projects.

Finally, it was concluded that integrating AI into research practices could meaningfully support students' cognitive processes, problem-solving abilities, and overall productivity, highlighting the potential of technology-enhanced learning to foster both innovation and efficiency in science education.

Recommendations

Considering the findings of the study, the following were recommended:

1. Department of Education (DepEd) may consider developing clear and practical guidelines for the ethical and responsible use of AI research assistants in schools, with emphasis on promoting higher-order thinking skills so that students use AI not only for information retrieval but also for critical analysis and independent inquiry.
2. School Administrators may organize capacity-building workshops and provide accessible AI-supported learning resources that guide students on how to use AI tools responsibly while strengthening analytical thinking and research independence.
3. Curriculum Planners may integrate structured AI-assisted research activities and critical thinking tasks within Science Investigatory Project (SIP) guidelines to ensure that AI use supports deeper conceptual understanding and independent problem-solving.
4. Teachers may design guided learning activities that encourage students to critically evaluate AI-generated information, ask higher-level questions, and independently refine their research ideas to strengthen creativity and intellectual ownership of their projects.
5. Future Researchers may further investigate how AI-assisted learning specifically influences students' higher-order thinking skills, research independence, and ethical academic practices across different grade levels and subject areas.

IV. ETHICAL CONSIDERATIONS

In preparation for implementation, all the plans and recommendations were presented to East-West Mindanao Colleges Inc. to ensure compliance with prescribed procedures and protocols. In the context of research on examining the utilization of AI research assistants and the creativity and efficiency of STE students in developing their Science Investigatory Projects (SIPs), it was imperative to emphasize the paramount importance of ethical considerations. Before commencing this study, the following ethical principles were highlighted:

Informed Consent. Before participation, consent was obtained from all school heads involved in the study.

They must possess a comprehensive understanding of the study's objectives, methodologies, potential risks, and benefits. Furthermore, participation remained entirely voluntary, allowing the participants to withdraw from the study at any juncture without adverse consequences.

Anonymity and Confidentiality. To safeguard identities and responses, rigorous measures were followed to ensure anonymity and confidentiality. Rather than using actual names, pseudonyms or codes were used to uphold the participants' privacy. The collected data was securely stored with access restricted solely to the research team.

Avoiding Harm. Delicate subjects, such as the challenges inherent in their roles, were discussed with potential emotional and psychological impact on participants. Strategies were in place to minimize distress, and a support system was readily available to assist participants.

Researcher-Participant Relationship. The researcher maintained a professional and respectful rapport when engaging with the school heads. Any actions that might harm the participants were scrupulously avoided, ensuring their utmost dignity and respect throughout the research process.

Data Protection. Adherence to data protection regulations and laws was observed to safeguard the participants' personal information. Stringent measures were employed to ensure the secure storage and transmission of data.

Voluntary Participation. Participants were assured that their participation in the study was devoid of any coercion or external pressure.

Researcher Bias. The researcher remained vigilant regarding potential biases that might influence data collection and analysis, upholding objectivity and transparency throughout the research endeavor.

Institutional Approval. Before initiating the study, the researcher sought ethical clearance from the pertinent institutional review boards or ethics committees.

Honesty and Integrity. The research findings were reported truthfully and accurately, free from manipulation or distortion to align with preconceived notions or biases.

Beneficence. The potential benefits of the research in educational practices and policies were thoughtfully considered, ensuring that the study contributes to the education system.

Cultural Sensitivity. The researcher demonstrated cultural sensitivity by respecting local customs, beliefs, and practices within the research setting and refraining from imposing external values on participants.

Inclusion and Diversity. The study's structure prioritized inclusivity and diversity, encompassing a wide spectrum of utilization of AI research assistants and the creativity and efficiency of STE students in developing their Science Investigatory Projects (SIPs)

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Declaration AI Tools Utilization

I do hereby declare the use AI tools, such as Perplexity, Quilbot and Grammarly for grammar checking and sentence organization purposes only.

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