INTERNATIONAL MULTIDISCIPLINARY JOURNAL OF RESEARCH FOR INNOVATION, SUSTAINABILITY AND EXCELLENCE
Published by: RISEJOURNALS.ORG | Online ISSN: 3028-032X | Print ISSN: 3028-0370
VOLUME 5, ISSUE NO. 6

IMPROVING CREATIVE TECHNOLOGY COMPETENCY PERFORMANCE THROUGH AI-SUPPORTED CONFUSION LOGGING AMONG GRADE 7 LEARNERS

DOI: 10.5281/zenodo.24183367

CYRIL MANLANGIT YCONG
Cebu Technological University, Main Campus, R. Palma St., Cebu City,Philippines
ycongcyril0820@gmail.com

Abstract

Creative Technology requires learners to understand concepts, apply procedures, and produce completed work. This study examined changes in Grade 7 learners' Creative Technology performance after four weeks of AI-Supported Confusion Logging at Mactan National High School during School Year 2026–2027. A quantitative one-group pretest–posttest design included all 40 learners in one intact advisory class. The study used an adapted questionnaire for both assessments and reported weighted means, standard deviations, and paired-sample t tests at the .05 significance level. The three reported domains were understanding of concepts and principles, application of skills and processes, and completion and quality of outputs. The reported overall mean rose from 2.01 to 4.02. Domain gains ranged from 1.95 to 2.06 points, and the reported paired comparisons yielded $p < .001$. The scores improved within the study group, but the design cannot establish that AI-Supported Confusion Logging alone caused the improvement. The findings informed an enhanced Creative Technology lesson plan that uses a confusion log to identify points of uncertainty and guide clarification and feedback.

Keywords: AI-Supported Confusion Logging, Creative Technology, quasi-experimental design, academic performance, Mactan, Lapu-Lapu City

Introduction

Creative technology is inherently dual-natured: it demands robust conceptual understanding of design principles, computational logic, and creative frameworks alongside mastery of technical operational skills, tool proficiency, and iterative practical application. Competency in this subject cannot rely on knowledge alone nor on mechanical execution alone learners must synthesize both to analyze problems, design solutions, and produce functional, creative outputs. Yet in practice, many students struggle to bridge these two domains: they may memorize concepts without applying them, or operate tools without understanding the underlying principles, creating disjointed learning that hinders mastery. When uncertainties arise, learners often fail to identify exactly where their understanding falters, or hesitate to communicate confusion due to shyness, fear of appearing unprepared, or the fast pace of lessons. Left unarticulated, these points of difficulty accumulate, hardening into persistent learning gaps that erode confidence, stall skill development, and ultimately lower academic performance (Almond, 2026; Lardhi & Ismail, 2026; Pixelman Academy, 2025).

This communication barrier forms the core of the learning problem: confusion rarely resolves on its own when it remains unspoken. In crowded classrooms, students often lack opportunities to voice individual doubt; they may assume their struggle is unique, lack the vocabulary to describe what they do not understand, or simply wait too long before seeking help. By the time gaps become visible in assessments or outputs, they are already entrenched, making reteaching less efficient and more discouraging for the learner. Without a structured, low-pressure mechanism to flag uncertainty, both students and teachers remain unaware of specific stumbling blocks until performance declines noticeably—delaying intervention and widening disparities between those who grasp concepts quickly and those who fall behind.

AI-supported confusion logging offers a targeted, responsive solution designed to address exactly this gap. As a structured feedback tool, it allows students to record areas of uncertainty in real time, whether during lessons, practice tasks, or independent work, without the pressure of public disclosure. Beyond simply capturing concerns, the system organizes these inputs systematically: it categorizes difficulties by topic, skill domain, or learning objective; identifies recurring patterns across groups; and generates summarized, actionable insights that guide instructional planning. For teachers, this means clearer visibility into where the curriculum is landing well and where adjustments are needed—enabling them to refocus explanations, design targeted practice activities, and deliver timely, personalized support aligned with the Most Essential Learning Competencies (MELCs). In this way, AI serves not as a replacement for instruction but as an organizing and analytical partner, helping align teaching practices with actual learner needs while strengthening the connection between conceptual mastery and practical skill building.

Globally, AI integration in education is increasingly framed around human-centered principles, and this perspective is especially relevant at Mactan National High School – Junior High School. Observations show that many learners already turn to generative AI for nearly all their academic outputs, often relying on it to complete tasks they could otherwise attempt themselves. If unguided, this habit risks reducing AI to a substitute for thinking, leaving students' intellect stranded they may produce finished work without understanding the process behind it. Rather than discouraging use entirely, the responsible approach is to teach students the right way to engage with these tools: to use AI as a support system specifically where they are genuinely confused, as a resource to clarify understanding, validate ideas, and overcome specific hurdles rather than as a shortcut that bypasses learning. Confusion logging reorients their practice: it channels AI toward identifying and resolving real gaps in knowledge and skill, so that technology strengthens rather than replaces independent reasoning and builds the capacity to learn without constant reliance on external assistance.

While global and regional literature has examined AI's general role in education, and national policies such as Department Order No. 003, s. 2026 have established responsible use frameworks, there remains limited empirical research focused specifically on AI-supported confusion logging as an intervention for creative technology learning in Philippine public secondary schools. No known studies have explored how this tool can address the combined challenges of large class sizes, constrained digital resources, and the dual demand of conceptual and technical mastery nor how it can reframe existing student AI use from over-reliance to intentional, purpose-supported learning in local settings like Mactan National High School – JHS. This study fills that gap by investigating whether AI-supported confusion logging can effectively identify learning difficulties, guide responsive instruction, curb unreflective AI dependence, and improve academic performance in creative technology within resource-constrained public-school contexts.

Theoretical and Conceptual Framework and Legal Bases

This study assumes that examining the effectiveness of AI-supported confusion logging can improve the academic performance of the grade 7 students in Creative Technology. Likewise, it is anchored on the following theories, Cognitive Load Theory (Sweller, 1988), Formative Assessment and Feedback Theory (Black & Wiliam, 1998), Metacognition and Self-Regulated Learning Theory (Zimmerman, 1990), and Zone of Proximal Development / Scaffolding Theory (Vygotsky, 1978; Wood et al., 1976).

Cognitive Load Theory (Sweller, 1988). Cognitive Load Theory posits that human working memory has strictly limited capacity for processing new information. Accordingly, learning is most effective when instructional design manages three types of loads: intrinsic load (inherent difficulty of the subject), extraneous load (unnecessary mental effort caused by poor presentation or disorganisation), and germane load (effort dedicated to building long-term understanding and schemas). Specifically, when total cognitive demand exceeds working memory limits, learning breaks down; conversely, aligning task demands with processing capacity allows learners to consolidate knowledge and skills successfully (Sweller, 1988; Sweller et al., 2011).Creative technology combining design principles, digital tools, and iterative creation naturally carries high intrinsic cognitive load. In particular, before using AI-Supported Confusion Logging, learners often face unrecognized or unaddressed overload that hinders their level of academic performance across four key areas: understanding of concepts and principles, application of skills and processes, completion and quality of outputs, and problem-solving and critical thinking ability. By contrast, AI-supported

confusion logging helps learners and teachers detect exactly where cognitive overload occurs, turning vague struggle into specific, manageable points of difficulty. Furthermore, by flagging these bottlenecks early, the tool reduces extraneous load from confusion or uncertainty, frees mental resources for practice and creation, and directs attention toward germane processing that builds mastery. Ultimately, this directly supports improved academic performance by ensuring learners can process and apply skills without becoming overwhelmed.

Formative Assessment and Feedback Theory (Black & Wiliam, 1998). Moving to, Formative Assessment and Feedback Theory establishes that assessment improves learning most when it is continuous, embedded in instruction, and focused on closing the gap between current performance and intended goals. Notably, Black and Wiliam's landmark synthesis confirms that timely, specific, and actionable feedback is one of the strongest influences on student achievement, far more impactful than grading alone because it guides learners to adjust their efforts and teachers to refine their approach while learning is still unfolding (Black & Wiliam, 1998).

In line with this framework, AI-supported confusion logging functions as a real-time formative assessment system. Currently, prior to its use, gaps in understanding of concepts and principles, inconsistent application of skills and processes, incomplete or low-quality outputs, and weaknesses in problem-solving and critical thinking ability often go unnoticed until summative evaluation. Meanwhile, the intervention captures learners' self-identified difficulties as they emerge, generates immediate prompts for clarification, and provides teachers with aggregated data on common misconceptions or skill gaps. Particularly, in creative technology where hands-on practice and iterative improvement are central, this turns delayed, general feedback into targeted support that keeps progress on track. As a result, this mechanism directly links the intervention to higher academic performance by ensuring gaps are addressed before they accumulate.

Metacognition and Self-Regulated Learning Theory (Zimmerman, 1990). Complementing the preceding perspectives, Metacognition and Self-Regulated Learning Theory describes effective learning as an active, cyclic process: learners plan their approach, monitor their understanding, evaluate their progress, and adjust their strategies as needed. As Zimmerman (1990) explains, learners who can recognize what they know and do not know, and who take ownership of their learning process, consistently achieve higher outcomes than those who rely only on external direction or passive instruction.

For this reason, many students struggle in creative technology not only from limited equipment but also from an inability to articulate what they do not understand. In fact, without AI-Supported Confusion Logging, learners often cannot identify exactly where their understanding of concepts and principles falters, where application of skills and processes breaks down, why completion and quality of outputs fall short, or how to strengthen problem-solving and critical thinking ability. However, AI-supported confusion logging builds metacognitive awareness by prompting learners to name and reflect on their specific difficulties, turning frustration into actionable questions and goals. Additionally, it fosters self-regulation by encouraging regular review of progress and challenges, empowering learners to take greater control of their skill development an essential foundation for improved academic performance in creative and technical subjects.

Zone of Proximal Development / Scaffolding Theory (Vygotsky, 1978; Wood et al., 1976). Finally, the Zone of Proximal Development (ZPD) refers to the gap between what a learner can do independently and what they can achieve with guided support. Correspondingly, scaffolding structured temporary assistance that is gradually withdrawn as competence grows, enables learners to cross this gap effectively. Vygotsky (1978) and Wood et al. (1976) further emphasize that learning is fundamentally social and that well-targeted support accelerates the move from assisted practice to independent mastery.

Especially in contexts such as Mactan National High School-JHS, where large classes and limited equipment restrict one-on-one guidance, identifying each learner's ZPD is difficult without targeted tools. Without this intervention, before AI-Supported Confusion Logging is used, teachers may not accurately pinpoint where learners struggle with understanding of concepts and principles, application of skills and processes, completion and quality of outputs, or problem-solving and critical thinking ability. On the contrary, AI-supported confusion logging pinpoints exactly where a learner needs help, allowing teachers to deliver tailored scaffolding, simplified steps, guided examples, peer

pairing, or focused explanation precisely when it is needed. In this way, this ensures that even with limited resources, support aligns with each student's current level, helping them advance confidently toward independent competence and better academic performance in creative technology.

Synthesis. Cognitive Load Theory (Sweller, 1988) as the core foundation, together with Formative Assessment and Feedback Theory (Black & Wiliam, 1998), Metacognition and Self-Regulated Learning Theory (Zimmerman, 1990), and Zone of Proximal Development / Scaffolding Theory (Vygotsky, 1978; Wood et al., 1976), forms an integrated framework that anchors this study on the efficacy of AI-Supported Confusion Logging in improving academic performance in Creative Technology across understanding of concepts and principles, application of skills and processes, completion and quality of outputs, and problem-solving and critical thinking ability. Cognitive Load Theory explains how the subject's inherent complexity often overwhelms unguided learners, whereas the intervention surfaces hidden difficulties to reduce unnecessary mental load and direct effort toward meaningful mastery; aligned with this, Formative Assessment and Feedback Theory confirms that real-time identification of gaps addresses weaknesses before they accumulate, while Metacognition and Self-Regulated Learning Theory highlights how prompting learners to articulate confusion builds awareness and ownership of their progress, and Zone of Proximal Development and Scaffolding Theory demonstrates how targeted insight enables teachers to provide appropriate support even in resource-constrained settings like Mactan National High School-JHS. Together, these theories validate that AI-Supported Confusion Logging is not merely a technical aid but a purposeful pedagogical tool that aligns cognitive processing, timely feedback, learner agency, and tailored guidance to advance all dimensions of academic performance in Creative Technology.

Aside from these theories that strengthen the study, there are also legal basis that strengthen the study. These are Department Order No. 003, s. 2026 – Foundational Guidelines on Artificial Intelligence (AI) in Basic Education, Republic Act No. 10533 – Enhanced Basic Education Act of 2013, Republic Act No. 10844 – Department of Information and Communications Technology Act of 2015, and UNESCO Recommendation on the Ethics of Artificial Intelligence (2021) and the Beijing Consensus on AI and Education (2023).

Department Order No. 003, s. 2026 – Foundational Guidelines on Artificial Intelligence (AI) in Basic Education. First, this official policy issued by the Department of Education establishes the regulatory framework for AI use in Philippine public basic education, affirming that AI shall operate only as an auxiliary tool aligned with ethical, pedagogical, and human-centred standards; it explicitly prohibits AI from replacing teachers or overriding human judgment, while mandating safeguards for data privacy, learner safety, and equitable access (Department of Education, 2026). In turn, it sets clear expectations for responsible integration, including the requirement for learners to disclose AI use and for schools to adopt graduated oversight based on learner maturity.

Consequently, this order directly legitimizes the present investigation by confirming that AI-Supported Confusion Logging falls within permitted educational uses specifically as a supportive tool to enhance instruction, identify learning gaps, and improve outcomes without compromising human oversight. Furthermore, its provisions on ethical safeguards and AI literacy align perfectly with the study's design, ensuring the intervention adheres to DepEd standards while addressing challenges in understanding, skill application, output quality, and critical thinking in Creative Technology.

Republic Act No. 10533 – Enhanced Basic Education Act of 2013. Next, this landmark law declares the State's policy to provide inclusive, quality, and relevant basic education that responds to societal and technological changes; it mandates the integration of information and communications technology across the curriculum, the development of critical and creative thinking, and the adoption of evidence-based instructional strategies that raise achievement levels for all learners (Republic of the Philippines, 2013). Equally important, it underscores the responsibility of schools to address gaps in resources and adapt teaching methods to ensure every learner attains the required competencies.

Accordingly, the study is grounded in this statutory mandate to innovate and improve learning outcomes, particularly in subjects requiring both creative and technical proficiency. Specifically, by evaluating an intervention that targets conceptual grasp, practical skills, output quality, and higher-order thinking—especially in under-resourced settings

INTERNATIONAL MULTIDISCIPLINARY JOURNAL OF RESEARCH FOR INNOVATION, SUSTAINABILITY AND EXCELLENCE
Published by: RISEJOURNALS.ORG | Online ISSN: 3028-032X | Print ISSN: 3028-0370
VOLUME 5, ISSUE NO. 6

like Mactan National High School-JHS—the research fulfils the law's directive to develop responsive, inclusive education that prepares learners for lifelong learning and productive participation.

Republic Act No. 10844 – Department of Information and Communications Technology Act of 2015. Subsequently, this legislation establishes the State's commitment to harness information and communications technology as a driver of equitable development and improved public service delivery; it directs the government to promote digital inclusion, build ICT competencies, and integrate appropriate technologies into education to expand access, enhance teaching-learning processes, and reduce disparities across regions and sectors (Republic of the Philippines, 2015). Notably, it prioritises solutions that are accessible, context-appropriate, and aligned with national development goals.

For this reason, the study is anchored in the State's policy to leverage technology for educational equity and quality. In particular, AI-Supported Confusion Logging responds directly to the Act's intent by offering a resource-efficient strategy that maximises limited equipment and large class sizes to support every learner's progress advancing both digital literacy and subject-specific competencies in Creative Technology.

UNESCO Recommendation on the Ethics of Artificial Intelligence (2021) and the Beijing Consensus on AI and Education (2023). Finally, these international instruments—endorsed by the Philippines alongside other UNESCO Member States—establish universal principles for AI governance centred on human rights, dignity, equity, transparency, and human agency; they emphasise that AI must serve education rather than dominate it, and that integration must be guided by pedagogical purpose, cultural sensitivity, and safeguards against bias and exclusion (UNESCO, 2021, 2023). Collectively, they call for evidence-based innovation that advances Sustainable Development Goal 4 through inclusive, quality learning.

How it strengthens the study: In alignment with these global norms, the research reinforces that AI interventions must be purposeful, learner-centred, and focused on improving educational quality rather than efficiency alone. Ultimately, these frameworks validate the study's approach by confirming that AI-Supported Confusion Logging designed to clarify understanding, scaffold skills, and foster critical thinking while upholding human oversight, conforms to internationally accepted standards for responsible AI in education.

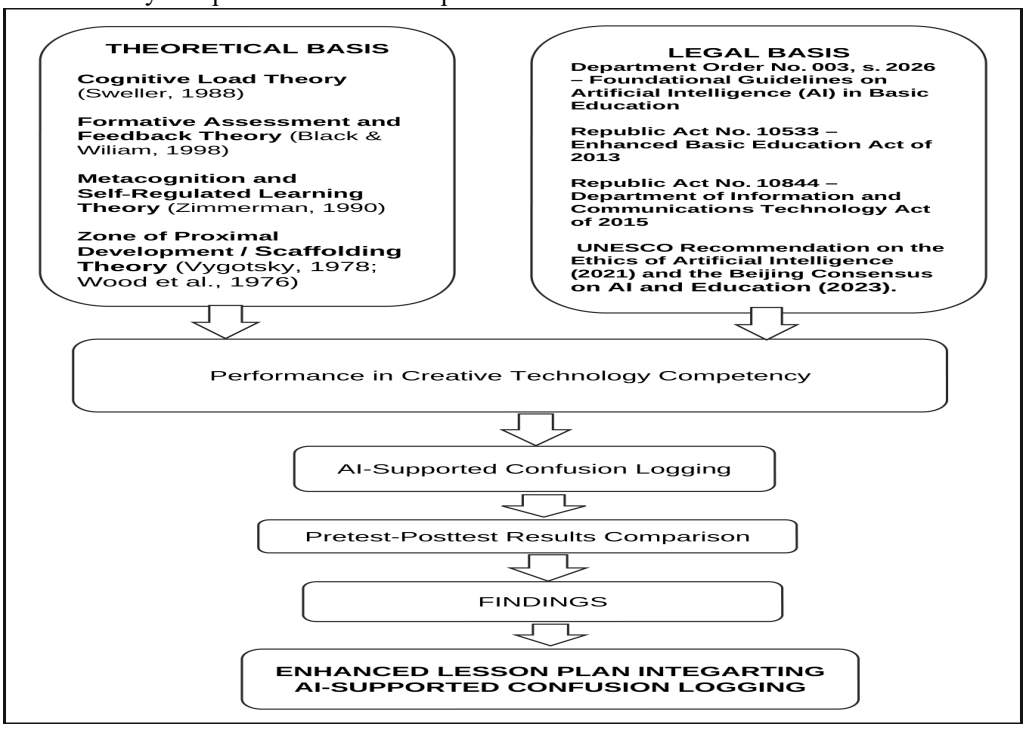


Figure 1
Theoretical and Conceptual Framework of the Study

INTERNATIONAL MULTIDISCIPLINARY JOURNAL OF RESEARCH FOR INNOVATION, SUSTAINABILITY AND EXCELLENCE
Published by: RISEJOURNALS.ORG | Online ISSN: 3028-032X | Print ISSN: 3028-0370
VOLUME 5, ISSUE NO. 6

Related Literature

Building on these legal and theoretical foundations, the following section reviews related literature and studies that examine artificial intelligence in education, organized around converging perspectives and contrasting findings to situate the present inquiry.

Across global and regional frameworks, scholars and institutions consistently affirm AI's transformative potential while emphasizing non-negotiable safeguards. UNESCO (2023, 2025) asserts that AI holds significant promise to address persistent educational challenges, modernize instruction, and advance Sustainable Development Goal 4, yet rapid technological advancement has outpaced policy development, regulatory frameworks, and institutional readiness. Guided by the Beijing Consensus on AI and Education, the organization advocates for a human-centred, inclusive approach that prevents technology from widening rather than narrowing gaps within and across nations. These principles are echoed by the OECD (n.d., 2026), which notes that while AI can streamline planning, personalise learning, and reduce administrative load, it also carries risks including algorithmic bias, data vulnerabilities, and the erosion of critical thinking if deployed without clear pedagogical purpose. Morandín Ahuerma (2024) further expands this analysis, identifying eight core challenges and proposing seven strategic actions aligned with UNESCO's guidance to ensure equitable, transparent, and accountable integration. Similarly, Julien (2024), Varsik and Vosberg (2024), and Temirov et al. (2025) collectively confirm that AI can expand access, support diverse learners, and boost engagement, but only when paired with robust infrastructure, teacher capacity building, and ethical governance; without these foundations, AI tends to reinforce existing disparities, disproportionately affecting schools already constrained by limited resources. Complementing these findings, Almond (2026), Bolarinwa (2026), and Abubakar et al. (2025) emphasize a critical practical concern: unguided or excessive reliance on AI creates what Almond terms the "performance trap", where short-term improvements in task completion mask long-term declines in independent reasoning, metacognition, and deep understanding. These sources uniformly agree that AI functions best as an amplifier, strengthening effective practice and deepening inequities equally making intentional design and human oversight indispensable.

Nevertheless, meaningful differences emerge regarding AI's measurable impact, optimal modes of use, and context-specific outcomes. While Mallillin (2024) demonstrates through mixed-methods research that AI tools can accurately identify individual learning needs, flag struggling learners, and deliver targeted interventions that lift overall academic performance, Dida-agun and Abarquez (2025) find no statistically significant correlation between general AI usage and measured achievement scores among Grade 11 students. This divergence suggests that how AI is integrated matters far more than whether it is used: purposeful, guided application yields benefits, while unstructured adoption may influence attitudes or motivation without translating into improved mastery. In creative and technical disciplines specifically, perspectives further diverge: ProFuturo (2025) and Pixelman Academy (2025) frame AI as a powerful partner that can spark divergent thinking, support interdisciplinary exploration, and augment human creativity, yet Mou (2026) reveals that without explicit scaffolding, learners of varying ability levels engage with AI very differently: high-performing students use it to validate ideas and refine outputs while retaining full creative agency, whereas lower-performing learners often experience choice overload, become overly dependent on generated content, and lose confidence in their own capacity. Local studies within the Philippine context underscore these complexities further: Reyes and Salvador (2026) report that TVL students use AI primarily for general assistance rather than skill-specific tasks, limited by poor connectivity, insufficient devices, and a lack of teacher guidance even as DepEd's Department Order No. 003, s. 2026 (Sevillano, 2026) establishes clear rules permitting AI only as an auxiliary tool that never replaces teachers or human judgment. While international comparisons by Lake (2023) and Rubin (2025) illustrate how systems such as Singapore, Finland, and Kenya have adapted AI to their own contexts, few investigations have centred on Creative Technology specifically, and none have empirically evaluated AI-Supported Confusion Logging as a structured intervention designed to surface gaps in understanding, skill application, output quality, and critical thinking in under-resourced public secondary schools.

The reviewed literature converges on a unified premise: AI offers substantial promise to enhance learning, inclusion, and creative-technical skill development, but its benefits are neither automatic nor universally distributed. Positive outcomes consistently depend on human-centered design, ethical safeguards, and guided integration that preserves learner agency and the primacy of teacher judgment; conversely, unregulated or shortcut-oriented use reliably hinders

long-term growth and deepens disparities. While global and local studies establish broad principles, identify common barriers, and confirm that AI is neither a panacea nor a threat, they reveal a critical research gap: there is limited empirical inquiry into targeted, process-focused interventions such as AI-Supported Confusion Logging, which systematically captures and addresses learner confusion at its source, especially in contexts like Mactan National High School-JHS, where large class sizes and insufficient computer access prevent timely, individualized support. This study directly addresses that gap by investigating whether AI-Supported Confusion Logging can effectively improve academic performance in Creative Technology across four key dimensions: understanding of concepts and principles, application of skills and processes, completion and quality of outputs, and problem-solving and critical thinking ability.

Significance of the Study

This study determines the efficacy of AI-Supported Confusion Logging in improving learners' academic performance in Creative Technology across four key areas: concept mastery, skill application, output quality, and critical thinking. The findings will benefit the following:

The Department of Education (DepEd). As the lead agency for basic education, DepEd gains direct, evidence-based support for Department Order No. 003, s. 2026, which mandates AI only as an auxiliary tool that supports, not replaces, teaching and human judgment. This study provides a proven, low-cost, ethical implementation model aligned with Project AGAP.AI and human-centred standards. It offers actionable data to advance inclusive quality education, address gaps in resource-constrained public schools, and guide responsible AI integration across the K-12 curriculum particularly in hands-on subjects like Creative Technology and TLE.

The Grade 7 Learners. Enables you to identify specific learning difficulties early, build awareness of your own thinking, and receive timely, targeted support. You will master core concepts, apply technical skills confidently, produce higher-quality outputs, and strengthen critical thinking all while learning to use AI purposefully rather than relying on it as a substitute for your own effort.

TLE Teachers. Delivers real-time, organized data on learner gaps so you can design precise instruction, adjust teaching strategies, and provide effective guidance even in large classes. It equips you to model and teach responsible AI use fully aligned with DepEd ethical and literacy standards.

School Administrators. Provides empirical evidence to develop school-level policies, staff training plans, and resource allocation frameworks for AI in Creative Technology and the TVL track. It supports equitable access, policy compliance, and consistent quality of learning outcomes across sections.

Curriculum Planners. Informs the design of responsive lessons and assessments that meaningfully integrate AI support alongside essential creative, technical, and critical-thinking competencies.

Parents and Guardians. Builds clear understanding of how AI is used responsibly in your child's learning. Equips you to reinforce purposeful tool use at home, encourage independent thinking, and support your child's progress without unhealthy dependence on technology.

Future Researchers. Serves as a vital reference and baseline data source, addressing the identified gap in empirical studies on targeted AI interventions such as confusion logging in Philippine public secondary education.

The Researcher. Deepens professional understanding of AI-supported pedagogy and educational inquiry. Contributes practical, context-specific insights to improve teaching and learning in Creative Technology and other skill-intensive subjects, and supports the broader DepEd goal of evidence-driven educational improvement.

Methods

INTERNATIONAL MULTIDISCIPLINARY JOURNAL OF RESEARCH FOR INNOVATION, SUSTAINABILITY AND EXCELLENCE
Published by: RISEJOURNALS.ORG | Online ISSN: 3028-032X | Print ISSN: 3028-0370
VOLUME 5, ISSUE NO. 6

Design and Flow of the Study

This study used a quantitative, quasi-experimental one-group pretest–posttest design (Campbell & Stanley, 1963; Creswell, 2014). The design measured change within the same class before and after AI-Supported Confusion Logging (Fraenkel & Wallen, 2012).

The same learners completed both assessments. The study did not include a separate comparison group. Figure 2 presents the Input–Process–Output framework for the documented pretest–posttest sequence.

Input. In the input phase, the study assessed learners' performance in Creative Technology before and after the introduction of AI-Supported Confusion Logging. Specific indicators included understanding of concepts and principles, application of skills and processes, and completion and quality of outputs. These baseline and post-intervention data formed the core information used to evaluate changes in learner performance.

Process. For the process phase, the study adopted the one-group pretest-posttest quasi-experimental research design. Data gathering proceeded through securing approval from concerned authorities, obtaining informed consent from respondents, administering the assessment instruments, and retrieving completed responses. All collected data underwent the appropriate statistical treatment to determine the significance of observed changes and to interpret results reliably.

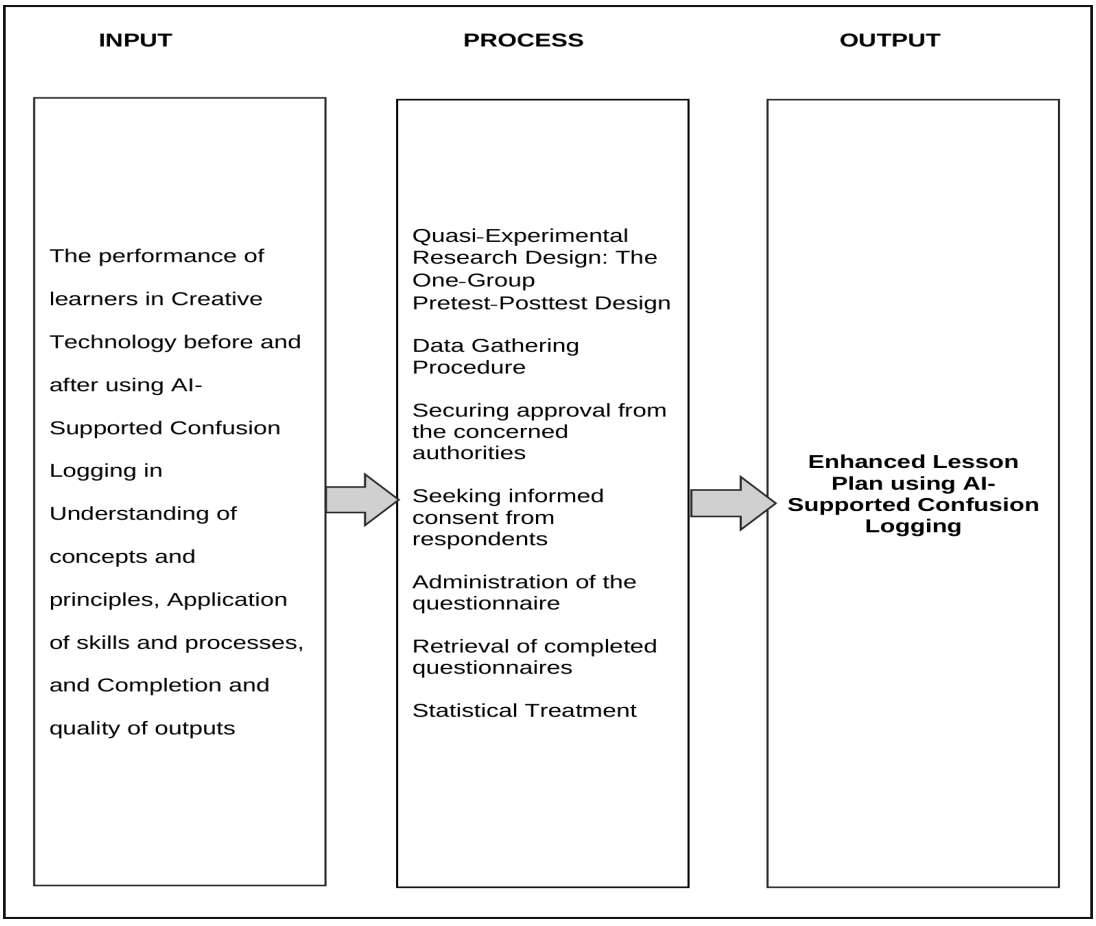


Figure 2
Flow of the Study

INTERNATIONAL MULTIDISCIPLINARY JOURNAL OF RESEARCH FOR INNOVATION, SUSTAINABILITY AND EXCELLENCE
Published by: RISEJOURNALS.ORG | Online ISSN: 3028-032X | Print ISSN: 3028-0370
VOLUME 5, ISSUE NO. 6

Research Environment and Respondents

The study was conducted at Mactan National High School, located in Mactan, Lapu-Lapu City, Cebu. This institution was classified as a very large public secondary school and was also the school where the researcher served as a Grade 7 TLE teacher.

This setting was highly appropriate for the research for several key reasons. First, its large learner population and regular offering of Creative Technology provided a sufficient number of respondents and a natural, authentic classroom environment where the intervention could be observed under real teaching and learning conditions. Second, as a public school, it represented the typical context where resource limitations, large class sizes, and restricted individual guidance were common challenges ensuring the findings were directly relevant and applicable to similar public schools across the Philippines. Finally, the researcher's official assignment at the school enabled convenient, ethical, and responsible access to participants, proper coordination with school authorities, and consistent monitoring throughout the implementation period.

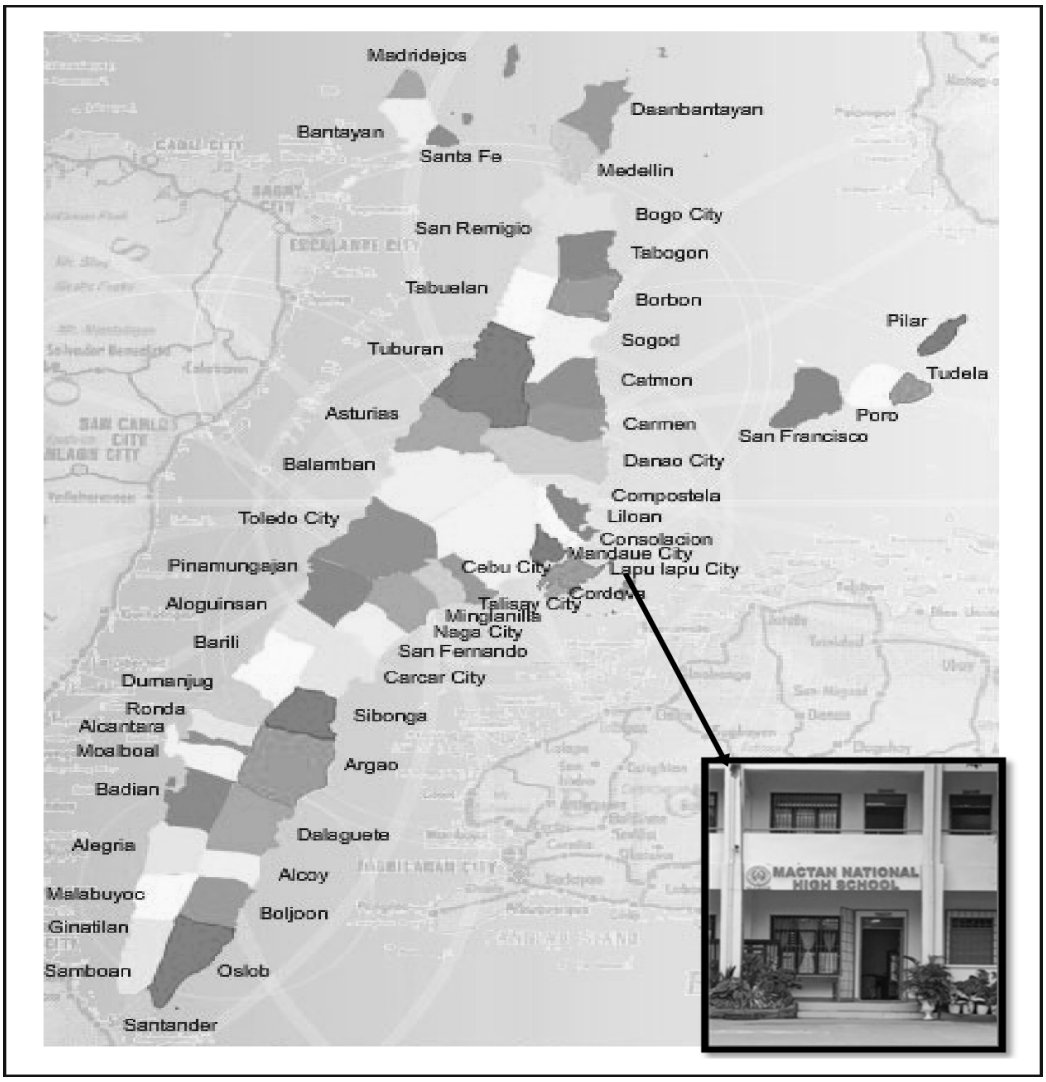


Figure 3
Location Map of the Research Environment

INTERNATIONAL MULTIDISCIPLINARY JOURNAL OF RESEARCH FOR INNOVATION, SUSTAINABILITY AND EXCELLENCE
Published by: RISEJOURNALS.ORG | Online ISSN: 3028-032X | Print ISSN: 3028-0370
VOLUME 5, ISSUE NO. 6

The researcher purposively selected one intact Grade 7 advisory class at Mactan National High School and included all 40 learners in that class.

The selected class shared the same subject, teacher, schedule, and classroom setting. Including every learner in that class allowed the researcher to monitor the intervention in its regular classroom setting; the class was not randomly sampled.

Table 1
Distribution of Respondents of the Study in Mactan National High School

Environment	**Frequency (f)**	**Percentage (%)**
Mactan National High School	40	100
Total	40	100

Instrument and Scoring

The main data-gathering instrument was an adapted questionnaire taken from Mallillin (2024) and Reyes and Salvador (2026), with selected items modified to suit the specific context, competencies, and objectives of Grade 7 Creative Technology. The instrument covered four areas: understanding of concepts and principles, application of skills and processes, completion and quality of outputs, and problem-solving and critical thinking ability. The same questionnaire was used for both the pre-test and post-test to ensure consistency and a fair comparison of learners' academic performance before and after the intervention. To establish content and construct validity, the adapted tool was reviewed and validated by three qualified experts, they were teachers who already earned their master's degree in teaching TLE.

This section presents the scoring procedure used to interpret the pre-test and post-test performance of Grade 7 students across the four learning dimensions: Understanding of concepts and principles, Application of skills and processes, Completion and quality of outputs, and Problem-solving and critical thinking ability.

Table 2
Scoring Procedure as Reported

Scale	**Numerical Range**	**Descriptive Rating**	**Qualitative Description**
5	4.21 – 5.00	Highly Proficient	Consistently demonstrates complete understanding, mastery of skills, and excellent output quality; applies critical thinking independently and effectively at all times.
4	3.41 – 4.20	Proficient	Demonstrates clear understanding, correct application of skills, and good output quality; uses critical thinking appropriately with minimal guidance.
3	2.61 – 3.40	Moderately Proficient	Shows basic understanding, can perform required skills, and produces acceptable outputs; uses critical thinking but still needs occasional prompting or assistance.
2	1.81 – 2.60	Fairly Proficient	Has partial understanding, struggles with some steps or tasks, and produces outputs that need improvement; finds it difficult to apply critical thinking without constant support.
1	1.00 – 1.80	Not Proficient	Lacks sufficient understanding, cannot perform required skills satisfactorily, and fails to meet expected standards; unable to apply critical thinking even with help.

The instrument description lists four areas. The research questions and results report three; no separate results are supplied for problem-solving and critical thinking. Table 2 and the results tables use different descriptive labels for the same numerical ranges. The results tables retain their reported labels.

Data Gathering Procedure

Data gathering for this study was conducted in three major stages: the Preliminary Stage, the Data Gathering Stage, and the Post-Data Gathering Stage. Each stage outlined systematic steps to ensure the credibility, validity, and rigor of the research process.

Preliminary Stage. The researcher first secured formal approval from the Office of the Schools Division Superintendent (SDS) to conduct the study. Upon approval, an endorsement letter signed by the SDS was submitted to the Office of the Public Schools District Supervisor (PSDS) for further clearance. Once endorsed, the researcher presented the SDS approval and PSDS confirmation to the School Head of Mactan National High School to secure final permission to conduct the study in the school. After receiving positive confirmation from all authorities, the researcher met with the selected participants during their free time to briefly explain the study's purpose, scope, and procedures. When they expressed willingness to participate, the researcher distributed the informed consent forms, which clearly outlined study details as well as participants' rights including voluntary involvement and the freedom to withdraw at any time without penalty.

Data Gathering Stage. After securing all necessary approvals and finalizing preparations, the researcher administered the pre-test to the selected Grade 7 respondents to establish their baseline academic performance in Creative Technology across the four indicators: understanding of concepts, application of skills, quality of outputs, and critical thinking. The AI-Supported Confusion Logging intervention was then implemented over four consecutive weeks, with two sessions per week lasting 60 minutes each aligned with the regular class schedule for the subject. During each session, the researcher guided learners on how to use the confusion logging tool to flag specific uncertainties privately and in real time as lessons progressed. The researcher monitored submissions daily, organized recorded concerns by topic and skill area, and adjusted instruction accordingly: clarifying misunderstood concepts, providing additional practice activities, and addressing gaps before they accumulated. At the end of the four-week implementation period, the same validated instrument was administered as the post-test to measure changes in learning outcomes.

Post-Data Gathering Stage. Once all assessments were completed, the quantitative data were compiled, tallied, and subjected to appropriate statistical analysis. The processed results were synthesized to answer the specific research questions and served as the evidence base for the final output: an Enhanced Lesson Plan in Creative Technology Using AI-Supported Confusion Logging.

Ethical Considerations

First, informed consent was secured from all respondents and their parents or legal guardians prior to any data collection. The researcher clearly explained the purpose, procedures, benefits, and risks of the study, as well as the voluntary nature of participation, emphasizing that learners might withdraw from the research at any time without penalty or effect on their academic standing.

Second, confidentiality and anonymity were observed at all times. All personal information, assessment results, and responses were treated as strictly private and were used solely for academic purposes. Real names were replaced with codes or pseudonyms in all records, transcripts, and the final manuscript to prevent identification.

Third, proper use of artificial intelligence was practiced responsibly; AI tools were used only for organization, formatting, and initial drafting support, while all analysis, interpretation, and intellectual content was the researcher's original work and was properly acknowledged in accordance with institutional standards.

Fourth, safe-keeping of data was maintained by storing all physical and digital records in password-protected files and secured storage, accessible only to the researcher and the adviser. All data were retained for the required period and were disposed of properly after the completion of the study.

Finally, the entire research process strictly followed the Cebu Technological University research format and policies, ensuring that all procedures complied with institutional requirements, DepEd guidelines, and established ethical standards for educational research.

Statistical Treatment

Weighted Mean was computed to determine the overall level of academic performance of learners before and after the intervention across the four indicators: understanding of concepts and principles, application of skills and processes, completion and quality of outputs, and problem-solving and critical thinking ability.

Standard Deviation was calculated to measure the spread or consistency of learners' responses and performance scores, indicating how closely individual data points clustered around the mean.

Paired-sample t tests compared the same learners' pretest and posttest scores at the .05 significance level.

Operational Definitions

Academic Performance. Refers to the learners' standing in Creative Technology measured by their scores on the validated questionnaire across four indicators: understanding of concepts and principles, application of skills and processes, completion and quality of outputs, and problem-solving and critical thinking ability. It is assessed before and after the intervention and interpreted using the 5-point proficiency scale.

AI-Supported Confusion Logging. Refers to the intervention tool and process used in this study, where learners explicitly record and identify points of difficulty or misunderstanding with the support of AI features. It serves to surface learning gaps, guide targeted teacher feedback, and help learners reflect on their own comprehension throughout the lessons.

Application of Skills and Processes. Refers to the learners' ability to carry out step-by-step procedures, use appropriate tools and techniques, and apply learned competencies to complete Creative Technology tasks correctly and independently, as rated in the pre-test and post-test.

Completion and Quality of Outputs. Refers to the extent to which learners submit complete, on-task, and timely work that follows given standards, specifications, and design criteria, assessed through the questionnaire before and after the intervention.

Creative Technology. Refers to the TLE/TVL subject area integrating artistic, design, and technical skills, which serves as the setting where the intervention is implemented and where academic performance is measured.

Enhanced Lesson Plan. Refers to the proposed instructional material developed from the study's results, integrating AI-Supported Confusion Logging as a structured activity to improve teaching-learning delivery and address identified learner difficulties.

Problem-Solving and Critical Thinking Ability. Refers to the learners' capacity to analyze tasks, identify issues, explore alternatives, make logical decisions, and evaluate results in Creative Technology activities, measured through the pre-test and post-test assessment tool.

INTERNATIONAL MULTIDISCIPLINARY JOURNAL OF RESEARCH FOR INNOVATION, SUSTAINABILITY AND EXCELLENCE
Published by: RISEJOURNALS.ORG | Online ISSN: 3028-032X | Print ISSN: 3028-0370
VOLUME 5, ISSUE NO. 6

Understanding of Concepts and Principles. Refers to the learners' grasp of core ideas, definitions, rules, and fundamental theories relevant to Creative Technology, demonstrated through explanation, identification, and connection of ideas as rated in the pre-test and post-test.

Results and Discussion

Tables 3–8 show the item ratings for the three reported domains. Before the intervention, domain means ranged from 1.99 to 2.03. After the intervention, they ranged from 3.96 to 4.09.
Reported results-table legend: 4.21-5.00 Excellent (E); 3.41-4.20 Very Good (VG); 2.61-3.40 Satisfactory (S); 1.81-2.60 Fair (F); 1.00-1.80 Poor (P)

Pretest Performance

Table 3
Understanding of Concepts and Principles

Indicators	**WM**	**SD**	**VD**
1. I can clearly explain basic concepts, core ideas, and foundational theories in digital imaging and interactive design.	1.93	0.82	F
2. I can identify and describe the purpose, value, and significance of creative and technical principles applied to digital media.	2.13	0.84	F
3. I can distinguish between closely related concepts (e.g., vector vs. raster, static vs. interactive) and explain how they differ.	2.08	0.82	F
4. I can accurately recall and define terminology, technical vocabulary, and standard definitions used in the field.	2.13	0.68	F
5. I can connect new concepts and principles to prior knowledge and previously learned design/technology lessons.	1.98	0.76	F
6. I can recognize and illustrate how design and technical principles apply across different digital imaging and interactive tasks.	2.03	0.82	F
7. I can explain industry-accepted rules, standards, and safety protocols for proper, responsible digital creation and work practice.	1.98	0.85	F
8. I can provide relevant, specific examples that demonstrate my understanding of digital imaging and interactive design topics.	1.90	0.86	F
9. I can respond to concept-related questions confidently and accurately, based on understanding rather than guessing or copying.	2.08	0.79	F
10. I can comprehend and follow instructions, explanations, and discussions presented during lessons and design activities.	2.05	0.86	F
Overall	2.03	0.82	F

Table 4
Application of Skills and Processes

Indicators	**WM**	**SD**	**VD**
1. I can systematically follow step-by-step procedures and workflows when creating digital imaging and interactive outputs.	1.93	0.85	F
2. I can correctly operate and handle hardware, software tools, materials, and core digital functions appropriate to the task.	2.05	0.74	F

INTERNATIONAL MULTIDISCIPLINARY JOURNAL OF RESEARCH FOR INNOVATION, SUSTAINABILITY AND EXCELLENCE
Published by: RISEJOURNALS.ORG | Online ISSN: 3028-032X | Print ISSN: 3028-0370
VOLUME 5, ISSUE NO. 6

Indicators	WM	SD	VD
3. I can transfer and apply learned skills and techniques to new, varied, or slightly modified design situations.	2.03	0.82	F
4. I can consistently apply the full design process — from planning, drafting, and creating to finalizing and exporting.	2.03	0.79	F
5. I can adjust, revise, or modify my approach or workflow when an initial method does not produce the intended result.	2.0	0.74	F
6. I can sustain safe work habits, observe ergonomic practices, and follow safety guidelines throughout all activities.	1.90	0.80	F
7. I can integrate two or more distinct skills or techniques to produce a unified, complete digital or interactive output.	2.05	0.84	F
8. I can demonstrate procedures, techniques, or processes competently when asked or guided by the teacher.	2.0	0.77	F
9. I can select and apply the most suitable technique, tool, or method for the specific type of output being developed.	2.03	0.79	F
10. I can independently complete skill-based activities, seeking only minimal or targeted assistance when truly necessary.	1.85	0.79	F
Overall	1.99	0.80	F

Table 5
Completion and Quality of Outputs

Indicators	WM	SD	VD
1. I consistently submit all outputs and deliverables on or before the established deadline.	1.95	0.80	F
2. My work fully adheres to given instructions, design briefs, and technical/specification requirements.	1.95	0.80	F
3. My outputs are visually neat, logically organized, and free from unnecessary or careless errors.	2.13	0.84	F
4. My work reflects thorough effort, careful attention to detail, and a conscientious approach to creation.	1.98	0.76	F
5. My final outputs meet or exceed the defined quality standards and performance criteria for the assigned task.	1.90	0.77	F
6. My finished work is polished, presentable, and appropriate for its intended audience and purpose.	1.90	0.86	F
7. I systematically review, self-assess, and refine my work before final submission.	1.83	0.83	F
8. My outputs clearly demonstrate the knowledge, concepts, and skills acquired through the lessons.	2.13	0.81	F
9. I produce all required components, sections, or parts of the assigned project or activity.	1.93	0.79	F
10. I effectively incorporate feedback and suggestions to improve the quality of subsequent or revised work.	2.38	0.79	F
Overall	2.01	0.82	F

INTERNATIONAL MULTIDISCIPLINARY JOURNAL OF RESEARCH FOR INNOVATION, SUSTAINABILITY AND EXCELLENCE
Published by: RISEJOURNALS.ORG | Online ISSN: 3028-032X | Print ISSN: 3028-0370
VOLUME 5, ISSUE NO. 6

Posttest Performance

Table 6
Understanding of Concepts and Principles

Indicators	**WM**	**SD**	**VD**
1. I can clearly explain basic concepts, core ideas, and foundational theories in digital imaging and interactive design.	3.88	0.75	VG
2. I can identify and describe the purpose, value, and significance of creative and technical principles applied to digital media.	4.23	0.76	E
3. I can distinguish between closely related concepts (e.g., vector vs. raster, static vs. interactive) and explain how they differ.	4.05	0.84	VG
4. I can accurately recall and define terminology, technical vocabulary, and standard definitions used in the field.	4.20	0.81	VG
5. I can connect new concepts and principles to prior knowledge and previously learned design/technology lessons.	4.20	0.68	VG
6. I can recognize and illustrate how design and technical principles apply across different digital imaging and interactive tasks.	4.15	0.85	VG
7. I can explain industry-accepted rules, standards, and safety protocols for proper, responsible digital creation and work practice.	4.10	0.77	VG
8. I can provide relevant, specific examples that demonstrate my understanding of digital imaging and interactive design topics.	4.15	0.76	VG
9. I can respond to concept-related questions confidently and accurately, based on understanding rather than guessing or copying.	4.08	0.85	VG
10. I can comprehend and follow instructions, explanations, and discussions presented during lessons and design activities.	3.95	0.86	VG
Overall	4.09	0.80	VG

Table 7
Application of Skills and Processes

Indicators	**WM**	**SD**	**VD**
1. I can systematically follow step-by-step procedures and workflows when creating digital imaging and interactive outputs.	4.0	0.87	VG
2. I can correctly operate and handle hardware, software tools, materials, and core digital functions appropriate to the task.	3.98	0.79	VG
3. I can transfer and apply learned skills and techniques to new, varied, or slightly modified design situations.	4.13	0.81	VG
4. I can consistently apply the full design process — from planning, drafting, and creating to finalizing and exporting.	3.95	0.80	VG
5. I can adjust, revise, or modify my approach or workflow when an initial method does not produce the intended result.	4.0	0.84	VG
6. I can sustain safe work habits, observe ergonomic practices, and follow safety guidelines throughout all activities.	3.73	0.77	VG
7. I can integrate two or more distinct skills or techniques to produce a unified, complete digital or interactive output.	4.05	0.86	VG

Indicators	WM	SD	VD
8. I can demonstrate procedures, techniques, or processes competently when asked or guided by the teacher.	4.08	0.85	VG
9. I can select and apply the most suitable technique, tool, or method for the specific type of output being developed.	4.18	0.83	VG
10. I can independently complete skill-based activities, seeking only minimal or targeted assistance when truly necessary.	4.08	0.85	VG
Overall	4.02	0.84	VG

Table 8
Completion and Quality of Outputs

Indicators	WM	SD	VD
1. I consistently submit all outputs and deliverables on or before the established deadline.	3.90	0.83	VG
2. My work fully adheres to given instructions, design briefs, and technical/specification requirements.	3.90	0.86	VG
3. My outputs are visually neat, logically organized, and free from unnecessary or careless errors.	4.08	0.79	VG
4. My work reflects thorough effort, careful attention to detail, and a conscientious approach to creation.	3.95	0.74	VG
5. My final outputs meet or exceed the defined quality standards and performance criteria for the assigned task.	3.93	0.82	VG
6. My finished work is polished, presentable, and appropriate for its intended audience and purpose.	4.03	0.85	VG
7. I systematically review, self-assess, and refine my work before final submission.	4.10	0.80	VG
8. My outputs clearly demonstrate the knowledge, concepts, and skills acquired through the lessons.	3.93	0.79	VG
9. I produce all required components, sections, or parts of the assigned project or activity.	3.95	0.89	VG
10. I effectively incorporate feedback and suggestions to improve the quality of subsequent or revised work.	3.89	0.84	VG
Overall	3.96	0.83	VG

Summary and Paired Comparisons

Table 9
Reported Pretest and Posttest Performance by Domain

Indicators	WM (Before)	WM (After)	Mean Difference	VD
Understanding of Concepts and Principles	2.03	4.09	2.06	VG
Application of Skills and Processes	1.99	4.02	2.03	VG
Completion and Quality of Outputs	2.01	3.96	1.95	VG

INTERNATIONAL MULTIDISCIPLINARY JOURNAL OF RESEARCH FOR INNOVATION, SUSTAINABILITY AND EXCELLENCE
Published by: RISEJOURNALS.ORG | Online ISSN: 3028-032X | Print ISSN: 3028-0370
VOLUME 5, ISSUE NO. 6

Indicators	WM (Before)	WM (After)	Mean Difference	VD
Overall	2.01	4.02	2.01	VG

The reported overall mean rose from 2.01 to 4.02, a gain of 2.01 points. Understanding of concepts and principles had the largest reported descriptive gain (2.06 points), followed by application of skills and processes (2.03 points) and completion and quality of outputs (1.95 points). The paired tests did not compare the size of the gains between domains.

Table 10
Reported Paired-Sample t Tests

Indicators	Mean (Before)	Mean (After)	Mean Difference	t-value	p-value	Decision	Interpretation
Understanding of Concepts and Principles	2.03	4.09	2.06	32.82	<0.001	Reject H_0	There is a significant difference
Application of Skills and Processes	1.99	4.02	2.03	39.29	<0.001	Reject H_0	There is a significant difference
Completion and Quality of Outputs	2.01	3.96	1.95	38.77	<0.001	Reject H_0	There is a significant difference
Overall Weighted Mean	2.01	4.02	2.01	36.96	<0.001	Reject H_0	There is a significant difference

The reported paired comparisons yielded $p < .001$ across the three domains and for the overall comparison. These results describe changes within the study group. Without a comparison group, the study cannot isolate the contribution of AI-Supported Confusion Logging.

The intervention gave learners a way to record specific uncertainties during instruction. The teacher grouped the concerns by topic or skill and used them to guide clarification and additional practice. This process reflects the study's formative assessment framework (Black & Wiliam, 1998) and informed the lesson plan below.

Output of the Study

The proposed enhanced lesson plan addresses the baseline needs in understanding concepts, applying procedures, and completing outputs. It uses digital imaging as the setting for learners to identify specific points of uncertainty while working.

The plan provides time for learners to log questions and for the teacher to review them, clarify misunderstandings, and guide revision. The implementation schedule, sample lesson, and confusion logging procedure are components of the proposed output; the measured results are reported separately above.

ENHANCED LESSON PLAN IN CREATIVE TECHNOLOGY USING AI-SUPPORTED CONFUSION LOGGING

Rationale

INTERNATIONAL MULTIDISCIPLINARY JOURNAL OF RESEARCH FOR INNOVATION, SUSTAINABILITY AND EXCELLENCE
Published by: RISEJOURNALS.ORG | Online ISSN: 3028-032X | Print ISSN: 3028-0370
VOLUME 5, ISSUE NO. 6

Creative Technology requires learners to integrate conceptual understanding with practical skill and independent judgment yet in large public-school settings, many learners hesitate to speak up when confused, allowing silent, unaddressed gaps to weaken their progress over time. AI-Supported Confusion Logging meets this need by providing a low-pressure, private way for learners to identify and articulate uncertainties in real time, while giving teachers clear, timely insights to adjust lessons and deliver focused support exactly where it is needed. Aligned with DepEd's framework for responsible, purposeful AI integration, this approach strengthens teaching and learning across the subject's core dimensions understanding, application, and output quality without requiring extra resources or specialized equipment, making it a sustainable, equitable solution for schools facing class-size and resource constraints.

Objectives

After the intervention, learners will be able to:
Explain key ideas, terms, and principles in digital and creative work accurately;
Follow procedures, adapt methods when needed, and complete tasks with minimal supervision;
Meet standards, review and refine outputs, and use Confusion Logging to seek clarification before submission.

Scheme of Implementation

This Enhanced Lesson Plan is designed for Grade 7 Creative Technology, delivered over four consecutive weeks with two 60-minute sessions per week, matching the regular class schedule. At the start of each session, the teacher briefly explains the day's topic and demonstrates how to log specific, clear questions or points of uncertainty emphasizing that entries remain private and exist solely to guide learning and support. During the lesson and hands-on activity, learners record difficulties as they arise; the teacher reviews submissions throughout, addresses common gaps through brief clarification or re-teaching, and provides targeted guidance to individuals or small groups. The final minutes of each period are used to confirm that logged concerns have been addressed and to preview what comes next. At the end of each week, the teacher identifies recurring themes across entries to refine and better align subsequent lessons ensuring the strategy evolves with learners' actual needs. The plan uses existing devices and fits directly into the standard weekly teaching routine, requiring no additional budget or personnel.

ENHANCED LESSON PLAN

Subject: TLE :Creative Technology – Grade 7
Sample lesson duration: 45 minutes
Topic: Digital Imaging Basics

Table 11
Enhanced Lesson Plan Components

Component	**Details**
I. Objectives	By the end of the session, learners will be able to: 1. Define and distinguish vector and raster graphics in their own words; 2. Select the appropriate format for a given purpose and produce a simple, correct output; 3. Submit one specific, clear Confusion Log entry and confirm understanding.
II. Subject Matter	Key Concepts: Vector, raster, resolution, scalability, best-use cases Materials: Available digital devices, presentation materials, Confusion Log tool/form Reference: DepEd Grade 7 Creative Technology Curriculum Guide

INTERNATIONAL MULTIDISCIPLINARY JOURNAL OF RESEARCH FOR INNOVATION, SUSTAINABILITY AND EXCELLENCE
Published by: RISEJOURNALS.ORG | Online ISSN: 3028-032X | Print ISSN: 3028-0370
VOLUME 5, ISSUE NO. 6

Component	Details
III. Procedure	1. Opening & Orientation (10 mins) – Show examples of logos and photographic images; guide observation of how they appear when resized. – Introduce Confusion Logging: model specific phrasing ("I want to understand why vector stays sharp when enlarged") rather than vague statements. 2. Lesson & Real-Time Logging (25 mins) – Explain definitions, traits, and suitable uses for each graphic type; demonstrate scaling differences. – Learners record points of uncertainty as the lesson proceeds; teacher reviews periodically and clarifies immediately or at designated checkpoints. 3. Application & Targeted Support (20 mins) – Task: Identify which format fits each of two given scenarios and create a simple labelled example or description for both. – Continue logging during independent work; teacher uses entries to guide individual or small-group help. 4. Closure & Confirmation (5 mins) – Address the most common logged points together. – Learners briefly note whether their main question was clarified.
IV. Assessment	– Accurate definition and distinction: – Correct format selection and complete output: – Specific Confusion Log entry submitted: – Output meets neatness and completeness standards:
V. Teacher's Reflection & Follow-Up	– Most frequently logged topics: _____ – Adjustments for next lesson: _____ – Learners needing extra support: _____

AI-SUPPORTED CONFUSION LOG

The AI-supported confusion log gave learners a private way to record specific questions or points of confusion during a lesson. For example, a learner could ask how resizing affects vector and raster images. Each entry included the date and a status of pending or addressed. After receiving clarification, learners briefly noted what they understood. The teacher reviewed the entries to identify recurring difficulties and decide which topics needed further explanation or practice.

Conclusion

The study concludes that AI-Supported Confusion Logging is a highly effective, context-appropriate intervention that substantially strengthens learners' academic performance in Creative Technology, successfully bridging the gap between initial basic proficiency and confident, independent mastery across conceptual understanding, practical skill application, and output quality. As a real-time, learner-centered strategy, it transforms how students engage with their own learning encouraging them to identify and articulate uncertainties openly while providing teachers with clear, actionable insights to guide responsive, targeted instruction. Aligned with DepEd's ethical AI integration standards and anchored in established learning theories, this approach addresses core challenges of large classes, limited individual feedback, and the need to guide responsible technology use, proving especially valuable in resource-constrained public-school settings. Beyond measurable gains, the intervention cultivates metacognitive awareness, self-reliance, and purposeful tool use building not just competence in the subject but the habits of mind that sustain long-term, independent growth.

Recommendations

AI-Supported Confusion Logging is recommended for adoption across DepEd Lapu-Lapu City and Mactan National High School as a formal, cost-effective practice aligned with DepEd Order No. 003, s. 2026 and Project AGAP.AI integrated into TLE training, school improvement plans, and daily lessons to guide responsive, real-time instruction and responsible AI use. Teachers should explicitly model specific, clear logging and adjust teaching based on recurring gaps, while learners build the habit of naming uncertainties early and independently, and parents reinforce purposeful tool use at home. Future researchers are encouraged to replicate this study across larger samples, longer periods, and other subjects to further validate the strategy's impact and deepen understanding of its long-term benefits.

References

Abubakar, S., Jeilani, A., & Yusuf, M. (2025, December 2). The role of over reliance on AI in the negative consequences of student learning: The moderating effects of ethical concerns and institutional policies. *Cogent Education, 12*(1), Article 2591503. https://doi.org/10.1080/2331186X.2025.2591503

Almond, N. (2026, January 27). The 17% learning drop: What the 2026 OECD AI report means for schools. forschools.ai. https://forschools.ai/p/the-17-learning-drop-what-the-2026-oecd-ai-report-means-for-schools

Black, P., & Wiliam, D. (1998). Assessment and classroom learning. Assessment in Education: Principles, Policy & Practice, 5(1), 7–74. https://doi.org/10.1080/0969595980050102

Bolarinwa, T. (2026, April). The impact of artificial intelligence on students' academic development, critical thinking, cognitive skills, and learning outcomes. *International Journal of Applied Resilience and Sustainability, 2*(2), 1097–1129. https://doi.org/10.70593/deepsci.0202045

Campbell, D. T., & Stanley, J. C. (1963). *Experimental and quasi experimental designs for research*. Rand McNally.

Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). SAGE Publications.

Dida agun, A., & Abarquez, C. (2025). Artificial intelligence: Its influence on academic performance of Grade 11 senior high school students. *Psychology and Education: A Multidisciplinary Journal, 46*(4). https://ejournals.ph/article.php?id=31492

Fraenkel, J. R., & Wallen, N. E. (2012). *How to design and evaluate research in education* (8th ed.). McGraw Hill.

Julien, G. (2024, June). How artificial intelligence (AI) impacts inclusive education. *Educational Research and Reviews, 19*(6), 95–103. https://doi.org/10.5897/ERR2024.4404

Lake, R. (2023, August). Shockwaves and innovations: How nations worldwide are dealing with AI in education. Center on Reinventing Public Education. https://crpe.org/shockwaves-and-innovations-how-nations-worldwide-are-dealing-with-ai-in-education/

Lardhi, J. S., & Ismail, A. F. (2026). Generative artificial intelligence for SDG 4: Enhancing sustainable quality learning. *Sustainability, 18*(5), 2498. https://doi.org/10.3390/su18052498

LinkedIn. (n.d.). The role of teachers in AI education. In AI in education innovation. https://www.linkedin.com/top-content/innovation/ai-in-education-innovation/the-role-of-teachers-in-ai-education/

Mallillin, L. L. (2024, July). Artificial intelligence (AI) towards students' academic performance. *Innovare Journal of Education, 12*(4). https://doi.org/10.22159/ijoe.2024v12i4.51665

Miao, F., & Holmes, W. (2023). *Guidance for generative AI in education and research*. UNESCO. https://www.unesco.org/en/articles/guidance-generative-ai-education-and-research

Morandín Ahuerma, F. (2024, October). UNESCO proposal for the use of generative AI in education: Eight challenges and seven actions. OSF Preprints. https://doi.org/10.31219/osf.io/78d3j

Mou, T. Y. (2026). Artificial intelligence and student creativity: An exploratory study of students' experiences with AI tools. *Computers in Human Behavior Reports, 22*, Article 100988. https://doi.org/10.1016/j.chbr.2026.100988

Organisation for Economic Co operation and Development. (2026, January 19). OECD Digital Education Outlook 2026: Exploring effective uses of generative AI in education. https://doi.org/10.1787/062a7394-en

Organisation for Economic Co operation and Development. (2026, March 3). Reimagining teaching in an accelerating world: Embracing the opportunities of artificial intelligence and educational technology. https://www.oecd.org/en/publications/reimagining-teaching-in-an-accelerating-world_d0edfe8c-en/full-report/component-6.html

Pixelman Academy. (2025, July 26). The importance of creative technology learning in the AI era. https://pixelmanacademy.com/the-importance-of-creative-technology-learning-in-the-ai-era/

ProFuturo. (2025, March 6). Artificial intelligence as a driver of creativity in the classroom. https://profuturo.education/en/observatory/trends/la-inteligencia-artificial-como-motor-de-creatividad-en-las-aulas/

Reyes, J. R. B., & Salvador, R. A. (2026, February 15). The effects of AI tools on the academic performance and engagement of TVL learners. *International Journal of Research and Innovation in Social Science, 10*(1), 6527–6549. https://doi.org/10.47772/IJRISS.2026.10100509

Rubin, C. (2025, August 26). AI in education best practices—What's working in classrooms around the globe. Forbes. https://www.forbes.com/sites/cathyrubin/2025/08/26/ai-in-education-best-practices---whats-working-in-classrooms-around-the-globe/

Sevillano, S. (2026, February 25). DepEd allows responsible AI use among learners, teachers nationwide. Philippine News Agency. https://www.pna.gov.ph/articles/1269776

Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science, 12*(2), 257–285. https://doi.org/10.1207/s15516709cog1202_4

Sweller, J., Ayres, P., & Kalyuga, S. (2011). *Cognitive load theory*. Springer.

Temirov, K., Kapanova, D., Kariyeva, K., Jakina, A., & Kopeyev, Z. (2025). Educational AI tools for ensuring inclusive education. *International Journal of Innovation Research in Social Sciences, 8*(5). https://doi.org/10.53894/ijirss.v8i5.8674

UNESCO. (2023, November 30; updated November 11, 2025). How generative AI is reshaping education in Asia Pacific. https://www.unesco.org/en/articles/how-generative-ai-reshaping-education-asia-pacific

UNESCO. (2025, January 20). Artificial intelligence in education: UNESCO advances key competencies for teachers and learners. https://www.unesco.org/en/articles/artificial-intelligence-education-unesco-advances-key-competencies-teachers-and-learners

UNESCO. (2025, October 17). AI in the classroom: Empowering teachers for the future of learning. https://www.unesco.org/en/articles/ai-classroom-empowering-teachers-future-learning

UNESCO. (n.d.). Artificial intelligence in education. https://www.unesco.org/en/digital-education/artificial-intelligence

Varsik, S., & Vosberg, L. (2024, August 14). The potential impact of artificial intelligence on equity and inclusion in education. OECD. https://www.oecd.org/en/publications/the-potential-impact-of-artificial-intelligence-on-equity-and-inclusion-in-education_15df715b-en.html

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.

Wood, D., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology and Psychiatry, 17*(2), 89–100. https://doi.org/10.1111/j.1469-7610.1976.tb00381.x