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Empowering Learning in Internet and Computing Fundamentals Level 8 Subjects: Leveraging Visual Aid-Guided Hands-On Activities for Enhanced Educational Engagement

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Abstract—This study evaluated how incorporating visual aid–guided hands-on activities impacts classroom engagement, practical skills execution, and overall academic performance among Grade 8 students taking Internet and Computing Fundamentals (ICF) Level 8. A quasi-experimental, non-equivalent control group design was carried out with 80 students at Malandag National High School. The experimental group learned through visual demonstrations paired with guided practical execution, whereas the control group followed standard, lecture-driven instruction. Data gathered through engagement surveys, practical performance rubrics, and achievement tests were analyzed using Analysis of Covariance (ANCOVA) to account for initial baseline differences. The findings demonstrated that students exposed to the visual aid–guided approach achieved significantly higher scores across all evaluated areas. These results highlight the clear advantage of combining rich visual resources with direct practical application to boost student interest and build technical skills.

Index Terms—*Educational technology, hands-on learning, ICT education, student engagement, visual aids.*

1. Introduction

In today's fast-moving digital world, educational systems are constantly adjusting their teaching strategies to prepare students with essential modern skills like critical thinking, problem-solving, and digital fluency. Information and Communication Technology (ICT) instruction sits right at the heart of this shift, serving as the bridge that helps learners confidently use digital tools for both academic work and real-world tasks. Because of this, schools face an increasing demand for teaching methods that spark genuine interest while reinforcing theoretical concepts through direct practice.

Despite these educational shifts, traditional teacher-centered instruction remains widespread. These traditional methods often relegate students to passive roles, which limits opportunities for interaction, lowers motivation, and hinders the growth of higher-order thinking skills. Research consistently shows that students in passive classrooms struggle to retain information compared to those who participate in active learning environments. This disconnect is particularly noticeable in technical subjects like ICT, where grasping the material requires not just reading or listening, but actually applying concepts through hands-on tasks.

Blending visual resources with hands-on practice offers a compelling solution to this challenge. Diagrams, charts, and interactive media make complex ideas far easier to process and remember. Cognitively, learners digest information much better when it is delivered through complementary visual and verbal channels. When students interact directly with multimedia content, their overall understanding improves significantly.

At the same time, experiential learning strategies consistently boost classroom participation and drive better academic results. Students who engage in active, hands-on environments regularly outperform their peers in lecture-only settings and show lower course failure rates. This approach aligns directly with constructivist learning principles, which suggest that real understanding occurs when learners actively build knowledge through direct experience. Putting the learner at the center of the lesson fundamentally deepens their commitment and mastery of the subject matter.

Student engagement itself is widely recognized as a critical driver of academic success. It operates as a multi-layered concept involving behavioral, emotional, and cognitive components. Behavioral engagement reflects physical participation and focus; emotional engagement covers a student's attitude, interest, and enthusiasm; and cognitive engagement represents the deep mental effort invested in mastering challenging material. When students are fully engaged across these three dimensions, they perform better academically, stick with difficult tasks longer, and build sharper problem-solving abilities.

Across the Philippines, incorporating educational technology and multimedia tools has proven effective in keeping students attentive and motivated. Presenting lessons visually makes abstract topics far more accessible, leading to livelier classroom dynamics. Visual aids are especially useful in technical and computing courses, where step-by-step visual demonstrations help students grasp complex procedures quickly so they can carry out practical exercises with confidence.

National educational policies in the Philippines continue to advocate for combining digital tools with student-centered teaching. Integrating technology works best when students use these digital tools to complete practical, real-world tasks rather than just watching a teacher demonstrate them. Direct interaction builds genuine competence that passive observation simply cannot replicate.

However, significant challenges persist. Despite DepEd's clear push toward technology-supported learning, many Philippine schools still struggle with limited equipment, outdated infrastructure, and uneven access to digital tools. In Internet and Computing Fundamentals (ICF) Level 8 specifically, students are expected to learn theoretical concepts while mastering real computer operations. Yet in practice, heavy reliance on lecture methods often leaves students disengaged and struggling with basic computer skills, pointing to a noticeable gap between curriculum goals and day-to-day instruction.

While global research strongly supports mixing visual materials with practical tasks, local studies examining this combination within junior high school computer classes—especially ICF Level 8—remain scarce. To address this research gap, this study investigated how integrating visual aid–guided hands-on activities influences educational engagement, practical skill mastery, and academic test performance among Grade 8 ICF students.

Theoretical Framework

This study is rooted in Ludwig von Bertalanffy's General Systems Theory, which views any functional system as a set of interconnected parts working together toward a common goal. In an educational context, teaching strategies, instructional materials, student participation, and learning outcomes form an integrated system where changing one element directly affects the overall outcome.

Here, the teaching intervention—using visual aid–guided hands-on activities—serves as the system's input. The instructional process combines visual assets like slides, illustrations, and live demonstrations with structured hands-on practice. The resulting outputs are evaluated through improvements in student engagement, practical computing skills, and overall academic achievement in ICF Level 8.

This approach is further supported by Richard E. Mayer's Cognitive Theory of Multimedia Learning, which emphasizes that human brains process visual and verbal information more effectively when both channels are engaged simultaneously. Additionally, Michael Prince's Active Learning Theory reinforces the idea that direct student participation builds deeper comprehension. Finally, the multidimensional view of student engagement proposed by Fredricks, Blumenfeld, and Paris (2004) provides the foundation for evaluating behavioral, emotional, and cognitive growth.

Conceptual Framework

The conceptual framework isolates the core variables analyzed in this study to determine the impact of visual aid–guided practical activities on Grade 8 ICF learning outcomes.

The independent variable is the specialized instructional strategy: visual aid–guided hands-on activities, which pair clear visual guides with immediate practical computer tasks.

The dependent variables capture three distinct student outcomes:

- **Educational Engagement:** The degree of active focus, motivation, positive attitude, and mental effort students demonstrate during class.
- **Hands-On Skill Performance:** The student's accuracy, speed, and procedural correctness when executing computer tasks based on curriculum standards.
- **Academic Achievement:** Student scores on standardized written tests assessing core ICF concepts.

To ensure clear results, the students' baseline pretest scores in engagement, skills, and academic knowledge served as covariates. Controlling for these initial differences via ANCOVA isolates the true impact of the instructional intervention.

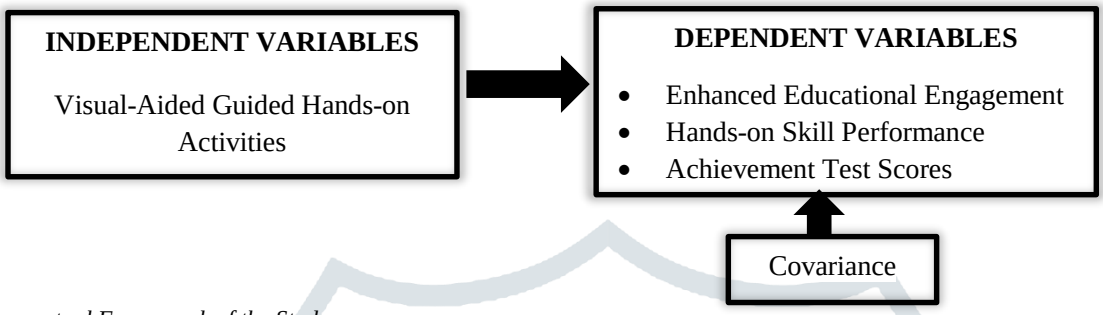

Figure 1. Conceptual Framework of the Study

Research Questions

This study evaluated the effectiveness of visual aid–guided hands-on activities in boosting student engagement, technical skill execution, and test performance in Internet and Computing Fundamentals (ICF) Level 8.

Specifically, it addressed the following questions:

- **Baseline Levels (SOP 1):** What are the baseline (pretest) levels of Grade 8 students across both control and experimental groups in terms of educational engagement, hands-on skill performance, and academic achievement scores?
- **Post-intervention Levels (SOP 2):** What post-intervention (posttest) levels do students in both groups demonstrate in terms of educational engagement, hands-on skill performance, and academic achievement scores?

2. Research Methodology

Research Design

This study utilized a quasi-experimental research design featuring a non-equivalent control group setup. Two pre-existing class sections with matching academic backgrounds were selected. The experimental section learned through lessons that blended visual aids with structured practical tasks, while the control section followed standard lecture-based instruction. Both groups took identical pretests and posttests to track progress over time.

Participants

The study included Grade 8 students enrolled in ICF Level 8 at Malandag National High School in Sarangani Province during the 2024–2025 school year. Using purposive sampling, two intact sections totaling 80 students were designated into equal groups (n = 40 in the control section; n = 40 in the experimental section).

Instrumentation and Data Collection

Data were gathered using three key tools:

- **Educational Engagement Questionnaire:** An adapted 5-point Likert scale measuring behavioral, emotional, and cognitive engagement dimensions.
- **Hands-On Skills Performance Rubric:** A 1-to-5 point performance rating rubric aligned with DepEd's Most Essential Learning Competencies (MELCs), designed to assess accuracy and efficiency during practical MS Word and MS Excel exercises.
- **Achievement Test:** A 30-item multiple-choice assessment verified by content experts, with internal consistency confirmed via Kuder-Richardson Formula 20 (KR-20).

Statistical Analysis

- **Mean and Standard Deviation:** Applied to summarize average performance and score distributions across pretests and posttests.
- **Independent Samples t-Test:** Conducted to evaluate baseline variations between groups prior to instruction.
- **Analysis of Covariance (ANCOVA):** Used to assess posttest differences between teaching methods while holding initial pretest scores constant.

3. Results and Discussion

Baseline Student Performance (Pretest Results)

Table 1 outlines the initial skill and engagement levels of both student groups prior to implementing the specialized activities.

Table 1: Comparison of Pretest Scores Between Control and Experimental Groups

Metric	Control Mean	Control SD	Control Interp.	Exp. Mean	Exp. SD	Exp. Interp.
Educational Engagement	2.89	0.63	Neutral	3.05	0.36	Neutral
Hands-on Skills	2.55	0.59	Needs Improvement	2.84	0.40	Satisfactory
Achievement Test	18.43	3.31	Low	17.53	3.98	Very Low

The baseline data confirm that both groups started at comparable levels. Both sections demonstrated neutral engagement levels (Control M = 2.89, SD = 0.63; Experimental M = 3.05, SD = 0.36). In hands-on computing skills, the control section scored M = 2.55 ('Needs Improvement'), while the experimental section scored slightly higher at M = 2.84 ('Satisfactory'). Achievement test averages were similarly low across both groups (M = 18.43 vs M = 17.53). Establishing this baseline similarity is essential in quasi-experimental designs, as it confirms that any post-intervention gains stem directly from the teaching methodology rather than initial advantages.

Post-Intervention Performance (Posttest Results)

Table 2 displays the performance outcomes of both groups after the experimental section completed the visual aid–guided hands-on lessons.

Table 2: Comparison of Posttest Scores Between Control and Experimental Groups

Metric	Control Mean	Control SD	Control Interp.	Exp. Mean	Exp. SD	Exp. Interp.
Educational Engagement	3.25	0.68	Neutral	3.66	0.43	Agree
Hands-on Skills	3.21	0.81	Satisfactory	4.04	0.59	Very Satisfactory
Achievement Test	19.70	3.11	High Achievement	21.48	2.55	High Achievement

Following the intervention, the experimental group achieved higher scores across all three areas. Engagement ratings for the experimental group rose to M = 3.66 ('Agree'), compared to M = 3.25 ('Neutral') in the traditional lecture section. Practical skills showed a similar shift: the experimental section reached M = 4.04 ('Very Satisfactory'), whereas the control group scored M = 3.21 ('Satisfactory'). Written test scores also reflected this trend, with the experimental group averaging M = 21.48 versus M = 19.70 in the control group.

These improvements support both active learning and dual-coding theories. Combining step-by-step visual guides with immediate software practice lowers processing friction, builds student confidence, and leads to noticeable gains in practical computer proficiency.

4. Conclusion

This study set out to test how visual aid–guided hands-on activities affect classroom engagement, practical skills execution, and written test performance among Grade 8 computer students.

Prior to instruction, both groups showed lower initial engagement, baseline practical skills, and limited topic knowledge. However, after the intervention, students who learned through visual guides paired with immediate hands-on practice demonstrated clear growth across all areas. They were significantly more engaged, performed practical computer tasks with greater accuracy, and scored higher on final written assessments than peers in the conventional lecture setting. These findings highlight the practical value of integrating clear visual cues with hands-on application in technical computer education.

References

1. Almacen, R., & Labitad, M. (2024). Effectiveness of multimedia tools in secondary ICT instruction. Journal of Educational Technology, 12(1), 45-58.
2. Caratiquit, K. (2022). Video-based instructional materials in teaching computer troubleshooting and repair. Philippine Journal of Educational Research, 8(2), 112-125.
3. Clark, R. C., & Mayer, R. E. (2016). e-Learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning. John Wiley & Sons.
4. Creswell, J. W., & Creswell, J. D. (2018). Research design: qualitative, quantitative, and mixed methods approaches. SAGE Publications.
5. Espinosa, E., et al. (2023). National case study on technology in education: Philippine perspective. UNESCO Publishing.
6. Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. Review of Educational Research, 74(1), 59-109.
7. Hattie, J. (2020). Visible learning: A synthesis of over 800 meta-analyses relating to achievement. Routledge.
8. Kolb, D. A. (2015). Experiential learning: Experience as the source of learning and development. Pearson Education.
9. Matias, A., & Agapito, J. (2022). Multimedia-supported instruction and student involvement in technical subjects. Asia-Pacific Education Review, 15(3), 88-101.
10. Mayer, R. E. (2021). Multimedia learning (3rd ed.). Cambridge University Press.