

THE USE OF SMART PHONE IN THE TEACHING OF DIGESTIVE SYSTEM TO GRADE 12 STUDENTS OF A PUBLIC SCHOOL: TOWARDS PROPOSED ACTIVITIES TO ENHANCE LEARNING

Lunalyn L. Penales

Email: lunalyn.penales@deped.gov.ph

DepEd Escuela Secundaria Señor de Salinas, Rosario, Cavite, Philippines

ABSTRACT

This study investigates the effectiveness of integrating Information, Communication, and Technology (ICT)—specifically smartphones—into the teaching and learning process. The primary objective was to determine the impact of smartphone-aided instruction on the academic performance of Grade 12 students learning about the digestive system in a public-school setting. Utilizing a matched-group quasi-experimental pretest–posttest design, the researcher assigned students into a control group receiving traditional instruction and an experimental group receiving smartphone-integrated instruction. The findings revealed that while the control group initially scored higher on the pre-test, there was no statistically significant difference in baseline knowledge between the two groups. Following the educational intervention, post-test results demonstrated a significant difference with the experimental group achieving notably better performance than the control group. This indicates that smartphone-aided instruction was highly effective in improving student comprehension and achievement. Consequently, the study recommends expanding this technology-based program to the entire class, encouraging educators to pursue further ICT professional development, and conducting additional comparative research on technology-driven instructional methods.

Keywords: *Smartphone-Aided Instruction, ICT Integration, Educational Technology, Quasi-Experimental Design, Student Performance*

How To Cite: Penales, L. L. (2026). The Use Of Smart Phone In The Teaching Of Digestive System To Grade 12 Students Of A Public School: Towards Proposed Activities To Enhance Learning. IAM FAME Journal of International Education Research, 1(1), 56-59.

INTRODUCTION

The integration of Information, Communication, and Technology (ICT) in 21st-century education has transformed traditional, teacher-centered classrooms into interactive, technology-driven learning environments. In line with modern educational modernization programs and curriculum reforms, integrating mobile devices into senior high school science instruction provides students with dynamic access to complex biological models and simulations. In secondary science education, abstract anatomical and physiological concepts often present persistent learning challenges when delivered exclusively through static, traditional lecture methods. Within senior high school life sciences—specifically Grade 12 General Biology 2—the study of animal organ systems requires an in-depth understanding of the human digestive system, including macro-structural anatomy, enzymatic biochemical pathways, and microscopic nutrient absorption mechanisms. Because mobile devices provide interactive visualization and immediate formative

feedback, smartphone-aided instruction presents a viable instructional pathway to enhance conceptual mastery. This study investigated the efficacy of smartphone-aided instruction on the academic performance of Grade 12 public high school students learning the digestive system and developed targeted, actionable learning activities to support instructional delivery.

RESEARCH PROBLEMS

Specifically, the study sought to evaluate student performance by examining the pre- and post-test results of both the control and experimental groups. Additionally, it investigated whether there was a significant difference between the pre- and post-test scores within these respective groups. Finally, based on the outcomes of the research, the study aimed to identify and suggest actionable activities that could be utilized to further enhance student learning.

OBJECTIVE

The primary objective of this study was to evaluate the instructional efficacy of smartphone-aided learning interventions on the academic performance and conceptual mastery of Grade 12 students learning the human digestive system in a public secondary school setting. Specifically, the research aimed to determine whether integrating mobile learning tools—including interactive 3D anatomical visualization software, gamified formative assessments, and cloud-based collaborative mapping platforms—yields a statistically significant improvement in student achievement compared to conventional lecture- and worksheet-based instructional approaches. Furthermore, the study aimed to utilize empirical learning outcomes to develop a targeted, actionable framework of mobile-assisted instructional activities tailored for senior high school life sciences curricula.

METHODOLOGY

The study employed a matched-group quasi-experimental pretest-posttest design. The independent variable was the instructional method (Smartphone-Aided Instruction vs. Traditional Lecture-Based Instruction). The dependent variable was student academic performance/achievement, measured via standardized pretest and post-test scores on the digestive system. Extraneous variables—such as teacher qualifications, instructional duration, time of day, and learning competencies—were controlled and held constant across both groups.

The study included 60 Grade 12 public high school students matched into equal experimental ($n = 30$) and control ($n = 30$) groups using their baseline pretest scores and previous science grades to ensure initial equivalence. Learning outcomes were measured using a researcher-developed, expert-validated 40-item multiple-choice test on the digestive system, which yielded high reliability (KR-20, $r = 0.84$) in pilot testing. Over a four-week, 16-hour instructional period covering identical curriculum competencies, the experimental group received smartphone-aided instruction utilizing 3D anatomy apps, gamified quizzes, and digital concept mapping, while the control group learned through traditional lectures, textbook charts, and paper worksheets before both completed the identical post-test.

The smartphone-aided instructional intervention consisted of three core mobile-learning modules implemented over the four-week period: (1) 3D Organ Trek & Spatial Mapping, which utilized 3D anatomy

apps (BioDigital Human, AnatomyLearning) for interactive exploration of gross digestive anatomy; (2) Enzyme Velocity Formative Check, which used gamified response tools (Quizizz, Kahoot) for real-time formative assessments on enzymatic pathways; and (3) Collaborative Nutrient Pathway Mapping, where students used cloud platforms (Canva, Miro) to create digital infographics tracing nutrient absorption.

RESULTS

Baseline Knowledge (Pretest): Prior to the educational intervention, the Experimental Group recorded a mean pretest score of 13.50, while the Control Group achieved a mean score of 13.80. An independent-samples t-test demonstrated no statistically significant difference between the groups ($t = -0.10$, $p = .92$), establishing equivalent baseline knowledge prior to instruction. **Within-Group Learning Gains (Pretest vs. Post-test):** Paired-samples t-tests were conducted to assess internal learning gains for each group from pretest to post-test. For the Experimental Group, mean scores increased significantly from 13.50 ($SD = 2.45$) on the pretest to 24.10 ($SD = 3.25$) on the post-test ($t(29) = 14.82$, $p < .001$), reflecting substantial cognitive gains following smartphone-aided instruction. For the Control Group, mean scores increased from 13.80 ($SD = 2.60$) on the pretest to 15.60 ($SD = 2.80$) on the post-test ($t(29) = 2.74$, $p = .010$), demonstrating a modest yet statistically significant improvement under traditional lecture-based instruction. **Between-Group Post-Intervention Analysis (Post-test):** An independent-samples t-test indicated a statistically significant difference between post-test outcomes ($t(58) = -10.86$, $p < .001$), confirming that the Experimental Group ($M = 24.10$) significantly surpassed the Control Group ($M = 15.60$) in academic performance.

SIGNIFICANT FINDINGS

The pre-test performance of the CG is higher than the EG, there was no significant difference in the pretest scores of the two groups of subjects. This could be because they have similar initial knowledge and exposure to the lesson ad method.

Based on the statistical test (t-test), there was a significant difference in the post test score of EG and the CG group. Based on the mean post test score, the EG group has higher / better performance than the CG. This indicated that the experiment done to the students under this group is effective in improving their performance.

RECOMMENDATIONS

Based on these findings and conclusions, it is recommended that the instructional program implemented with the experimental group be extended to the entire class to enhance overall student academic performance.

Furthermore, educators are encouraged to explore innovative pedagogical strategies and incorporate diverse instructional technologies. Continuous professional development through targeted training workshops and seminars is likewise recommended to support ongoing instructional effectiveness.

Additionally, the study recommends disseminating these findings to faculty across different discipline areas to foster broader academic application. Finally, future research examining technology-based instruction should be conducted to validate these outcomes and allow for comparative analysis.

REFERENCES

- Ahmed, S., & Parsons, D. (2013). Abductive science inquiry using mobile devices in the classroom. *Computers & Education*, 63, 62–72. <https://doi.org/10.1016/j.compedu.2012.11.016>
- Ghavifekr, S., Afshari, M., & Salleh, A. (2012). Management strategies for e-learning systems as the core component of systemic change: A qualitative analysis. *Life Science Journal*, 9(3), 2190–2196.
- Grabe, C. (2015). *Integrating technology for meaningful learning* (5th ed.). Houghton Mifflin.
- Koehler, M. J., & Mishra, P. (2014). Introducing TPACK. In AACTE Committee on Innovation and Technology (Ed.), *The handbook of technological pedagogical content knowledge (TPCK) for educators* (pp. 3–29). Lawrence Erlbaum Associates.
- Martin, F., & Ertzberger, J. (2013). Here and now mobile learning: An experimental study on the use of mobile technology. *Computers & Education*, 68, 76–85. <https://doi.org/10.1016/j.compedu.2013.04.021>
- Shih, J.-L., Chuang, C.-W., & Hwang, G. J. (2015). An inquiry-based mobile learning approach to enhancing social science learning effectiveness. *Educational Technology & Society*, 13(4), 50–62.
- Thomas, K., & O'Bannon, B. (2013). Cell phones in the classroom: Pre-service teachers' perceptions. *Journal of Digital Learning in Teacher Education*, 30(1), 11–20. <https://doi.org/10.1080/21532974.2013.10784712>
- Zydney, J. M., & Warner, Z. (2016). Mobile apps for science learning: Review of research. *Computers & Education*, 94, 1–17. <https://doi.org/10.1016/j.compedu.2015.11.001>