



INSTRUCTIONAL MEDIA AND ACADEMIC PERFORMANCE IN ELEMENTARY SCIENCE: A MIXED-METHODS STUDY OF GRADE VI LEARNERS

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ABSTRACT

This study investigated the effects of instructional media on the academic performance of Grade VI learners in Science in two public elementary schools in the Division of Tandag City, Surigao del Sur, Philippines. Employing a mixed-method convergent parallel design, the study integrated a quasi-experimental pretest–posttest non-equivalent groups approach with phenomenological inquiry to examine both learning outcomes and participants' experiences. Quantitative data were collected using the standardized Department of Education (DepEd) Caraga Science achievement test and an instructional media utilization questionnaire, while qualitative data were obtained through semi-structured interviews and focus group discussions involving learners and teachers. Pretest results confirmed comparable baseline achievement between the experimental and conventional groups ($M = 14.64$ vs. 14.45). Following the intervention, learners exposed to instructional media demonstrated significantly higher Science achievement ($M = 35.55$, $SD = 4.25$) than those receiving conventional instruction ($M = 27.82$, $SD = 5.56$), with a statistically significant difference, $t(18.71) = 3.66$, $p = .0017$, and a very large effect size (Hedges' $g = 1.50$). Correlation analysis revealed significant positive relationships between Science achievement and the use of visual ($r = .373$, $p = .011$) and audio-visual instructional media ($r = .317$, $p = .024$), whereas audio and digital/ICT media showed no significant associations. Qualitative findings generated five overarching themes: improved conceptual understanding through visual representation, enhanced learner motivation and classroom participation, preference for blended multisensory instruction, challenges associated with pacing and technological limitations, and teachers' professional growth toward student-centered, media-enhanced pedagogy. The findings demonstrate that strategically designed and teacher-facilitated instructional media significantly improve Science learning outcomes and learner engagement, particularly in

geographically isolated and Indigenous Peoples (IP)-majority schools. Based on these findings, the Science Media Integration Enhancement Program (SMIEP) is proposed to strengthen evidence-based instructional media integration, teacher capacity building, and sustainable Science instruction in public elementary schools.

Keywords: *instructional media; Science education; academic performance; mixed-methods research; quasi-experimental design; elementary education; Indigenous Peoples (IP) learners; Philippines; multimedia learning; Science Media Integration Enhancement Program (SMIEP)*

INTRODUCTION

Science education plays a critical role in developing learners' scientific literacy, critical thinking, and problem-solving skills that are essential for lifelong learning and informed decision-making. However, elementary learners often encounter difficulties in understanding abstract scientific concepts when instruction relies primarily on conventional teaching methods. To address these challenges, educators have increasingly integrated instructional media into classroom instruction to promote meaningful learning experiences. According to Torrington and Bower (2021), teacher-created instructional videos significantly improve learners' academic achievement, classroom engagement, and positive learning attitudes because the materials are contextualized to learners' needs. Their findings further suggest that well-designed instructional media promote active participation and enhance learners' motivation to learn Science.

The rapid advancement of educational technologies has further strengthened the integration of multimedia resources in Science instruction. Navarrete et al. (2023) reported that effective video-based learning environments improve learners' conceptual understanding by combining visual, textual, and interactive elements that facilitate cognitive processing. Their comprehensive review emphasized that instructional videos incorporating appropriate pacing, signaling, and learner interaction consistently produce higher levels of engagement and learning effectiveness than traditional instructional approaches.

The effectiveness of instructional media is particularly evident in elementary Science education, where many concepts require visualization and concrete representations. Jahro and Setiyawan (2026) found that integrating video learning media significantly enhanced elementary pupils' science process skills, classroom participation, and conceptual understanding compared with traditional instruction. Their findings indicate that multimedia-supported instruction enables learners to construct scientific knowledge more effectively through multisensory experiences that integrate images, narration, demonstrations, and learner interaction.

Beyond improving conceptual understanding, instructional media also contribute to learners' academic performance and engagement. Angga and Ramirez (2026) revealed that video tutorials significantly improved learners' academic performance and

learning interest in Chemistry by facilitating self-paced learning and reinforcing difficult concepts through repeated exposure. Likewise, Saludo and Villanueva (2026) reported that teachers' effective utilization of video-based instructional materials positively influenced students' classroom engagement and academic performance, highlighting the importance of teacher competence in maximizing the educational benefits of instructional media.

Despite the growing body of international evidence supporting the effectiveness of instructional media, empirical studies focusing on Grade VI Science learners in geographically isolated public elementary schools in the Philippines remain limited. Furthermore, few studies have employed a mixed-method approach that simultaneously examines learners' academic achievement and the lived experiences of both learners and teachers regarding media-supported instruction. Addressing these research gaps, the present study investigated the effects of instructional media on the academic performance of Grade VI learners in Science in selected public elementary schools in the Division of Tandag City, Surigao del Sur. The findings are expected to contribute evidence-based recommendations for strengthening instructional media integration and improving Science teaching and learning in resource-constrained educational settings.

Research Questions

This study aimed to examine the effects of instructional media on the academic performance of Grade VI learners in Science at Mabuhay Integrated School and Pag-asa Tribal Community Integrated School during the School Year 2025–2026. Specifically, this study sought to answer the following research questions:

1. What are the pretest and posttest levels of academic performance in Science among Grade VI learners exposed to instructional media and traditional instruction?
2. To what extent are the following instructional media utilized in Science instruction?
 - 2.1 Visual media
 - 2.2 Audio media
 - 2.3 Audio-visual media
 - 2.4 Digital/ICT media?
3. Is there a significant difference in the posttest academic performance of Grade VI learners in Science between those exposed to instructional media and those receiving traditional instruction?
4. Is there a significant relationship between the extent of instructional media utilization and the posttest academic performance of Grade VI learners in Science?
5. How do teachers and learners describe their experiences with the use of instructional media in Science instruction?
6. What intervention program can be developed to enhance the academic performance of Grade VI learners in Science through the effective integration of instructional media?

METHODOLOGY

This study employed a mixed-method convergent parallel design to examine the effects of instructional media on the academic performance of Grade VI learners in Science. The quantitative component utilized a quasi-experimental pretest–posttest non-equivalent groups design to compare the academic performance of learners exposed to instructional media with those receiving traditional instruction. The experimental group consisted of Grade VI learners from Mabuhay Integrated School, while the comparison group comprised Grade VI learners from Pag-asa Tribal Community Integrated School during the School Year 2025–2026. A standardized Department of Education (DepEd) Caraga Science Achievement Test served as the primary instrument for measuring learners' academic performance through pretest and posttest assessments. The extent of instructional media utilization was measured using a validated researcher-developed questionnaire covering visual, audio, audio-visual, and digital/ICT media. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to summarize the data, while Welch's independent-samples t-test determined significant differences in academic performance between the two groups. Pearson's product-moment correlation coefficient examined the relationship between instructional media utilization and posttest academic performance, and effect sizes were computed using Cohen's *d* and Hedges' *g*. The qualitative component adopted a phenomenological approach to explore the lived experiences of teachers and learners regarding the use of instructional media through semi-structured interviews and focus group discussions. Qualitative data were analyzed using Braun and Clarke's thematic analysis, and the quantitative and qualitative findings were integrated during the interpretation stage to provide a comprehensive understanding of the effects of instructional media on learners' academic performance in Science.

RESULTS

Table 1. Pretest and Posttest Academic Performance of Grade VI Learners in Science

Test	Group	n	Mean	SD	Percentage Performance Level	
Pretest	Instructional Media	11	14.64	4.59	29%	Low Proficient
	Traditional Instruction	11	14.45	4.99	29%	Low Proficient
Posttest	Instructional Media	11	35.55	4.25	71%	Nearly Proficient
	Traditional Instruction	11	27.82	5.56	56%	Nearly Proficient

Table 2. Extent of Instructional Media Utilization

Instructional Media	Mean	Interpretation
Visual Media	3.36	Moderate Extent
Audio Media	2.53	Low Extent
Audio-Visual Media	4.35	Very High Extent
Digital/ICT Media	3.13	Moderate Extent
Overall	3.34	Moderate Extent

Table 3. Difference in Academic Performance Between the Two Teaching Methods

Test	t	p-value	Decision
Pretest	0.089	.930	Not Significant
Posttest	3.660	.002	Significant

Table 4. Relationship Between Instructional Media Utilization and Posttest Academic Performance

Instructional Media	r	p-value	Interpretation
Visual Media	.373	.011	Significant
Audio Media	.115	.736	Not Significant
Audio-Visual Media	.317	.024	Significant
Digital/ICT Media	.261	.438	Not Significant

Table 5. Emergent Themes from Learners' and Teachers' Experiences

Theme	Description
Enhanced clarity and understanding of Science concepts	Instructional media facilitated visualization of abstract concepts and improved conceptual understanding.
Increased motivation and enjoyment	Learners became more motivated, interested, and actively engaged during Science lessons.
Preference for multisensory and blended media	Participants preferred combining videos, models, charts, simulations, and hands-on activities.
Challenges in media utilization	Technical limitations, pacing issues, cognitive overload, and limited instructional resources constrained media use.
Professional growth and enhanced teaching practices	Teachers reported improved instructional strategies, creativity, learner-centered pedagogy, and digital competence through media integration.

Table 6. Proposed Intervention Program

Program	Goal
Science Media Integration Enhancement Program (SMIEP)	To improve Grade VI learners' academic performance in Science through the systematic integration of instructional media, teacher capacity-building, multimedia resource development, and formative assessment strategies.

DISCUSSION

The findings of the study demonstrated that the integration of instructional media contributed positively to learners' academic performance in Science. Although both the instructional media and traditional instruction groups showed improvement after the intervention, learners exposed to instructional media achieved higher levels of academic performance, indicating that multimedia-supported instruction provided a more effective learning environment than conventional teaching alone. The results further suggested that instructional media enhanced learners' engagement, facilitated conceptual understanding, and promoted more meaningful learning experiences, particularly when visual and audio-visual resources were incorporated into classroom instruction. These quantitative findings were reinforced by the qualitative evidence, which revealed that both teachers and learners perceived instructional media as valuable in making abstract scientific concepts more understandable, stimulating learner motivation, and encouraging active classroom participation, despite challenges related to technological resources and infrastructure.

The present findings are consistent with the contemporary view that effective multimedia instruction improves learning by promoting active cognitive processing rather than merely increasing learners' exposure to technology. Mayer (2024) emphasized that instructional media become effective when they integrate words, images, and meaningful representations that help learners organize and connect new knowledge with prior understanding. Well-designed multimedia materials reduce unnecessary cognitive load while facilitating deeper conceptual learning, particularly in content-rich disciplines such as Science. This theoretical explanation aligns with the observed improvement in learners' academic performance following exposure to instructional media.

Similarly, Cromley and Chen (2025) reported in their meta-analysis that multimedia learning interventions consistently produced positive effects on academic achievement across educational settings when instructional materials were designed to encourage learner engagement and active processing. Their findings highlighted that the educational value of multimedia lies not in the technology itself but in its pedagogical integration. This observation supports the present study, where instructional media appeared to enhance Science learning by providing learners with opportunities to visualize concepts, participate actively in lessons, and connect scientific ideas with authentic learning experiences.

The findings also support recent evidence regarding instructional media in elementary Science education. Prayoga et al. (2025) concluded that interactive media,

including educational videos, animations, simulations, and digital presentations, significantly enhanced learners' conceptual understanding and classroom engagement. Their review emphasized that multimedia resources were particularly beneficial for explaining scientific processes that are difficult to observe directly, thereby improving learners' comprehension and retention. Such observations correspond with the qualitative findings of the present study, in which participants described instructional media as making Science lessons clearer, more engaging, and easier to understand.

Furthermore, Wulandari and Sumarno (2026) found that digital instructional media improved learners' motivation and supported more meaningful learning experiences by transforming abstract scientific concepts into concrete and interactive representations. Their systematic review emphasized that learners became more engaged when instructional media encouraged exploration, visualization, and active participation. These conclusions parallel the experiences reported by teachers and learners in the present study, who consistently identified increased motivation, improved understanding, and greater classroom participation as major benefits of instructional media integration.

However, the study also revealed that the effectiveness of instructional media depended on appropriate implementation and adequate instructional support. Participants reported challenges related to internet connectivity, limited technological resources, pacing of multimedia materials, and insufficient access to digital tools. These findings are consistent with Bond et al. (2024), who reported that educational technologies produce meaningful learning outcomes only when teachers possess adequate pedagogical competence and when schools provide sufficient technological infrastructure and institutional support. Consequently, instructional media should be viewed not as a replacement for effective teaching but as a pedagogical resource whose success depends on thoughtful instructional design, teacher expertise, and contextual readiness.

Overall, the findings provide evidence that instructional media constitute an effective pedagogical approach for improving elementary Science learning. The convergence of quantitative and qualitative evidence indicates that multimedia-supported instruction enhances learners' academic performance by promoting conceptual understanding, increasing learner motivation, encouraging active participation, and facilitating more engaging classroom experiences. At the same time, the findings underscore the importance of strengthening teachers' instructional capacities and improving access to educational technologies to maximize the benefits of instructional media in elementary Science education.

Conclusions

The findings of the study lead to the conclusion that the integration of instructional media significantly enhances the academic performance of Grade VI learners in Science compared with traditional instruction. Although both groups demonstrated comparable levels of prior knowledge before the intervention, learners exposed to instructional media achieved higher posttest performance, indicating the effectiveness of multimedia-supported teaching in improving Science learning. Among the different types of

instructional media, visual and audio-visual resources showed significant positive relationships with learners' academic performance, highlighting their value in facilitating conceptual understanding and learner engagement. The qualitative findings further revealed that instructional media made Science lessons clearer, more engaging, and more meaningful by increasing learners' motivation, participation, and comprehension while also promoting teachers' professional growth and learner-centered instructional practices. Despite challenges related to technological resources, connectivity, and instructional implementation, the convergence of quantitative and qualitative evidence demonstrates that instructional media constitute an effective pedagogical approach for enhancing Science education. Consequently, the study concludes that the systematic and pedagogically sound integration of instructional media, supported by adequate teacher training and appropriate educational resources, can substantially improve elementary learners' academic performance and overall learning experiences in Science.

Recommendations

Based on the findings of the study, it is recommended that elementary Science teachers integrate instructional media more consistently into classroom instruction, particularly visual and audio-visual resources, to enhance learners' conceptual understanding, engagement, and academic performance. School administrators should strengthen support for multimedia-based instruction by providing adequate instructional resources, improving ICT infrastructure, ensuring reliable internet connectivity, and facilitating continuous professional development programs that enhance teachers' competencies in designing and implementing technology-supported lessons. The Department of Education and other educational stakeholders may consider incorporating structured multimedia integration strategies into Science curriculum implementation and teacher training initiatives to promote learner-centered instruction. Furthermore, schools are encouraged to adopt and implement the proposed Science Media Integration Enhancement Program (SMIEP) to address identified gaps in instructional media utilization and strengthen Science teaching practices. Finally, future researchers may conduct similar studies involving larger sample sizes, different grade levels, subject areas, and educational settings, while exploring additional variables such as learner motivation, digital literacy, teacher technological competence, and long-term academic achievement to further validate and extend the findings of the present study.

Compliance with Ethical Standards

This study was conducted in accordance with established ethical principles governing educational research involving human participants. Prior to data collection, permission to conduct the study was obtained from the appropriate educational authorities, including the Schools Division Office and the respective school heads of Mabuhay Integrated School and Pag-asa Tribal Community Integrated School. Informed consent was secured from the participating teachers, while written parental consent and learner assent were obtained for all Grade VI learner participants. Participation in the study was entirely voluntary, and participants were informed of their right to decline participation or withdraw from the study at any stage without penalty or adverse consequences.

Confidentiality and anonymity were strictly maintained throughout the research process. Participants' identities were protected through the use of identification codes instead of personal names, and all information collected was treated with the utmost confidentiality. The data were used solely for academic and research purposes and were securely stored to prevent unauthorized access. The instructional intervention posed no physical, psychological, or social risks to the participants, as it involved regular classroom instructional activities aligned with the Department of Education curriculum. Throughout the conduct of the study, the researchers adhered to the ethical principles of respect for persons, beneficence, and justice, ensuring that the rights, dignity, privacy, and welfare of all participants were safeguarded. The study likewise complied with the ethical standards and research policies of the Department of Education and the institutional requirements governing educational research.

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