

Integration in Early Grade Instruction: Effects on Academic Achievement of Grade 1 Students

Manilyn N. Hingangan

Northeastern College, Santiago City, Isabela, Philippines

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Email of Author: hinganganm@gmail.com

Abstract

In today's world, technology is a key player in education, changing how teachers teach and students learn. This study examined how modern technology affects teaching Grade 1 Science students in Bambang District, Nueva Vizcaya, during the 2025–2026 school year. It focused on the availability of tech tools, the level of teachers' technological skills, the effectiveness of tech in the classroom, and the challenges teachers face when using tech in science lessons. This study used a descriptive quantitative research design and gathered data from 20 Grade 1 teachers using a specially designed questionnaire. Frequency count, percentage, weighted mean, standard deviation, and ranking were employed to analyze the data. The findings showed that teachers generally found modern technology to be effective in enhancing science instruction. The overall average weighted mean indicated that the respondents strongly agreed that technology boosts students' participation, motivation, engagement, and understanding of science concepts. Teachers also showed proficiency in using technological tools during lessons. However, they faced challenges such as poor internet connection, lack of technology resources, limited technical skills, and insufficient training opportunities. The study concluded that modern technology positively impacts teaching and learning in Grade 1 Science. Therefore, schools should continue to improve technology integration by providing sufficient resources, stable Internet, and ongoing teacher training to enhance the quality of science education and students' learning experiences.

Keywords: Grade 1 Pupils, Modern Technology, Science Education, Technology Integration, Teaching Effectiveness

1. Introduction

Technology is a key player in modern education, changing how teachers teach and students learn. Globally, digital tools such as laptops, tablets, projectors, and online resources have transformed traditional classrooms into spaces that are more interactive, engaging, and learner-focused. These technologies make it easier to access information, promote collaboration, and help students build critical thinking, creativity, and problem-solving skills that are crucial for learning in the 21st century. In Science education, using educational technology has been shown to effectively boost students' understanding of concepts through interactive and visual learning experiences. Anselmo et al. (2024) highlighted that mobile learning tools enhance students' understanding, engagement, and participation in Science and Physics education. As education continues to evolve, technology plays a crucial role in enhancing teaching effectiveness and boosting student academic performance.

In the Philippines, the integration of technology into education has become a significant focus, particularly with the K–12 curriculum and various programs from the Department of Education (DepEd). Schools are encouraged to use Information and Communication Technology (ICT) to make classroom learning more effective and engaging. The government has stepped in by providing technological resources, Internet access, and training programs for teachers to boost technology-assisted teaching. According to Anselmo et al. (2025), using augmented reality (AR) technology can enhance student engagement and learning in Science and Physics classes. However, despite these efforts, many schools still face hurdles, such as limited technological resources, unstable Internet connections, and insufficient teacher training, especially in public elementary schools. These issues can hinder the smooth integration of technology in classrooms and might impact the quality of science education for young students.

In Bambang District, Nueva Vizcaya, Grade 1 teachers are beginning to incorporate modern technology into their science classes. However, there are still some bumps in the road, such as differences in the availability of tech tools, how comfortable teachers are with using them, and their classroom experiences. Some teachers find it difficult to handle digital devices, access online resources, and run technology-based lessons smoothly. As Science is a subject that thrives on interactive and engaging learning, using modern technology can help students grasp concepts better. Although integrating technology is becoming increasingly important, there are not many studies focusing on Grade 1 Science teaching in Bambang District. Most research tends to look at secondary or higher education and does not pay much attention to teachers' views, skills, and the challenges they face with technology. This study was conducted to determine how modern technology

impacts teaching Grade 1 Science students and to pinpoint the challenges teachers face when bringing technology into their classrooms.

2. Material and methods

2.1 Research Design

This study used a descriptive quantitative research design to determine the impact of modern technology on teaching Grade 1 Science pupils. This design was appropriate because it described teachers' perceptions, experiences, and challenges in using technology in classroom instruction. This study focused on collecting numerical data through survey questionnaires. The descriptive method helped the researcher analyze the availability of technological tools, teacher proficiency, effectiveness of technology, and the problems encountered in teaching. The study did not manipulate variables but only described the existing conditions among the respondents.

2.2 Locale of the Study

The study was conducted in elementary schools in Bambang District, Nueva Vizcaya during the School Year 2025–2026. The locale was chosen because schools in the district utilize modern technology for classroom instruction. The area was accessible to the researcher and provided suitable respondents for this study. The schools included in the study have Grade 1 teachers who use technological tools such as laptops, projectors, and Internet resources to teach Science subjects.

2.3 Respondents of the Study

The respondents of the study were Grade 1 teachers from selected elementary schools in Bambang District, Nueva Vizcaya. The respondents were chosen because they were directly involved in teaching science and using modern technology in classroom instruction. Their responses provided important information regarding the effectiveness and challenges of technology integration in teaching.

2.4 Sample and Sampling Procedure

This study used a complete enumeration sampling technique. All twenty (20) Grade 1 teachers in the selected schools were included as respondents in the study. Complete enumeration was used because the number of respondents was manageable. This sampling technique allowed the researcher to gather complete information from all the qualified participants.

2.5 Research Instrument

The researcher used a researcher-made questionnaire as the main instrument for gathering data. The questionnaire consisted of two sections. The first part focused on the profile of the respondents, while the second part focused on the impact of technology on teaching science. The questionnaire included items about technological tools, teacher proficiency, effectiveness of technology, and problems encountered by teachers. A Likert scale was used to measure the participants' responses.

2.6 Data Gathering Procedure

The researcher first obtained permission from the school authorities before conducting the study. After approval, the questionnaires were personally distributed to the respondents. The purpose of the study was clearly explained to the participants. The respondents were given sufficient time to answer the questionnaire honestly. After answering, the questionnaires were collected, checked, and organized for the data analysis.

2.7 Data Analysis Techniques

The data gathered were analyzed using statistical tools. Frequency counts and percentages were used to describe the respondents' profiles. The weighted mean was used to determine the respondents' perceptions of the use of modern technology in teaching science. Ranking was also used to identify the common problems encountered by teachers when using technology.

2.8 Ethical Considerations

The researcher observed the proper ethical considerations during the conduct of the study. Permission was obtained from the school authorities before gathering data. The respondents were informed about the purpose of the study, and their participation was voluntary. The confidentiality and anonymity of the respondents were maintained at all times. The information gathered was used only for academic research.

3. Results and Discussion

3.1 Impact of Modern Technology in Teaching Science

3.1.1 Availability of Modern Technology

The findings revealed that modern technological tools were generally available in schools and classrooms. Teachers agreed that they had access to technological devices such as laptops, projectors, mobile phones, and digital learning materials.

Internet access was also reported as generally adequate for teaching purposes. The overall average weighted mean for the availability of modern technology was 4.16 (SD = 0.74), interpreted as “Agree.” These findings indicate that schools are gradually improving their technological resources to support science instruction. The accessibility of digital tools and learning materials provides teachers with opportunities to deliver more interactive and engaging lessons. The availability of these resources also supports effective classroom instruction and enhances the integration of technology in teaching Science.

3.1.2 Teachers’ Proficiency in Using Technology

The results showed that teachers demonstrated a high level of proficiency in operating modern technological devices and integrating them into science lessons. Teachers strongly agreed that they could prepare digital learning materials, confidently use technological tools during instruction, and manage classroom activities using technology. The overall average weighted mean for teachers’ proficiency was 4.24 (SD = 0.71), interpreted as “Strongly Agree.” The findings suggest that teachers possess the necessary skills and confidence to integrate technology effectively into classroom instruction. Their ability to utilize digital tools contributes to more organized and efficient science teaching. These results support the findings of Morales et al. (2021), who emphasized that teachers’ technological skills improve instructional effectiveness and classroom delivery.

3.1.3 Effectiveness of Modern Technology in Teaching Science

The findings revealed that modern technology was highly effective in teaching Science. Teachers strongly agreed that technology made science lessons more interesting, improved pupils’ participation, enhanced understanding of science concepts, increased learners’ motivation, and improved teaching efficiency and classroom interaction. The overall average weighted mean for effectiveness was 4.37 (SD = 0.65), interpreted as “Strongly Agree.” These results indicate that technology positively influences the learning experiences of Grade 1 pupils by promoting engagement, interaction, and understanding during science lessons. Technology-assisted instruction allows pupils to participate actively and become more motivated to learn. These findings are consistent with Diab et al. (2024), who highlighted that educational technology improves students’ understanding and engagement in science. Similarly, Anselmo et al. (2026) emphasized that mobile technology enhances student participation and learning outcomes in science education.

3.2 Problems Encountered in Using Modern Technology

The findings showed that teachers encountered several challenges in using modern technology in teaching Science. The most common problems included poor Internet connection, insufficient technological devices for pupils, technical problems such as device malfunction, lack of budget for technological resources, power interruptions, limited technical skills, insufficient training, limited access to updated digital learning materials, difficulty maintaining pupils’ attention using gadgets, and time constraints in preparing technology-based lessons. The overall average weighted mean was 4.13 (SD = 0.73), interpreted as “Agree.” These challenges suggest that despite the positive impact of technology in education, barriers still affect its effective implementation in classrooms. Poor connectivity and lack of resources limit the smooth delivery of technology-assisted lessons, while inadequate training affects teachers’ confidence and competence in using digital tools. These findings support Adsız & Dinçer (2025) and Singh & Meena (2022), who noted that unstable Internet connectivity disrupts online and blended learning. Similarly, Kibirige (2023) and Tabuena & Villareal (2024) emphasized that limited training and technical skills hinder effective technology integration. Budget limitations and technical interruptions also remain significant concerns in schools, as discussed by Mkwizu & Bordoloi (2024), Noor & Isa (2023), and Molla & Seyoum (2022).

3.3 Summary of Findings on Technology Integration

The overall findings revealed that modern technology has a positive impact on teaching Science among Grade 1 teachers. The effectiveness of modern technology obtained the highest rating with an average weighted mean of 4.37 (SD = 0.65), followed by teachers’ proficiency in using technology with 4.24 (SD = 0.71). The availability of technological resources received an average weighted mean of 4.16 (SD = 0.74), while the problems encountered obtained 4.13 (SD = 0.73). The overall average weighted mean was 4.23 (SD = 0.71), interpreted as “Strongly Agree.” The results indicate that technology integration contributes positively to science teaching by improving classroom interaction, student engagement, and teaching efficiency. Teachers generally possess the skills needed to integrate technology effectively, although challenges related to infrastructure, funding, and technical support remain present. These findings align with Rosmiati et al. (2025), who emphasized that technology integration enhances learner engagement and classroom interaction. Likewise, Diab et al. (2024) and Anselmo et al. (2024) highlighted that digital and technology-enhanced learning tools improve teaching effectiveness and students’ science learning experiences.

4. Conclusion and Recommendations

The study found that modern technology benefits teaching Grade 1 Science students in Bambang District, Nueva Vizcaya. Teachers noted that technology makes science lessons more engaging, interactive, and effective for students. It also showed

that teachers are quite capable of using technological tools in their classrooms. However, they faced some challenges, such as poor Internet connections, a lack of technical resources, and limited training opportunities.

Given these findings, schools should continue to support the use of technology in teaching by ensuring that there are enough devices, a stable Internet connection, and up-to-date learning materials. It is also important to encourage teachers to attend seminars and training programs to enhance their technical skills for classroom instruction. Future researchers might want to explore similar studies in other schools or grade levels to build on these results.

This study has a few limitations. It was only conducted with Grade 1 teachers in selected elementary schools in Bambang District, Nueva Vizcaya, which might limit the applicability of the findings to other areas. The study also relied on teachers' responses to a questionnaire, which could involve some personal bias. Additionally, the focus was solely on science teaching and did not cover other subjects or students' actual academic performance.

Compliance with ethical standards

The authors declare no conflict of interest and received no external funding for this study. The researchers acknowledge the participation of the Grade 1 teachers and the cooperation of the elementary schools in Bambang District, Nueva Vizcaya, where the study was conducted. Participation was voluntary, informed consent was obtained from all respondents, and data were collected through non-invasive survey questionnaires. Confidentiality and anonymity were strictly maintained, and no identifying information of the participants was disclosed.

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