The International Review of Multidisciplinary Research
Volume 1, Issue 6, May 2026, pp. 480-487
https://doi.org/10.5281/zenodo.20496383

Students' Perceptions of Technology Integration in Science 8 at Dibuluan National High School, Jones, Isabela

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Article Details:

Received: 20 April 2026
Revised: 4 May 2026
Accepted: 11 May 2026
Published: 31 May 2026
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Recommended Citation:

Abiog, M. T. (2026). Students' Perceptions of Technology Integration in Science 8 at Dibuluan National High School, Jones, Isabela. The International Review of Multidisciplinary Research. 1 (6), 480-487.
https://doi.org/10.5281/zenodo.20496383

Index Terms:

technology integration, science education, students' perceptions, technology-based activities, ethical considerations

Abstract. Technology plays an essential role in contemporary education, particularly in science instruction, where digital tools help students understand complex concepts and improve their classroom engagement. This study examined the perceptions of Grade 8 students toward the integration of technology in Science 8 at the Dibuluan National High School. Specifically, it investigated students' positive and negative perceptions, technology-based activities used in instruction, ethical considerations related to technology use, and the relationships among these variables. A descriptive-correlational research design was employed involving fifty (50) Grade 8 students selected through simple random sampling. Data were gathered using a researcher-made questionnaire that was adopted, modified, validated by experts, and analyzed using frequency, percentage, weighted mean, standard deviation, Pearson Product-Moment Correlation Coefficient, Independent Samples t-test, and One-Way Analysis of Variance (ANOVA). The findings revealed that students generally demonstrated favorable perceptions of technology integration, particularly in enhancing engagement, participation, motivation, and understanding of science lessons. Ethical practices in technology use were also highly observed, while technology-based activities were moderately implemented in classroom instructions. Negative perceptions of technology integration were minimal and only occasionally experienced by respondents. Significant relationships were identified among students' perceptions, technology-based activities, and ethical considerations, indicating that meaningful and responsible technology use contributes to more positive learning experiences for students. However, limitations in technological resources, Internet connectivity, and accessibility remain evident in the school setting. The study concluded that technology integration positively supports science learning despite challenges in resource-limited educational environments and may serve as a basis for improving technology-supported instruction, strengthening ICT-related programs, and promoting responsible technology use in science education.

Introduction

In today's world, technology plays a vital role in education, especially in science, where digital tools help break down complex ideas and make learning more engaging. Schools worldwide are increasingly using ICT, online platforms, AI, simulations and multimedia in their teaching methods. Research has shown that technology can significantly boost students' motivation, participation, critical thinking, and overall performance. For instance, Xu et al. (2024) found that AI tools can enhance higher-order thinking and motivation, and Wagino (2024) observed that e-learning encourages creativity and collaboration. Anselmo et al. (2024) also found that AR-enhanced virtual laboratories improved students' understanding and engagement in science and physics learning. These studies underscore the importance of technology in preparing students to meet the challenges of the twenty-first century. However, many schools struggle to integrate technology effectively. Issues such as limited connectivity, lack of devices, inadequate infrastructure, and insufficient teacher training are major hurdles, particularly in developing countries (Ahmed 2025; Kibirige 2023). Teachers often do not receive the training and support they need to fully leverage technology's potential (Jailani et al., 2025). Additionally, the digital divide between urban and rural areas impacts equal access to quality technology-based learning (Kormos &

Wiseman, 2023). To successfully integrate technology, schools need the right digital tools, infrastructure, teacher readiness, and support systems.

In the Philippines, the integration of technology into education has been recognized as a national priority, as evidenced by the programs and policies implemented by the Department of Education (DepEd), such as the ICT4E Strategic Plan. The transition toward blended and digital learning became more pronounced during the COVID-19 pandemic, encouraging teachers and students to enhance their digital skills and adapt to technology-enhanced instruction. Local studies have indicated that technology can positively impact students' engagement, participation, and understanding in science classes. However, challenges such as unstable Internet connections, a lack of gadgets, and varying levels of teacher readiness continue to affect implementation, particularly in public schools located in rural areas (Leonardo & Cha, 2021; Valverde-Berrocoso et al., 2021).

At Dibuluan National High School, technology integration in Grade 8 Science classes reflects the current educational landscape. Teachers are incorporating digital presentations, educational videos, and online activities to enhance their lessons and learning experiences of students. However, the use of more advanced technologies is still limited because of a lack of resources, inconsistent Internet access, and insufficient devices. Students have different experiences with technology; some find digital tools engaging and helpful for grasping scientific concepts, while others face challenges due to accessibility issues and technical difficulties in using these tools. This makes schools a key place to explore how technology integration impacts science learning in resource-limited environments.

While many studies have examined the effectiveness of ICT integration and teachers' views on educational technology, few have specifically focused on Grade 8 students' perceptions in science classes. Moreover, there has been little research conducted in rural public secondary schools such as the Dibuluan National High School. Previous studies have often concentrated on broad ICT implementation; however, this study focused on students' positive and negative perceptions, technology-based activities, and ethical considerations related to the use of technology in science 8. This gap in the literature inspired the researcher to carry out the study, aiming to provide localized and updated insights that could help improve science teaching through more effective and inclusive technology integration in the future.

Research Questions

This study aimed to investigate the perceptions of Grade 8 students regarding technology integration in Science 8 at the Dibuluan National High School. Specifically, this study sought to answer the following research questions:

1. What is the demographic profile of the respondents in terms of gender, age, parents' highest educational attainment, parents' occupation, and dialect spoken at home?
2. What are the positive perceptions of Grade 8 students toward technology integration in Science 8?
3. What are the negative perceptions of Grade 8 students toward technology integration in Science 8?
4. What technology-based activities are utilized in teaching Science 8?
5. What ethical considerations associated with technology use are observed in Science 8 instruction?
6. Is there a significant relationship between students' perceptions, technology-based activities, and ethical considerations related to technology integration in science 8?
7. Is there a significant difference in students' perceptions of technology integration when grouped according to demographic profile?

Integrated Conceptual and Theoretical Mapping

The Integrated Conceptual and Theoretical Mapping of the study on students' perceptions of technology integration in Science 8 at Dibuluan National High School offers a comprehensive framework. This framework illustrates how technology integration, the learning context, and student-related factors may influence students' perceptions of technology use in science instruction. Technology integration encompasses access to digital tools, instructional strategies and learning resources. The learning context considers the school environment, teacher support, internet connectivity, and device availability. Student factors, such as motivation, attitude toward technology, digital competence, and prior experience, also contribute to shaping learners' perceptions of online learning. Collectively, these factors may affect students' positive and negative perceptions, participation in technology-based activities, and awareness of ethical considerations in technology use. The framework further suggests that these perceptions contribute to important educational outcomes, including enhanced engagement in science learning, improved understanding of concepts, the development of 21st-century skills, and responsible use of technology. The study is anchored on the Technology Acceptance Model (TAM), Constructivist Learning Theory, and the TPACK Framework, which explain how students accept technology, actively construct learning through digital experiences, and benefit from the integration of technology, pedagogy, and content knowledge. Finally, the framework highlights the research gap in rural educational contexts, emphasizing the importance of examining technology integration in resource-limited public secondary schools.

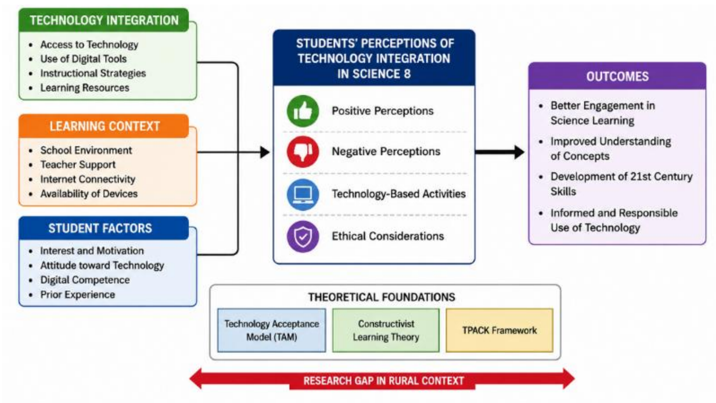

Figure 1. Integrated Conceptual and Theoretical Mapping of Students' Perceptions of Technology Integration in Science 8 at Dibuluan National High School, Jones, Isabela

Methodology

Research Design

This study utilized a descriptive-correlational research design to investigate Grade 8 students' perceptions of technology integration in Science 8 at Dibuluan National High School. The descriptive component systematically detailed the respondents' demographic profiles, positive and negative perceptions, technology-based activities employed in instruction, and ethical considerations related to technology use in science classes. Concurrently, the correlational aspect assessed the relationships among students' perceptions, technology-based activities, and ethical considerations, as well as variations in perceptions when respondents were categorized according to selected profile variables. This design was deemed appropriate as it facilitated the collection of quantitative data and the analysis of patterns, relationships, and differences relevant to technology integration in science education.

Research Locale

The research was conducted at the Dibuluan National High School, a public secondary institution in the municipality of Jones, Isabela, Philippines. This school offers both junior and senior high school programs and serves students from nearby barangays and rural areas of the municipality. The location was chosen because it represents the challenges associated with technology integration in resource-constrained educational environments, where access to digital tools and Internet connectivity varies among students. Furthermore, the school employs various technology-based instructional practices in science classes, making it an ideal setting for examining students' perceptions of technology integration in science 8.

Research Participants

The study involved fifty (50) Grade 8 students enrolled at Dibuluan National High School during the School Year 2025–2026. Participants were selected through simple random sampling, ensuring that each student had an equal opportunity to be included in the study sample. This sampling method minimized selection bias and enhanced the reliability and objectivity of the data collected from the participants. The participants were deemed appropriate for the study as they had direct experience with the integration of technology in science instruction, enabling them to provide pertinent insights regarding their perceptions, learning experiences, and exposure to technology-based activities.

Research Instrument

This study employed a customized, researcher-developed survey questionnaire as the primary data collection tool. The questionnaire was formulated based on the relevant literature, prior studies, and existing instruments related to technology integration in education. It comprised two main sections: the demographic profiles of the respondents and the primary survey questions. The primary survey included statements regarding students' positive and negative perceptions of technology integration, technology-based activities used in science instruction, and ethical considerations associated with the use of technology in learning. A five-point Likert scale was used to assess respondents' level of agreement and perceptions. To ensure the validity and reliability of the instrument, the questionnaire underwent content validation by research advisers, experts, and experienced educators. Necessary revisions and modifications were made based on their feedback and recommendations to enhance the clarity, relevance, and appropriateness of the questionnaire items.

Data Gathering Procedure

The researcher employed systematic procedures for the data collection. Initially, the researcher developed the survey questionnaire and submitted it to an adviser and research expert for validation and approval. Following the incorporation of the suggested revisions, a formal letter requesting permission to conduct the study was sent to the principal of Dinuguan National High School. Upon receiving approval, the researcher personally administered the questionnaires to selected Grade 8 students. Prior to data collection, the respondents were informed of the study's objectives and significance and were assured of the confidentiality of their responses. Clear instructions were provided to guide the participants in accurately completing the questionnaire. After retrieving the completed questionnaires, the responses were checked, organized, tabulated, and analyzed using appropriate statistical tools, including frequency, percentage, weighted mean, standard deviation, Pearson Product-Moment Correlation Coefficient, Independent Samples t-test, and One-Way Analysis of Variance (ANOVA). These statistical methods were used to interpret the data and address the study's research questions.

Ethical Considerations

This study strictly adhered to ethical standards of research. Prior to data gathering, permission to conduct the study was obtained from relevant school authorities. The respondents were informed of the purpose, nature, and significance of the study, and participation in the study was entirely voluntary. The respondents were also informed of their right to decline participation or withdraw from the study at any time without penalty. To ensure confidentiality and anonymity, the names and personal identities of the participants were not disclosed in any part of the study, and all collected information was used solely for academic and research purposes. Informed consent was obtained before the administration of the questionnaire, and the researcher ensured that the study did not cause any form of harm, discomfort, or prejudice to the respondents throughout the research process.

Results and Discussion

Demographic Profile of the Respondents

Variables	Category	Frequency (f)	Percentage (%)
Gender	Male	15	30.00
	Female	35	70.00
Age	13 years old	23	46.00
	14 years old	27	54.00
	15 years old and above	0	0.00
Father's Educational Attainment	Elementary Education	4	8.00
	High School	15	30.00
	Vocational	0	0.00
	College	31	62.00
Mother's Educational Attainment	Elementary Education	1	2.00
	High School	20	40.00
	Vocational	0	0.00
	College	29	58.00
Father's Occupation	Farming	21	42.00
	Driving	6	12.00
	OFW	0	0.00
	Private Firm Employee	6	12.00
	Carpentry	9	18.00
	Government Employee	8	16.00
Mother's Occupation	Stay at Home	17	34.00
	OFW	16	32.00
	Private Firm Employee	7	14.00
	Government Employee	10	20.00
Dialect Spoken at Home	Ilocano	30	60.00
	Tagalog	20	40.00

Table 1. Demographic Profile of the Respondents (N = 50)

Table 1 presents the respondents' demographic characteristics. A significant proportion of the participants were female (70%) and 14 years old (54%). Most of the respondents' fathers (62%) and mothers (58%) had completed college education. Farming was the predominant occupation among fathers (42%), while most mothers were either homemakers (34%) or overseas Filipino workers (32%). Regarding language use, Ilocano was the primary dialect spoken at home by 60% of the respondents. These findings indicate that the participants generally originated from households with diverse socioeconomic and educational backgrounds, which may have affected their access to and perceptions of technology integration in science education.

Students' Perceptions, Technology-Based Activities, and Ethical Considerations on Technology Integration in Science 8

Dimensions	Mean	SD	Interpretation
Positive Perceptions	3.79	0.65	Often
Negative Perceptions	2.93	0.76	Sometimes
Technology-Based Activities	3.28	0.61	Sometimes
Ethical Considerations	3.83	0.63	Often Considered

Table 2. Students' Perceptions, Technology-Based Activities, and Ethical Considerations on Technology Integration in Science 8

Table 2 provides a comprehensive summary of students' perceptions, technology-based activities, and ethical considerations regarding the integration of technology in Science 8. The findings indicate that ethical considerations achieved the highest mean (M = 3.83, SD = 0.63), categorized as "Often Considered," signifying that students acknowledge the significance of responsible and ethical technology use in their learning processes. Positive perceptions also recorded a high mean (M = 3.79, SD = 0.65), suggesting that students generally perceive technology as advantageous in enhancing engagement and comprehension in science classes. This outcome aligns with the research of Xu et al. (2024) and Wagino (2024), who highlighted that technology-enhanced learning fosters increased student motivation and participation in the learning process. Similarly, Anselmo et al. (2025) emphasized that artificial intelligence and technology-supported instruction enhance students' critical thinking, engagement, and learning experiences in science education. Conversely, technology-based activities recorded a mean of 3.28 (SD = 0.61), interpreted as "Sometimes," indicating a moderate incorporation of digital learning activities in instruction. Negative perceptions registered the lowest mean (M = 2.93, SD = 0.76), suggesting that while students encountered some challenges with technology use, these issues were not prominent in their learning experience. These findings are consistent with those of Leonardo and Cha (2021) and Valverde-Berrocoso et al. (2021), who reported that students generally maintain favorable attitudes toward technology integration despite limitations in technological resources and access to them.

Pearson Product-Moment Correlation between Students' Perceptions, Technology-Based Activities, and Ethical Considerations

Variables	r-value	p-value	Interpretation
Positive Perceptions and Technology-Based Activities	0.68	0.001	Significant Moderate Positive Relationship
Positive Perceptions and Ethical Considerations	0.59	0.003	Significant Moderate Positive Relationship
Negative Perceptions and Technology-Based Activities	-0.34	0.021	Significant Weak Negative Relationship
Technology-Based Activities and Ethical Considerations	0.62	0.002	Significant Moderate Positive Relationship

Table 3. Pearson Product-Moment Correlation between Students' Perceptions, Technology-Based Activities, and Ethical Considerations

Table 3 illustrates the correlation between students' perceptions, technology-based activities, and ethical considerations concerning technology integration in Science 8. The results indicate a moderately significant positive correlation between positive perceptions and technology-based activities ($r = 0.68$, $p < 0.05$), suggesting that students engaged in more technology-based activities tend to have more favorable perceptions of technology integration. This finding aligns with the research of Xu et al. (2024) and Wagino (2024), who highlighted that technology-enhanced learning improves student engagement and participation in the learning process. Similarly, Ellorin et al. (2024) emphasized that pedagogical innovations and technology integration positively influence students' engagement, collaboration, and overall learning experience in modern classrooms. Furthermore, positive perceptions were significantly associated with ethical considerations ($r = 0.59$, $p < 0.05$), indicating that students who value responsible technology use tend to have positive views of technology integration. Additionally, technology-based activities and ethical considerations demonstrated a significant moderate positive relationship ($r = 0.62$, $p < 0.05$). Conversely, negative perceptions and technology-based activities exhibited a weak negative correlation ($r = -0.34$, $p < 0.05$), implying that increased engagement in technology-based activities may reduce unfavorable perceptions of technology integration in education. These findings are consistent with those of Kormos and Wisdom (2023) and Valverde-Berrocoso et al. (2021), who reported that the meaningful use of digital technology contributes to more positive learning experiences among students.

Independent Samples t-Test on Positive Perceptions According to Gender

Variable	Mean	SD	t-value	p-value	Interpretation
Male	3.68	0.61	1.42	0.162	Not Significant
Female	3.84	0.58			

Table 4. Independent Samples t-Test on Positive Perceptions According to Gender

Table 4 presents the variation in students' positive perceptions of technology integration when categorized by gender. The analysis indicated no significant difference between male and female respondents, as evidenced by the computed p-value of 0.162, which exceeded the 0.05 level of significance. This finding suggests that both male and female students generally exhibit similar favorable perceptions of technology integration in science instruction. The results imply that gender does not significantly influence students' attitudes toward the use of technology in learning. This conclusion aligns with that of Nawastheen et al. (2023), who reported that students' readiness and attitudes toward ICT use were not strongly affected by gender differences. Similarly, Valverde-Berrocoso et al. (2021) emphasized that positive perceptions of educational technology are generally influenced more by access, experience, and instructional practices than by sex.

One-Way Analysis of Variance (ANOVA) on Positive Perceptions According to Parents' Educational Attainment

Source of Variation	Sum of Squares	df	Mean Square	F-value	p-value	Interpretation
Between Groups	2.84	3	0.95	3.41	0.025	Significant
Within Groups	12.81	46	0.28			
Total	15.65	49				

Table 5. One-Way Analysis of Variance (ANOVA) on Positive Perceptions According to Parents' Educational Attainment

The one-way ANOVA results showed a clear difference in positive perceptions based on parents' education levels ($F(3,46) = 3.41$, $p = 0.025$). This implies that parents' education influences their positive perspectives. Many studies agree that parents' education influences children's and families' attitudes and behaviors. Higher parental education is linked to more positive attitudes among children and adults. For example, people with more educated parents often have better views of immigrant groups. This is due to both parental influence and personal education paths(Donnaloja & Borkowska, 2025). Parents' education creates an environment that encourages positive views. It also affects home settings, such as access to learning resources. In Qatar, children with more educated parents had better reading habits, although interventions can help reduce gaps related to parental education(Cochrane et al., 2022). This is linked to the ANOVA results, which show that higher parental education may lead to better cognitive and attitudinal outcomes in children. In a wider social context, parents' education is tied to opportunities for higher education and social mobility. Economic and political factors affect how parental education impacts their children. In advanced economies and democracies, the effect of parental education is less significant(Boyadjieva & Ilieva-Trichkova, 2025). This suggests that while parents' education is important, its impact can vary based on the context. The influence of education across generations also impacts health and cognitive outcomes in parents, facilitated by the education of their adult children, highlighting a reciprocal effect within families(Xu & Luo, 2022). This detail underscores that the effects of parental education are intertwined with family interactions and wider social support systems, indicating that positive perceptions are part of an intricate relational process. The literature also highlights the significance of family structure and parenting styles in educational achievement. Parental education correlates with authoritative parenting styles that encourage autonomy support, which subsequently has a positive impact on children's perceptions and behaviors(Inda-Caro et al., 2023). This psychosocial aspect strengthens the view that higher levels of parental education foster advantageous cognitive and attitudinal frameworks in children. Finally, the research distinguishes between genetic and environmental pathways in the transmission of educational attainment. Although genetic factors strongly influence educational outcomes, parental education still has a direct impact through environmental context and upbringing practices(Baier et al., 2022). This supports the argument that parental education shapes children's positive perceptions through environmental mechanisms, which aligns with the significant ANOVA findings.

Conclusion and Recommendations

Conclusion

This study took a closer look at how Grade 8 students at Dibuluan National High School feel about using technology in Science 8 classes. Most students had a positive view of technology in their science lessons. They see it as a great way to boost their engagement, participation, and understanding of the material being studied. The students were also quite aware of the ethical side of using technology, showing that they knew how to use digital tools responsibly and appropriately in their learning process. Even though technology-based activities are not used all the time, students generally do not have many negative feelings about technology integration in their classes. The study also found interesting connections between students' perceptions, the use of technology-based activities, and ethical considerations. This suggests that when technology is used meaningfully and responsibly, it can lead to better learning experiences for students and teachers. However, challenges such as limited resources, accessibility issues, and infrastructure problems make it difficult to fully integrate technology into science education curricula. Overall, this study emphasizes the need to strengthen technology-supported teaching and improve access to digital learning resources, especially in rural public secondary schools.

Recommendation

The study suggests that science teachers should focus on integrating technology into their lessons. This could mean using virtual simulations, online research tasks, educational videos, and other interactive digital tools to make science classes more engaging and help students understand better the subject matter. For this to work well, school administrators should consider providing better tech resources, reliable internet, and enough digital devices, especially in schools that do not have many resources. It is also important for teachers and school staff to promote the ethical and responsible use of technology. This includes teaching students' digital citizenship, online safety, and data privacy. Regular ICT training and professional development can help teachers enhance their digital skills and teaching methods. Parents can also play a significant role by supporting and guiding their children to use technology responsibly at home, which can enhance their learning experiences. Lastly, future researchers could conduct similar studies with larger groups, different grade levels, and other subjects to determine how technology integration affects student engagement, perception, and academic performance.

Acknowledgement

The authors would like to thank the colleagues and institutions who provided guidance, feedback, and support throughout the conduct of this study and the preparation of this manuscript. Any remaining errors or omissions are the authors'sole responsibility.

Funding

This research received no external funding from any public, commercial, or not-for-profit funding agency, and no organization provided financial support for the conduct of the study, authorship, or publication of this article.

Competing Interests Statement

The authors declare that they have no competing financial interests or personal relationships that could have influenced the work reported in this article.

Data Availability Statement

Data sharing is not applicable to this article, as no new data were created or analyzed in this study; all data used were obtained from previously published sources, as cited in the reference list.

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Appendices

Appendix upon request