

Assessing the Extent and Effects of Technology Integration in Teaching Science on Learners' Motivation and Academic Performance in Planas National High School

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Abstract — This study investigated the extent of technology integration in Science instruction and its effects on learners' motivation and academic performance. In response to concerns regarding inequities within the classroom in digital implementation, the study sought to determine how technology-supported teaching influences students' intrinsic and extrinsic motivation, task value, self-efficacy, and achievement. It used a descriptive-comparative-correlational design, and the data were culled from junior and senior high school students selected via stratified random sampling. A researcher-developed instrument measured students' profiles, perceived extent of technology integration, and motivational outcomes, while academic performance was represented by Science records culled from official first-quarter records. The instrument was subjected to expert validation and pre-testing, showing an excellent reliability. Because of violated assumptions of normality, non-parametric tests are appropriate. Results revealed that technology integration has been implemented to a high extent, and learners have indicated very high motivational gains in most dimensions. Similarly, this study indicated highly significant differences across profile groups; strong positive relationships existed among the extent of technology integration, motivational outcome variables, and academic performance. These suggest that more meaningful technology use enhances engagement and supports improved Science outcomes. This calls for strengthened teachers' competencies in digital pedagogy as schools continue to refine technology-supported instructional practices.

Keywords: *Technology Integration, Science Education, Learner Motivation, Academic Performance, Digital Instruction.*

I. INTRODUCTION

Science education worldwide faces a persistent paradox in that notwithstanding the transformative impact brought about by digital tools, such as simulations, virtual laboratories, and augmented reality, many students continue to exhibit low scientific literacy and declining motivation, as revealed through the international assessments in which developing nations consistently perform poorly. While national reform agendas strongly press for the integration of technology to enhance conceptual understanding, motivation, and achievement, classroom implementation remains variable due to heterogeneity in teacher competence, levels of digital preparedness, and instructional prioritization. In view of this, the present study investigated the level of technology integration in science instruction, perceived motivational impacts, task value, self-efficacy, and persistence, and its relation to academic performance. Utilizing a descriptive–comparative–correlational design, data from junior high school students were gathered through a validated, highly reliable researcher-developed questionnaire, complemented by first-grading science performance records. Results identified high technology integration, significant motivational gains, and considerable differences within learner profiles, along with a positive correlation among technology use, motivation, and academic performance. Such findings would imply that meaningful, sustained, and pedagogically grounded technology integration empowers engagement and sustains improved learning outcomes. This paper, therefore, concludes that strengthening teachers' digital pedagogical competence is important to ensure sustainability of gains and to inform future instructional innovations.

Literature Review

Technology-assisted instruction is widely conceptualized as a pedagogical approach that enriches learning through simulations, virtual laboratories, multimedia resources, and interactive digital platforms. Contemporary research positions technology as an instructional amplifier: it enhances conceptual understanding, supports inquiry-based learning, and strengthens motivation by fostering autonomy, competence, and meaningful engagement (Woldemariam et al., 2023; Sung

et al., 2016). Effective integration, however, requires alignment between digital tools and pedagogical intent, as teacher-centered practices often limit the transformative potential of technology (Hamid et al., 2023; Schindler, 2020). Motivation emerges as a critical mechanism linking technology and achievement, with digital environments shown to stimulate both intrinsic and extrinsic motivation through personalization, real-time feedback, and cognitively rich tasks (Ryan, 2020; Hattie, 2021). Studies further indicate that technology supports self-regulated learning by promoting goal setting, monitoring, and strategic adjustment (Zimmerman, 2020; Fullan, 2021). Empirical evidence across global contexts consistently reports improved science performance, stronger engagement, and enhanced self-efficacy when learners interact with simulations, virtual experiments, and computer-based learning environments (Gambari et al., 2017; Abou Faour & Ayoubi, 2017; Mihindo et al., 2017). Yet these benefits are moderated by teacher competence, infrastructure availability, and access to devices, underscoring the importance of institutional support and digital readiness (OECD, 2020; Kwon, 2022). Recent studies also highlight motivation as a significant predictor of science achievement, with technology increasing task value and learner confidence through interactive, feedback-rich activities (Means, 2021; Pintrich, 2020). Philippine-based research aligns with global trends, noting gains in engagement, performance, and self-efficacy, while emphasizing persistent challenges related to ICT utilization, teacher training, and equity of access (Garcia, 2021; Valencia, 2021; Ramos, 2021). Collectively, the literature establishes that technology integration enhances learning by optimizing motivation, feedback, cognitive engagement, and self-regulation, although its effectiveness ultimately rests on pedagogical alignment, teacher capacity, and the robustness of digital ecosystems.

II. METHODOLOGY

This study used a descriptive–comparative–correlational design to determine the level of technology integration in Science instruction, examine the differences across learner profiles, and determine its relationship with motivation and academic performance. The sample consisted of junior and senior high school students selected through stratified random sampling. Data were collected through a validated, pilot-tested, researcher-developed questionnaire measuring profile

variables, technology integration, and motivation on a five-point Likert scale; the instrument yielded a Cronbach's alpha of .964. After the required approvals, the respondents were oriented regarding the aims of the study, confidentiality, and voluntary participation, including consent procedures, after which they answered the instrument. The retrieved questionnaires were encoded and cleaned, and the Science grades in the first quarter were secured as the academic performance measure. Data analysis involved frequency and percentage computations for profile variables, mean scores for technology integration and motivation, and non-parametric tests through Kruskal–Wallis and Spearman's rho, consistent with normality test results showing non-normal distribution. This efficient approach thus proved to be ethical and sound while assessing the correlations among technology integration, motivation, and performance.

Research Design

This study utilized a descriptive-comparative-correlational design to measure the extent of technology integration in Science instruction; test differences among learner profiles in their perceived level of technology integration, motivation, and academic performance; and determine its relations to motivation and academic achievement. The descriptive aspect delineated technology adoption across essential domains of planning and preparation, teaching and learning processes, assessment practices, teacher competence, and infrastructure, plus intrinsic and extrinsic motivation, task value, self-efficacy, and goal orientation. Academic performance was measured through the first-grading Science scores. The comparative aspect tested whether perceptions of technology integration and motivation varied according to demographic variables such as age, sex, grade level, availability of devices, and family income. The correlational aspect made it possible to trace patterns between technology integration, motivation, and academic performance that best capture variable associations without suggesting cause-and-effect linkages. This integrated design enabled an in-depth examination into the current state of instructional practice and subgroup differences and inter-relations among variables that provide evidence for developing a structured intervention toward strengthening technology-supported Science instruction and improving learner motivation and performance.

Sample of the Study

The research sample included junior and senior high school students selected through stratified random sampling, ensuring proportional representation across grade levels. The approach captured changes in age, access to devices, and socioeconomic backgrounds that will perhaps influence perceptions about technology integration motivation and academic performance. Stratification on the basis of grade level minimizes sampling bias to preserve variation in the population. This resulted in 156 respondents sampled proportionally from Grades 7 to 12. The description of respondents used frequency and percentage, technology integration and motivation used mean scores, while their relationship and comparison between groups used appropriate inferential tests, either Pearson's r or Spearman's ρ for relationships, and t-tests or ANOVA depending on the distribution of data. This sampling and analytic strategy supported reliable generalization and a rigorous examination of patterns across demographic subgroups.

Measures

This study used a structured questionnaire developed by the researcher to quantify demographic characteristics of learners and the degree of integration of technology into Science classes, as well as motivational measures. The development of the instrument used in this research relied on extensive literature review and existing tools that were deemed valid and reliable. It consisted of three parts: (1) fixed-response items that asked about age, sex, grade level, device access, and family income; (2) technology integration indicators that consider planning, instructional processes, assessment, competency of teachers, and infrastructure; and (3) motivational dimensions such as intrinsic and extrinsic motivation, task value, self-efficacy, and goal orientation—all of which were subjected to a five-point Likert-type rating scale. Content validity was first determined through expert review for clarity, relevance, and match with variables within the study, secondarily followed by a pilot test with 30 learners to allow refinement in item structure and ambiguity. The reliability analysis showed a Cronbach's alpha of .964, indicating excellent

internal consistency. The final form thus furnished strong quantitative measures for investigations of technology integration, its motivational impact, and their relationship to academic performance..

Procedure

Data collection commenced after obtaining the necessary ethical and administrative approvals, followed by liaising with the schools to arrange the logistics involved in securing the data. Students were oriented on the purposes of the study prior to filling out the instrument, informing them about confidentiality provisions, free and voluntary participation, and procedures on securing informed consent. The researcher-constructed questionnaire had expert validation on the contents with experts in science education, educational technology, and measurement and evaluation and was further improved through a pilot test conducted with 30 learners to refine clarity, item order, and contextual relevance. Expert judgment obtained through a structured evaluation process using set criteria yielded a content validity index of 4.59, interpreted to be excellent, hence indicating that the instrument was strongly aligned with the study variables. The final survey was administered face-to-face, with the researcher overseeing the distribution and retrieval process and making adjustments in scheduling for maximum participation. Completed questionnaires were encoded, cleaned for errors, and prepared for analysis, and first-grade science scores of learners were secured as measures of academic performance. These standardized and strict processes ensured that ethical requirements, quality of data, and methodological integrity were upheld for the assessment of technology integration, motivation, and academic performance.

Data Processing

Data were thus analyzed using both descriptive and inferential statistical procedures to ensure systematic and precise interpretation. Frequency and percentage were used to summarize learner profiles; the mean and standard deviation described the degree of technology integration across key instructional domains and levels of intrinsic motivation, extrinsic motivation, task value,

self-efficacy, and goal orientation. Academic performance was summarized using frequency distributions based on official Science grades. Normality was evaluated with the Kolmogorov–Smirnov and Shapiro–Wilk tests; results indicated that all variables were not normally distributed, and thus non-parametric procedures were adopted. The Kruskal–Wallis test evaluated differences in perceptions of technology integration and motivation across demographic groups, while Spearman's rho quantified the associations among learner profiles, technology integration, motivation, and academic performance. These analytical procedures thus ensured valid, appropriate, and rigorous interpretation of the data..

III. RESULTS AND DISCUSSION

Implementation of Technology Integration in Teaching Science

This section presents the findings on the perceived level of technology integration in Science instruction as provided by student respondents. The analysis follows the five major areas of technology-assisted instruction: planning and preparation, teaching and learning processes, assessment and evaluation, teacher competence and confidence, and infrastructure and support. Each of these domains bears a mean score of its constituent indicators with an interpretation set against the Likert scale to provide a picture of the extent to which teachers incorporate digital resources in their lessons concerning Science..

TABLE 1
IMPLEMENTATION OF TECHNOLOGY INTEGRATION IN TEACHING SCIENCE
IN TERMS OF PLANNING AND PREPARATION

Item	Mean	Interpretation
1. My Science teacher plans lessons that already include videos, slides, or online materials.	3.89	Great Extent
2. Our lessons are clearly prepared using computers or digital tools.	3.96	Great Extent
3. The teacher chooses online activities that match what we need to learn in Science.	3.60	Great Extent
4. Before class, the teacher makes sure all digital materials are ready and working.	4.00	Great Extent
5. The Science lessons are well-organized because of the teacher's use of technology.	4.25	Very Great Extent
Overall Mean	3.94	Great Extent

Legend: 4.21-5.00= Very Great Extent; 3.41-4.20= Great Extent; 2.61-3.40= Moderately Extent; 1.81-2.60= Low Extent; 1.00-1.80= Very Low Extent

As shown in Table 1, the overall average for the Planning and Preparation domain is 3.94, which falls into the category of "Great Extent". This indicates that teachers generally use technology effectively to plan Science lessons. Of all indicators, the highest rated (4.25, Very Great Extent) refers to the fact that lesson organization improved due to the use of technology; this would mean that digital tools make great contributions toward lesson structure and coherence. The slightly lower mean for selecting online activities aligned with learning needs (3.60, Great Extent) shows that even though teachers actively incorporate digital resources into their practice, there is still a greater potential to align online activities more closely with specific learning objectives. Generally, these findings denote a positive adoption of technology in lesson planning, supporting more engaging, organized, and richly resourced Science instruction, and in line with previous research, digital tools are considered very instrumental in enhancing lesson preparedness and the effectiveness of instruction (Reiser & Dempsey, 2020; Ertmer & Ottenbreit-Leftwich, 2021).

TABLE 2
IMPLEMENTATION OF TECHNOLOGY INTEGRATION IN TEACHING SCIENCE
IN TERMS OF TEACHING AND LEARNING PROCESS

Item	Mean	Interpretation
1. We often use digital tools or apps during Science activities.	3.28	Moderate Extent
2. My teacher uses videos or animations to explain Science topics.	4.54	Very Great Extent
3. Online discussions or group tasks help us learn Science together.	3.39	Moderate Extent
4. We sometimes explore websites or simulations to understand Science lessons.	4.10	Great Extent
5. Technology makes our Science class more exciting and easier to understand.	4.69	Very Great Extent
Overall Mean	4.00	Great Extent

Legend: 4.21-5.00= Very Great Extent; 3.41-4.20= Great Extent; 2.61-3.40= Moderately Extent; 1.81-2.60= Low Extent; 1.00-1.80= Very Low Extent

Table 2 summarizes the perceived extent of technology integration within the Teaching and Learning Process domain. The overall mean of 4.00 shows that digital tools and resources are being used by teachers to a "Great Extent" in Science instruction. The highest-scoring item in this strand is "Technology makes our Science class more exciting and easier to understand" with a mean of 4.69, indicating a Very Great Extent as perceived by students that technology can serve

as an effective tool for keeping them more engaged and informed about Science. Likewise, the statement addressing the use of videos and animations to illustrate topics received a very high rating, 4.54, or Very Great Extent, which again reflects the instructor's use of varied, multimedia forms of learning.

Statements like “We often use digital tools or apps during Science activities” resulted in 3.28 (Moderate Extent), while “Online discussions or group tasks help us learn Science together” had 3.39 (Moderate Extent); these reflect that frequent or collaborative uses of technology are less consistent, likely out of limitations in terms of accessibility, familiarity, or structured integration of specific digital activities. Similarly, the moderate extent to which students use these tools points to further development that could be made in integrating more interactive applications and tools promoting online collaboration to enhance student participation.

Overall, the results suggest that technology is being adopted relatively well within teaching and learning, where the greatest use of technology is multimedia resources. These findings are consistent with previous research positioning technology as supportive of increased engagement, understanding, and motivation in Science; however, such integration requires effective teacher competence and consistent use across multiple classroom activities (Ertmer & Ottenbreit-Leftwich, 2021; Reiser & Dempsey, 2020).

TABLE 3
IMPLEMENTATION OF TECHNOLOGY INTEGRATION IN TEACHING SCIENCE
IN TERMS OF ASSESSMENT AND EVALUATION

Item	Mean	Interpretation
1. My teacher gives quizzes or tests using online forms or apps.	3.01	Moderate Extent
2. We submit Science assignments through online platforms or email.	3.86	Great Extent
3. I receive feedback from my teacher through digital tools (like chat or Google Classroom).	3.33	Moderate Extent
4. The teacher checks our work using computer-based tools.	3.78	Great Extent
5. Technology helps our teacher track our progress in Science.	4.22	Very Great Extent
Overall Mean	3.64	Great Extent

Legend: 4.21-5.00= Very Great Extent; 3.41-4.20= Great Extent; 2.61-3.40= Moderately Extent; 1.81-2.60= Low Extent; 1.00-1.80= Very Low Extent

Table 3 shows the perceived extent of technology integration in Assessment and Evaluation within Science instruction. The overall mean of 3.64 indicates that technology is utilized to a “Great Extent” in assessment. Among the specific indicators, the item “Technology helps our teacher track our progress in Science” got the highest rating (4.22, Very Great Extent), which points out that digital tools are particularly helpful in monitoring and tracking student progress. This finding may suggest that educators use technology to keep records of student performance promptly and accurately, hence helping improve feedback and inform instruction.

Items such as “We submit Science assignments through online platforms or email” (3.86, Great Extent) and “The teacher checks our work using computer-based tools” (3.78, Great Extent) denote strong integration of digital tools in assignment management and grading, reflecting efficiency and convenience in submission and evaluation processes. However, items such as “My teacher gives quizzes or tests using online forms or apps” (3.01, Moderate Extent) and “I receive feedback from my teacher through digital tools” (3.33, Moderate Extent) would mean that some aspects of assessment and feedback continue to be done conventionally, or that indeed, this practice is not uniformly implemented in all classes. These moderate scores reflect limitations either in the teachers’ use of digital assessment platforms or in the reliable access to the internet and devices of students.

Overall, the results suggest that technology is very important for enhancing assessment and evaluation practices, especially regarding progress tracking and digital submission. Nevertheless, there is still a possibility to increase the frequency of online quizzes and improve feedback timeliness to make fuller use of technology in support of effective and interactive assessment practices. This agrees with previous studies indicating that technology increases student engagement and deepens learning outcomes when consistently used for evaluation and subsequent feedback (Black & Wiliam, 2022; Ertmer & Ottenbreit-Leftwich, 2021).

TABLE 4
IMPLEMENTATION OF TECHNOLOGY INTEGRATION IN TEACHING SCIENCE
IN TERMS OF TEACHER COMPETENCE AND CONFIDENCE

Item	Mean	Interpretation
1. My Science teacher knows how to use computers, projectors, or online apps well.	4.89	Very Great Extent
2. The teacher teaches confidently when using technology in class.	4.45	Very Great Extent
3. When technical problems happen, the teacher can fix or handle them quickly.	4.67	Very Great Extent
4. The teacher shows us how to use technology safely and properly.	4.77	Very Great Extent
5. My teacher keeps learning new ways to use technology in teaching Science.	4.61	Very Great Extent
Overall Mean	4.68	Very Great Extent

Legend: 4.21-5.00= Very Great Extent; 3.41-4.20= Great Extent; 2.61-3.40= Moderately Extent; 1.81-2.60= Low Extent; 1.00-1.80= Very Low Extent

Table 5 shows the perceived extent of Teacher Competence and Confidence in integrating technology within Science instruction. The overall mean of 4.68 interpreted as “Very Great Extent” shows high levels of teacher competence and confidence when using digital tools to enhance learning experiences. All items scored very high ratings, suggesting that teachers were quite competent with the operation of computers, projectors, and online applications (4.89) and confident in their effective use in the classroom (4.45).

The ability to resolve quickly technical problems (4.67) and to instruct students in safe and proper use of technology (4.77) further reflect substantial preparedness and professional proficiency. These competencies contribute to a smooth learning environment, mitigate disruptions, and enhance students' engagement with technology-mediated lessons. The high level of continuous learning (4.61) reveals that teachers are proactive in updating their skills, signaling a commitment to professional growth and responsiveness to evolving educational technologies.

Put together, these findings suggest that teacher competence and confidence have been identified as the key enablers of successful technology integration in Science education. When teachers possess both technical skills and pedagogical confidence, they are able to apply

appropriate technology-based strategies for effective lesson delivery, enhancing interactive learning and giving positive student outcomes (Ertmer & Ottenbreit-Leftwich, 2021; Mishra & Koehler, 2020). This further calls for ongoing professional development programs and support structures that enhance teachers' digital literacy and instructional confidence.

TABLE 6
IMPLEMENTATION OF TECHNOLOGY INTEGRATION IN TEACHING SCIENCE
IN TERMS OF INFRASTRUCTURE AND SUPPORT

Item	Mean	Interpretation
1. Our classroom has a working projector or computer for Science lessons.	3.03	Moderate Extent
2. There is a stable internet connection when we use online Science activities.	3.10	Moderate Extent
3. The school provides enough devices (computers, tablets) for our Science classes.	3.45	Great Extent
4. We can borrow or use school gadgets when needed for Science lessons.	3.70	Great Extent
5. The school helps fix or maintain the technology used in our Science classes.	3.88	Great Extent
Overall Mean	3.43	Great Extent

Legend: 4.21-5.00= Very Great Extent; 3.41-4.20= Great Extent; 2.61-3.40= Moderately Extent; 1.81-2.60= Low Extent; 1.00-1.80= Very Low Extent

Table 6 reports the respondents' perceptions of Infrastructure and Support for technology integration in Science instruction. The over-all mean of 3.43, interpreted as "Great Extent," suggests that while some infrastructural support is available, several areas need improvement if the application of technology in teaching is to be fully optimized.

Items dealing with the availability of a working projector or computer (3.03) and internet connectivity that is reliable (3.10) were ranked at the "Moderate Extent," suggesting that restricted access to reliable hardware and internet prevents regular realization of lessons based on technology. In contrast, items regarding the availability of devices (3.45), the opportunity to borrow devices from school (3.70), and support for maintenance services (3.88) were rated at "Great Extent," which means that the school does offer mechanisms to be able to use technology. However, these may not be entirely sufficient or equally accessible in every class.

These results suggest that although the teachers are competent and confident in using technology, the level of technology integration is at least in part constrained by infrastructural limitations. As is noted by UNESCO 2021 and Ertmer & Ottenbreit-Leftwich 2021, working devices, stable internet access, and support help to guarantee the success of technology-assisted instruction. Improving infrastructure deficiencies and ensuring timely maintenance and adequate availability of devices can be expected to enhance teacher performance and student involvement in technology-mediated Science lessons.

Effects of Technology Integration on Students’ Motivation

This section unpacks the perceived effects of technology integration on students' motivation to learn Science. The discussion is organized around the principal dimensions of motivation-intrinsic motivation, extrinsic motivation, task value and relevance, self-efficacy and confidence, and goal orientation and persistence. The findings shed light on how digital tools, online resources, and interactive technologies shape the ways learners engage in, show enthusiasm for, and demonstrate commitment to Science education.

TABLE 7
EFFECTS OF TECHNOLOGY INTEGRATION ON STUDENTS’ MOTIVATION IN TERMS OF INTRINSIC MOTIVATION

Item	Mean	Interpretation
1. Enjoying Science activities that involve the use of technology.	4.88	Very Great Extent
2. Showing curiosity to explore new scientific ideas through digital media.	3.76	Great Extent
3. Feeling more engaged in lessons that include interactive technology.	3.70	Great Extent
4. Taking initiative to use educational apps or websites for Science learning.	3.78	Great Extent
5. Expressing satisfaction when mastering technology-based Science tasks.	4.30	Very Great Extent
Overall Mean	4.08	Great Extent

Legend: 4.21-5.00= Very Great Extent; 3.41-4.20= Great Extent; 2.61-3.40= Moderately Extent; 1.81-2.60= Low Extent; 1.00-1.80= Very Low Extent

Table 7 presents respondents' perceptions of how integration of technology influences intrinsic motivation in Science learning. The total mean of 4.08 suggests that integration of technology has a tremendous impact on students' intrinsic motivation. Of the items, students responded most strongly to being motivated while participating in Science activities that integrate technology (M = 4.88) and feeling satisfaction when mastering technology-enhanced tasks in Science (M = 4.30), with both falling within a very great extent. These findings point to the conclusion that technology-enhanced, interactive activities create a positive learning environment that fosters engagement with active content and personal satisfaction from accomplishing the task.

Items that reflect more curiosity, engagement, and initiative-such as exploring new ideas in science through digital media (M = 3.76), being engaged during lessons where interactive technology is used (M = 3.70), and taking initiative in using educational apps or websites (M = 3.78)-are rated slightly lower but still judged to reflect a great extent. This indicates that, while technology effectively stimulates interest and participation, some students may still require guidance or scaffolding to fully leverage digital tools for independent exploration.

Overall, the data show that technology integration enhances intrinsic motivation because Science lessons become more enjoyable, interesting, and rewarding personally. These findings confirm previous studies declaring that digital learning tools enhance self-directed learning, curiosity, and interest in learning academic content continuously (Saavedra & Opfer, 2012; Chen et al., 2020). Such results point to the need for consistent and purposeful use of technology to develop intrinsic motivation among secondary school learners.

TABLE 8
EFFECTS OF TECHNOLOGY INTEGRATION ON STUDENTS' MOTIVATION IN TERMS OF EXTRINSIC MOTIVATION

Item	Mean	Interpretation
1. Striving to earn higher grades when technology is used in Science lessons.	3.95	Great Extent
2. Completing online Science tasks to receive teacher recognition or rewards.	3.45	Great Extent
3. Participating actively to gain positive feedback through digital platforms.	3.66	Great Extent
4. Competing with peers in online Science activities or quizzes.	4.34	Very Great Extent
5. Following teacher instructions carefully when using digital tools.	4.56	Very Great Extent
Overall Mean	3.99	Great Extent

Legend: 4.21-5.00= Very Great Extent; 3.41-4.20= Great Extent; 2.61-3.40= Moderately Extent; 1.81-2.60= Low Extent; 1.00-1.80= Very Low Extent

Table 8: Respondents' perceptions regarding technology integration and extrinsic motivation in Science learning. The overall mean of 3.99 suggests that technology integration substantially enhances extrinsic motivation. Participants reported the highest motivation in adhering closely to teacher instructions when using digital tools ($M = 4.56$) and in engaging in competitive activities with peers in online Science tasks or quizzes ($M = 4.34$), both indicating a very great extent. These findings imply that technology fosters compliance with instructional guidance and promotes a healthy sense of competition that bolsters accountability and drive in completing academic tasks.

Measures of motivation through rewards and recognition - such as completing online tasks to obtain teacher feedback or recognition, $M = 3.45$, and striving for higher grades when technology is employed, $M = 3.95$ - were interpreted as a great extent, indicating that, indeed, external incentives effectively stimulate participation, albeit with variability across learners. Participation for positive feedback through digital platforms also received a great extent rating, $M = 3.66$, underscoring the role of interactive and responsive technologies in sustaining student engagement.

Taken together, the results suggest that technology integration enhances extrinsic motivation by embedding scaffolding, rewards, and competition. These findings are also consistent with prior work, which has noted that technology tools and game-based learning approaches tend to increase students' performance goals and susceptibility to external contingencies in academic settings (Deci & Ryan, 2000; Huang et al., 2019). This speaks to the potential for technology-enhanced instruction to foster a motivating context that supplements intrinsic interest with tangible rewards..

TABLE 9
EFFECTS OF TECHNOLOGY INTEGRATION ON STUDENTS' MOTIVATION IN TERMS OF TASK VALUE AND RELEVANCE

Item	Mean	Interpretation
1. Recognizing the importance of technology in understanding Science concepts.	4.41	Very Great Extent
2. Perceiving technology-based lessons as meaningful and applicable to real life.	4.77	Very Great Extent
3. Valuing digital learning tools as essential aids in Science education.	4.15	Great Extent
4. Appreciating the relevance of technology to future scientific careers.	4.43	Very Great Extent
5. Relating Science topics to real-world problems through technology use.	4.56	Very Great Extent
Overall Mean	4.47	Very Great Extent

Legend: 4.21-5.00= Very Great Extent; 3.41-4.20= Great Extent; 2.61-3.40= Moderately Extent; 1.81-2.60= Low Extent; 1.00-1.80= Very Low Extent

Table 10 presents the perceptions of students regarding the value of tasks and relevance of technology integration in Science education. The mean of 4.47 indicates that students perceive technology-enhanced instruction to increase substantially the value and applicability of their learning. In summary, the highest rated items are the perceived meaningfulness and real-world applicability of technology-based lessons (M = 4.77) and linking the Science topics to real-world problems through the use of technology (M = 4.56). These results suggest that students recognize the practical benefits of technology in linking classroom content to real-life applications, which in turn reinforces motivation and engagement.

Participants also agreed to the role of technology in understanding Science concepts (M = 4.41) and placed value on its relevance to prospective scientific careers (M = 4.43), interpreted as a very great extent, reflecting an awareness of the function of digital tools in preparing them for advanced study and professional pathways. Valuation as essential aids in Science education was slightly lower with a mean of 4.15, but this is still within a very great extent category. This suggests that while students acknowledge the importance of these tools, some regard them as supplementary, rather than indispensable.

In sum, the results showed that technology integration not only supports comprehension but also increases the perceived relevance and meaningfulness of Science learning. This again echoes perspectives from the literature on teaching and learning, which suggest that digital and

interactive tools foster task value by providing ways for students to learn in an authentic manner related to their future pursuits (Schunk et al., 2014; Wang & Hannafin, 2005). Such beliefs become important because perceiving tasks as useful promotes sustained engagement and motivation in academic settings.

TABLE 11
EFFECTS OF TECHNOLOGY INTEGRATION ON STUDENTS' MOTIVATION IN TERMS
OF SELF-EFFICACY AND CONFIDENCE

Item	Mean	Interpretation
1. Believing in one's ability to complete technology-based Science tasks.	3.25	Moderate Extent
2. Feeling capable of using digital tools to understand Science lessons.	3.63	Great Extent
3. Overcoming challenges when learning with new technologies.	3.88	Great Extent
4. Showing confidence in presenting Science projects using multimedia.	3.21	Moderate Extent
5. Demonstrating independence in exploring Science concepts through apps.	3.12	Moderate Extent
Overall Mean	3.42	Great Extent

Legend: 4.21-5.00= Very Great Extent; 3.41-4.20= Great Extent; 2.61-3.40= Moderately Extent; 1.81-2.60= Low Extent; 1.00-1.80= Very Low Extent

Table 11 summarizes the respondents' perceptions of self-efficacy and confidence in carrying out science tasks based on technology integration. The overall mean of 3.42 suggests that students consider technology integration as an important contributor to the development of self-efficacy and confidence. This means that while students generally feel capable and autonomous when using digital tools, they feel varying degrees of confidence concerning various uses.

The highest perceptions among the items are those related to overcoming challenges when learning with new technologies (M = 3.88) and feeling capable of using digital tools to comprehend science lessons (M = 3.63), both interpreted as to a great extent. These findings, therefore, denote that students are relatively comfortable with the navigation of digital platforms and the employment of such in enhancing their understanding of the science content.

In contrast, items such as belief in one's ability to complete technology-based science tasks ($M = 3.25$), confidence in presenting science projects using multi-media ($M = 3.21$), and independence in exploring science concepts through apps ($M = 3.12$) were rated at a moderate extent. This pattern suggests that some students may still require guidance, scaffolding, or practice to fully develop confidence and autonomy in performing more complex or evaluative tasks with technology.

The overall results revealed that technology integration positively impacted students' self-efficacy and confidence in science learning, while it also pointed out the areas for further improvement. Specific instructional supports, practical experience, and scaffolded activities may enhance students' independent skills in applying digital tools and hence improve their competence and confidence. These findings again corroborate Bandura's social cognitive theory of 1997 that mastery experiences, social modeling, and constructive feedback are critical to developing self-efficacy among learners.

TABLE 12
EFFECTS OF TECHNOLOGY INTEGRATION ON STUDENTS' MOTIVATION
IN TERMS OF GOAL ORIENTATION AND PERSISTENCE

Item	Mean	Interpretation
1. Setting learning goals when using technology in Science lessons.	3.08	Moderate Extent
2. Continuing to work on Science tasks despite technical difficulties.	3.55	Great Extent
3. Maintaining focus on learning objectives when using digital tools.	3.39	Moderate Extent
4. Persisting in completing online Science activities even when challenged.	3.73	Great Extent
5. Striving to improve performance in Science through consistent technology use.	4.25	Very Great Extent
Overall Mean	3.60	Great Extent

Legend: 4.21-5.00= Very Great Extent; 3.41-4.20= Great Extent; 2.61-3.40= Moderately Extent; 1.81-2.60= Low Extent; 1.00-1.80= Very Low Extent

Table 12 presents the descriptive statistics for goal orientation and persistence within technology-enhanced science learning as reported by respondents. The mean of 3.60 suggests that

to a considerable extent, students show goal-directed behavior and persistence when interacting with digital tools during science instruction. This finding may indicate a positive contribution of technology integration on students' commitment to learning and their ability to put in more effort to get through difficult work.

Regarding individual items, students rated their effort to improve performance in science through continuous use of technology highest ($M = 4.25$, Very Great Extent), indicating that ongoing engagement with digital tools motivates pursuit of higher achievement. Continuing to work on science tasks despite technical difficulties ($M = 3.55$) and persisting in the completion of online science activities when faced with challenges ($M = 3.73$) were rated at a great extent, suggesting that technology fosters resilience and determination in the learning process.

However, items related to establishing learning goals while using technology in science lessons, and focusing on learning objectives during the use of digital tools, were rated at the moderate level of $M = 3.08$ and $M = 3.39$, respectively. This suggests that even though pupils generally show persistence, they may need additional guidance with respect to goal-setting and sustained focus within digital learning environments.

Overall, results suggest that technology not only engages students but also encourages persistence and motivation toward academic achievement. It supports the work of Pintrich and De Groot (1990) on goal orientation and perseverance as critical determinants for academic success, especially within interactive and engaging learning contexts. The moderate ratings in this regard on goal-setting and focus suggest that structured scaffolding strategies are needed to help students effectively plan and monitor their learning when using technology.

Academic Performance in Science of the Respondents Based on Their Grades from the First Grading Period

This section shows the academic performance of the respondents in Science, as reflected by their grades for the first grading period. The analysis will provide an overview of students' achievement level and set findings in context regarding possible effects of the integration of technology and motivational factors on learning outcomes. An examination of the grade

distribution is helpful in identifying areas of strength and those aspects that may need further instructional support.

TABLE 13
ACADEMIC PERFORMANCE IN SCIENCE OF THE RESPONDENTS BASED ON THEIR GRADES FROM THE FIRST GRADING PERIOD

	Frequency	Percentage
Outstanding	-	-
Very Satisfactory	38	24.40
Satisfactory	114	73.10
Fairly Satisfactory	4	2.60
Did Not Meet Expectation	-	-
Overall Mean	156	100.00
Mean=84		
SD=2		

Legend: 4.21-5.00= Very Great Extent; 3.41-4.20= Great Extent; 2.61-3.40= Moderately Extent; 1.81-2.60= Low Extent; 1.00-1.80= Very Low Extent

Table 13 shows the distribution of grades in Science for the cohort. The majority of the students got a Satisfactory performance, with 114 respondents (73.10%) in the 80–84 range, indicating that most of the learners have met the expected standards of learning in Science and have a good grasp of the concepts. A smaller proportion, 38 respondents (24.40%), rated Very Satisfactory performance (85–89), indicating higher-than-average understanding and application of the learning in the subject. There were 4 (2.60%) students who obtained a Fairly Satisfactory grade (75–79), which would suggest that a small part of the class may need extra help to meet expectations in Science learning. No student fell within the Outstanding and the Did Not Meet Expectation grades, meaning there are no very high or low performers in this cohort.

The overall trend represents a generally consistent achievement pattern across class components and with most students performing at or above satisfactory levels. Such distribution might be indicative of effectiveness within instructional approaches, such as integration with technology, which can increase both engagement and comprehension, as found by Mishra & Koehler, 2006. The emergence of Very Satisfactory performers further depicts that some students greatly benefit from instructional intervention along with the availability of digital learning tools.

On the other hand, the small percentage of Fairly Satisfactory students can indicate differentiated instruction or extra scaffolding might be necessary for all learners to reach their full capacities.

In summary, the academic performance data indicate a generally positive performance in Science for the first grading period, thus laying the foundation for reviewing the relationship between technology integration, student motivation, and learning achievement in further analyses.

IV. CONCLUSION

Results showed that learners come from varied demographic and socioeconomic backgrounds, which, in turn, affect the differences in their access to digital resources, experiences of learning, and performance in Science. The practice of integration is across the board in planning, teaching, evaluation, teacher capacity, and infrastructure, suggesting that teachers are largely competent in integrating digital tools for instruction. This practice contributes significantly to enhancing students' motivation by strengthening intrinsic interest, confidence, task value, and goal orientation, while also contributing positively to extrinsic motivation. Students' academic performance ranges from satisfactory to very satisfactory, reflecting that technology-enhanced instruction contributes to achieving the expected competencies in Science. The study confirms the crucial role of meaningful technology integration in enhancing motivation and improving learning performance and, implicitly, hints at further sustaining and refining the use of technology in pedagogical practices.

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