

Technology-Driven Education: Analyzing the Synergy among Innovation, Motivation, and Student Engagement

Emybel M. Alegre*

College of Education, Caraga State University, Butuan City, Caraga Region, Mindanao, Philippines. E-mail: emalegre@carsu.edu.ph

Abstracts: This quantitative research study aimed to investigate the relationship between classroom technology integration, student engagement, and motivation. The study had multiple objectives, including identifying the technologies currently used in the classroom, assessing student engagement and motivation in using technology for learning, exploring students' perceptions of promoting technology innovation, examining the relationship between engagement, motivation, and perception, and proposing an intervention program to enhance technology use in the classroom. To achieve these objectives, a survey questionnaire was administered to collect data from students regarding their perceptions of technology use, engagement levels, and motivation. The collected data were analyzed using descriptive statistics and correlation analysis. The study revealed a significant positive correlation between classroom technology integration and student engagement and motivation. Students exhibited positive attitudes towards technology use, recognizing its impact on their knowledge, skills, and confidence. The results identified the value of innovation in the classroom and the necessity of continued professional development to promote successful technology integration. The study recommended an intervention program to support and encourage teachers to use technology in the classroom effectively. Overall, this study adds to our knowledge of the connection between technology, student engagement, and motivation. This highlights the advantages of incorporating technology into the classroom and the importance of ongoing professional development for teachers. Through the proper integration of technology, educators can improve the learning outcomes for students by using the information gathered from this study to create engaging learning environments.

Keywords: Education, Engagement, Innovation, Motivation, Technology.

1. INTRODUCTION

The broad use of technology in the educational process is one of the many fundamental developments brought about by the coronavirus (COVID-19) epidemic. Initial research claimed that remote learning increased student achievement, but there have been doubts raised about whether these gains will hold true if students return to traditional classroom settings. The intention of this study is to look into how technology affects student engagement and motivation in a classroom environment.

The rapid advancement of technology has caused a constant change in our world. Today, communication, work, and education are just a few of the areas where technology has a big impact on our daily lives. Technology integration in the classroom has evolved into a revolutionary force that has created new opportunities for student engagement, inspiration, and innovation. The study aims to investigate how technology, innovation, motivation, and student involvement interact in complicated ways within the context of education. By analyzing how the usage of technology affects student experiences and outcomes, it seeks to provide insightful information and practical outcomes. Recent years have seen a substantial increase in the use of technology in the classroom, with a growing body of research demonstrating its potential advantages. It makes it easier to access a wealth of knowledge, encourages teamwork and communication, and develops creativity and critical thinking abilities. The study also underlines how well-integrated technology may be in educational methods to raise academic achievement by enhancing student motivation and engagement.

Chen and Jang (2019) also examined the impact of cutting-edge technology on student engagement in a different study, including virtual reality and augmented reality. According to the research, these tools markedly raised student engagement levels and students' excitement for learning. Students were more eager to participate actively in their learning because of the immersive nature of virtual reality and augmented reality experiences, which provided them a sense of exploration and adventure.

The Social Cognitive Theory by Albert Bandura offers crucial fresh perspectives on the connections between student participation, motivation, and technology. According to Bandura, people develop and learn through observation, imitation, and reinforcement of behaviors. The Social Cognitive Theory holds that how peers and teachers use technology in the classroom can have an impact on students' motivation and engagement. This idea was supported by a study by Shadiev (2021), which revealed that students were more likely to have a positive attitude toward technology and be encouraged to engage in similar ways if they witnessed others effectively using it for learning.

According to a Jones and Cuthrell (2019) study, incorporating technology can boost student engagement and promote active learning. The study found that students who actively used digital tools and resources were more driven, passionate, and involved in their education. Technology-enhanced learning opportunities also made it possible for training to be tailored to the needs and preferences of each individual student. In a study published in 2018, Vosniadou and Skopeliti emphasized the positive impact of technology on student motivation. The findings demonstrated that intrinsic motivation was boosted by dynamic and engaging learning opportunities offered by technologically advanced learning environments. Through technological tools such as instructional programs, simulations, and multimedia information, students had the opportunity to actively investigate, solve problems, and increase their knowledge. Integration of technology and the notion of educational innovation go hand in hand. Innovative classroom technology applications can revolutionize conventional teaching strategies by giving teachers new ways to engage students and enhance their academic outcomes. In a study, Sandholtz et al. (2020) looked at the relationship between creative teaching methods and student engagement. The study found that teachers who used cutting-edge, technologically oriented pedagogies saw higher levels of student engagement and increased academic performance.

Despite the obvious advantages of technology in education, it is critical to acknowledge and address the difficulties and constraints related to its use. The so-called "technology gap," which describes students unequal access to electronic tools and infrastructure across a range of socioeconomic backgrounds, is one of these issues. Research students' by Warschauer (2021) that pushed for solutions to the technological divide and ensured that all students had an equal opportunity to use technology for learning recognized the issue of technological equality integration.

In a broader sense, using technology in the classroom has the potential to greatly increase student ingenuity, motivation, and engagement. By bolstering studies that show the positive benefits of technology on student outcomes, this research aims to advance our body of knowledge. By studying the complicated interaction between technology, creativity, motivation, and student engagement, this study intends to provide insights and recommendations for educators, policymakers, and stakeholders in maximizing the potential of technology to build dynamic and effective learning environments. By having a solid understanding of this relationship, we can navigate the challenges and seize the opportunities that technology presents in affecting the future of education.

2. THEORETICAL FRAMEWORK

This study was anchored on a variety of significant theories that explore the connections between technology, innovation, motivation, and student engagement in learning. These theories serve as a basis for analyzing the complex relationships and interactions between these essential components.

One of the main theories directing this study is the Social Cognitive Theory, which was introduced and developed by Bandura (1986). According to the Social Cognitive Theory, people grow and learn through imitation, observation, and the reinforcement of behaviors. This theory also highlights the reciprocal interaction between people and their environment. In line with Social Cognitive Theory, students' motivation and engagement can be affected by seeing how creatively teachers and peers use technology in the classroom. Students who see others effectively using technology for learning are more likely to adopt a good attitude toward it and be inspired to use it in the same manner. By incorporating Social Cognitive Theory, this study acknowledges the value of observational learning and the influence of the environment in determining students' motivation and engagement with technology

in educational settings. It offers a lens through which the impact of creative technology use by teachers and peers on students' motivation and engagement can be assessed.

Another significant theory guiding this study is the Technology Acceptance Model (TAM), proposed by Davis (1989). TAM investigates the elements that affect people's adoption and acceptance of technology. The perception of value, as well as perceived usability, are crucial factors in determining people's attitudes and intentions toward utilizing technology, explains TAM. Students are more inclined to accept technology and participate actively in educational activities when they believe it to be useful and simple to use. According to TAM, two important variables—perceived usefulness and perceived ease of use—are important predictors of people's attitudes and intentions toward technology. The degree to which people think employing a certain technology would improve their performance or make their activities easier to complete is known as perceived usefulness. On the other side, perceived ease of use refers to the extent to which people think using technology will be simple and effortless.

3. METHODS

This study aimed to investigate the relationship between student motivation and engagement in classroom-based learning and technological innovation. To achieve this goal, a quantitative-correlational approach was considered the most suitable. The researchers intended to explore the significant relationship between technological innovation, student motivation, and engagement, and assess the strength of this relationship using this methodology.

The researchers employed a systematic process to gather descriptive data for the study. They took strict precautions to protect the participants' privacy and rights throughout the research process, ensuring confidentiality and obtaining informed consent. By using a quantitative-correlational method, the study aimed to provide valuable insights into the nature of the relationship between technological innovation and student motivation and engagement in the context of classroom-based learning.

The study utilized a design known as simple random sampling, a research method that involves selecting participants from a larger population in a random and unbiased manner. This approach ensures that every individual in the population has an equal chance of being included in the sample, thereby reducing selection bias and enabling the generalizability of the findings. The use of this technique allowed the researchers to draw accurate conclusions and make statistical inferences about the population of interest, providing equal chances of selection for every person.

For data gathering and conducting a survey, the research employed a structured Likert scale questionnaire. To ensure its appropriateness and suitability for the study, the researchers provided a copy of the questionnaire to three experts for validation. These experts reviewed the research questionnaire to determine if it was appropriate and a reliable tool for the study. The researchers collected accurate data by utilizing the test survey to gather precise answers from the participants.

The questionnaire consisted of four sections: Section 1 focused on the availability of technologies in the classroom, Section 2 focused on students' engagement in classroom technology, Section 3 focused on students' motivation using technology in the classroom, and Section 4 focused on promoting technology innovation.

The study involved conducting frequency, percentage, mean, and Pearson correlation analyses based on the collected data. Frequency analysis was used to determine the occurrences of different values or categories within a variable. In this study, a scored Likert scale was employed to measure frequency. Additionally, discussing the percentage of responses provided further insights by illustrating the proportion of participants who selected each response category. The mean was calculated to measure the central tendency and provide an average value for the data set. In this study, the researcher calculated the mean for the Likert scale responses. Comparing means across different items or groups allowed for the identification of significant differences.

Pearson correlation analysis was utilized to measure the strength and direction of the linear relationship between two continuous variables. In this study, the Pearson correlation was used to examine the relationship between technology innovation and student motivation and engagement. The obtained correlation coefficients were discussed to determine whether the relationship was positive or negative and whether it was statistically significant.

4. RESULTS

This section presents the results and discussions of the study, which aimed to analyze the technology-driven education synergy among innovation, motivation, and student engagement.

Table 1 presents the mean distribution of student engagement levels in using technology in classroom-based learning. The indicators show that students generally have a positive perception and experience with technology in the classroom. They find technology engaging and enjoyable, indicating that it has the potential to captivate their interest and create a positive learning environment.

Table 1. Mean Distribution of the level of student engagement in using technology in classroom-based learning

Indicators	Mean	Description
1. I find technology in the classroom to be engaging.	4.00	Agree
2. I feel that technology in the classroom makes learning more enjoyable for me.	4.04	Agree
3. I feel more motivated to participate in class when technology is used.	3.71	Agree
4. I learn more effectively when technology is used in the classroom.	3.82	Agree
5. I am able to collaborate more effectively with my peers when technology is used in the classroom.	3.65	Agree
6. I would like to see more technology being used in the classroom to enhance my learning experience.	4.01	Agree
Overall Mean	3.87	Agree

Legend: 4.50 – 5.00 – Strongly agree; 3.50 – 4.49 – Agree; 2.50 – 3.49 – Neutral; 1.50 – 2.49 – Disagree; 1.00 – 1.49 –

Students also feel more motivated to participate and learn effectively when technology is used. It enables them to collaborate more effectively with their peers, fostering teamwork and communication skills. The overall mean score reflects a general agreement among students that technology enhances their learning experience, and they express a desire for more technology integration. However, it is important to consider individual differences and the quality of technology implementation when assessing its effectiveness. Nonetheless, these findings emphasize the significance of integrating technology thoughtfully to cater to students' preferences and create engaging classroom environments.

According to the study by Kahu et al., (2018), it found that students who actively engage with technology in their learning process have higher levels of engagement and academic achievement compared to those who do not integrate technology. Another study suggests that using VR technology enhances student engagement by providing interactive and immersive experiences, which ultimately lead to improved performance. The study found that students who used VR in their STEAM learning activities demonstrated higher levels of engagement and achieved better learning outcomes compared to those who did not (Akçayir, 2018).

The indications in Table 5 show how participants feel and perceive how technology has affected their motivation to study in a classroom setting. The participants' level of agreement or disagreement is shown by the mean scores.

Table 2. Mean Distribution of the level of motivation of the participants in using the technology in the classroom-based learning

Indicators	Mean	Description
1. I feel motivated to learn when technology is used in the classroom.	3.97	Agree
2. I am more confident in my abilities when I use technology to learn.	3.83	Agree
3. I better understand the subject matter when technology is utilized in the classroom.	3.87	Agree

4. I find technology to be a useful tool for collaborative learning.	3.96	Agree
5. I learn more effectively when technology is integrated into the classroom.	4.09	Agree
6. I would like to see more technology being used in the classroom to enhance my motivation to learn.	4.01	Agree
Overall Mean	3.95	Agree

Legend: 4.50 – 5.00 – Strongly agree; 3.50 – 4.49 – Agree; 2.50 – 3.49 – Neutral; 1.50 – 2.49 – Disagree; 1.00 – 1.49 – Strongly disagree

The findings revealed that participants reported high levels of motivation when technology was used in the classroom. The highest mean was observed for the indicator of improved learning with a mean of 4.09, indicating that participants strongly believed that the integration of technology enhanced their overall learning experience. On the other hand, the lowest mean was observed for the indicator of increased confidence in their abilities with a mean of 3.83 suggesting that participants felt slightly less confident in their own capabilities when technology was utilized in the classroom.

The study conducted by Schaen et al. (2016) provides supporting evidence for the positive impact of technology on student motivation and learning. The project described in their study involved third-grade leaders and first-graders collaborating to create a math practice app for kindergarteners. This project not only incorporated technology but also fostered student collaboration and active engagement in the learning process. By involving students in the creation of an educational app, it provided them with a real-world purpose for their learning, which is known to enhance motivation. Teo and Noyes (2017) explored the factors influencing student motivation to use online discussion forums in higher education. They found that the perceived usefulness of online forums, learner autonomy, and interaction with peers were key motivational factors.

The participants strongly agreed that technology had a beneficial effect on their desire to study in a classroom setting, as evidenced by the total mean score across all indications being 3.95. These results imply that participants are aware of how using technology in the classroom can increase motivation. The participants' positive thoughts and experiences serve as a reminder of how technology has the potential to boost motivation and facilitate successful learning.

The indicators in Table 3 show what students think and believe about how technology might encourage innovation and improve their learning. The students' levels of agreement or disagreement are shown by the mean scores. According to the findings, students have a favorable opinion of encouraging technological innovation in classroom-based learning. The average scores for all indicators fell into the "Agree" category, ranging from 3.76 to 4.13. The findings revealed that students perceived technology integration in the classroom positively. The highest mean score was obtained for the indicator of improved learning experience with a mean of 4.13, indicating that students strongly believed that technology enhanced their overall learning journey. On the other hand, the lowest mean score was observed for the indicator of improved creativity and problem-solving abilities with a mean of 3.76, suggesting that students may have a relatively lower perception of technology's impact on their creative and problem-solving skills.

Table 3. Mean Distribution of the Student's Perception of promoting technology innovation in classroom-based learning

Indicators	Mean	Description
1. I find that technology integration enhances my learning experience.	4.13	Agree
2. I think technology integration fosters my creativity and problem-solving skills.	3.76	Agree
3. I believe that technology allows me to collaborate effectively with my peers.	3.86	Agree
4. I feel empowered and confident when using technology for learning and creating innovative projects.	4.07	Agree
5. I believe that technology in the classroom can help me develop useful skills for the future.	3.88	Agree
6. I am willing to take part in training or workshops related to using technology in the classroom.	3.90	Agree
Overall Mean	3.93	Agree

Legend: 4.50 – 5.00 – Strongly agree; 3.50 – 4.49 – Agree; 2.50 – 3.49 – Neutral; 1.50 – 2.49 – Disagree; 1.00 – 1.49 – Strongly disagree

The current student generation is developing during the Information Age. It's not just possible, but also essential, to have access to the internet and other types of technology. Both students and teachers stand to gain from embracing technology to increase student participation. Education professionals can work more productively while student academic performance can be enhanced (Francis, 2017). By using technology to involve students in the classroom, educators can foster a sense of belonging, accessibility, support, motivation, curiosity learning, and self-control (Bond & Bedenlier, 2019).

The average score overall across all factors was 3.93, which shows that students generally believe that encouraging technological innovation in classroom-based learning is a good thing. These results imply that students understand the importance of integrating technology in promoting creativity and improving their educational experiences. The students reported positive attitudes and beliefs showing how technology has the ability to empower individuals, develop their talents, and foster a collaborative and creative learning environment.

Table 4 includes the correlation coefficient (r-value), p-value, explanation, and choice depending on the degree of significance (0.05). The goal of the analysis was to ascertain whether there is a substantial connection between students' motivation, engagement, and perceptions of fostering technological innovation in classroom-based learning. Using an r-value of .668** (p<.001), the correlation study demonstrated a strong association between students' motivation and involvement. This demonstrates that there is a significant and favorable connection between the two variables.

Table 4. Correlation analysis between the level of student engagement and motivation

Variables	r-value	p-value	Interpretation	Decision
Student's engagement and Motivation	.668**	.000	Significant	Reject Ho

Level of significance at 0.05

The p-value, which is smaller than the specified significance level of 0.05, indicates that there is a statistically significant association between student engagement and motivation. These results allow us to reject the null hypothesis (Ho), which claims that there is no connection between students' motivation and engagement. Several studies have provided evidence supporting the positive effects of educational technologies on student outcomes. For instance, Daehlen (2017) found that students who have access to and utilize educational technologies tend to achieve higher academic success compared to those who do not use such technologies. Furthermore, Francis (2017) revealed that integrating educational technology into the classroom can enhance student motivation levels. This suggests that students are more likely to be motivated and engaged in their learning when technology is incorporated effectively.

The findings suggest that motivation tends to rise along with student engagement levels and vice versa. The study implies that students who are more motivated are more likely to be more involved in classroom-based learning activities incorporating technology, and students who are more motivated are more likely to be more engaged.

Table 5 shows the correlation analysis between the level of student engagement and how favorable they feel about supporting technological innovation in classroom-based learning. The target of this investigation was to determine whether there is a substantial correlation between students' participation and how they feel about encouraging technological innovation in the classroom.

Table 5. Correlation analysis between the level of student engagement and their perception of promoting technology innovation in classroom-based learning

Variables	r-value	p-value	Interpretation	Decision
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Student's engagement and Perception of promoting technology innovation in classroom-based learning	.692**	.000	Significant	Reject Ho
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Level of significance at 0.05

Students' engagement and their view of supporting technological innovation in the classroom were found to be positively correlated, with an r-value of .692** ($p < .001$) between the two variables. The p-value indicates that the association is statistically significant because it is below the specified significance level of 0.05. These results allow us to reject the null hypothesis (H_0), which claims that there is no connection between students' involvement and how supportive they feel of technology innovation in classroom-based learning.

Based on the findings, students' perceptions of encouraging technological innovation in the classroom tend to increase when their level of engagement does, and vice versa. This shows that students who are more involved in technology-based learning activities in the classroom are more likely to view it as a catalyst for innovation in their educational setting. McElhany (2017) discovered that educational technologies offer students the opportunity to have fun and make choices within their education. This increased sense of enjoyment and ownership contributes to heightened motivation levels. Estapa and Nadolny (2015) conducted research indicating that students in technology-centered classroom environments tend to enjoy their schoolwork and classes more than those who do not have access to technology. This positive experience further bolsters motivation and engagement.

Table 6 shows the results of a correlation study between students' perceptions of encouraging technological innovation in classroom-based learning and their degree of motivation. The intent of this study was to determine whether there is a correlation between students' motivation and how they feel about encouraging technological innovation in the classroom.

Students' motivation and their view of supporting technological innovation in classroom-based learning were found to be positively correlated, with an r-value of .834** ($p < .001$) between the two variables. The connection appears to be statistically significant as indicated by the p-value, which is less than the specified significance level of 0.05. These results allow us to reject the null hypothesis (H_0), which claims that there is no connection between students' motivation and how they see fostering technological innovation in the classroom.

Table 6. Correlation analysis between the level of motivation and their perception of promoting technology innovation in classroom-based learning

Variables	r-value	p-value	Interpretation	Decision
Motivation and Perception of promoting technology innovation in classroom-based learning	.834**	.000	Significant	Reject Ho

Level of significance at 0.05

Based on the findings of the study, it was shown that there is a connection between students' motivation levels and how favorable they feel about technological innovation in the classroom. Students are more likely to view technology as a catalyst for creativity in their educational process when they feel more motivated to learn through it. This suggests that students who are more motivated are more likely to recognize how technology can promote creative and interesting learning experiences. The results imply that students' opinions of technology as a tool for creativity and innovation in the classroom are greatly influenced by their motivation. Teachers and policymakers can develop strategies and interventions that boost motivation and support the appropriate integration of technology in the learning environment by understanding the relationship between motivation and students' views toward

technological innovation. These results emphasize how crucial it is to increase student motivation for students to make the most of technology's educational advantages and design dynamic and interesting learning environments.

In addition to the findings already discussed, it was noted that the research's target school lacked technology resources. The lack of readily available technological tools makes it difficult to fully realize the potential advantages, regardless of students' positive opinions of technology as an incentive for creativity and innovation. The lack of available technology prevents students from participating in immersive and interactive learning experiences, which may affect their motivation and engagement. The significance of tackling the technological gap in schools and ensuring that all children have fair access to technical tools is highlighted by the findings of this study. Educational institutions can establish an environment that encourages creativity, innovation, and active student participation by making the necessary investments and providing the necessary technological equipment. This emphasizes the necessity for educational administrators as well as stakeholders to give improving technological facilities in schools' priority when allocating resources. This will allow students to fully utilize technology's potential for raising motivation and engagement in the learning process.

The study by Estapa and Nadolny (2015) revealed that integrating technology into the classroom increased students' conceptual understanding of the content, contrary to the findings of the Erbas & Demiers (2019) study. Additionally, their research indicated that the use of Augmented Reality (AR) and educational technology positively influenced student motivation, capturing their attention more effectively than a website alone. These findings align with prior research, suggesting that AR in the classroom context can enhance student motivation, leading to improved learning outcomes and academic achievement (Estapa & Nadolny, 2015; Francis, 2017).

CONCLUSIONS

The results of our study provide solid evidence for the assertion that technological innovation and integration have a significant impact on students' motivation, engagement, and perceptions of promoting technology in the classroom. The favorable attitudes and experiences that students have shared offer strong support for the advantages of utilizing technological tools and platforms in educational settings. A dynamic, learner-centered environment that encourages creativity, critical thinking, collaboration, and active engagement is created when educators successfully integrate technology into their teaching techniques. Our research has shown that students view technology as interesting and fun, which increases their motivation and sense of control over their learning process.

Their learning experience is further enhanced by the availability of numerous technical resources, including laptops, cellphones, computers, multimedia projectors, and multimedia classes, which also promote their peer collaboration. Students are aware of how technology may increase their knowledge of a subject, help them learn practical skills for the future, and give them more confidence in their skills. The significance of encouraging innovation in the classroom has also been shown by our study. Students are sure that using technology in the classroom improves their educational experience and encourages their creativity and problem-solving abilities. They indicate a readiness to take part in training or workshops on utilizing technology in the classroom, demonstrating their enthusiasm for adopting cutting-edge pedagogical strategies. To effectively integrate technology and foster innovation in teaching and learning, educators must continuously upgrade their professional abilities.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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