The Influence of Digital Skills and Attitude towards Technology on Learning Engagement

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DOI: https://doi.org/10.47772/IJRISS.2026.100300086

Received: 02 March 2026; Accepted: 07 March 2026; Published: 26 March 2026

ABSTRACT

This study examined the influence of digital skills and attitudes toward technology on learning engagement of Computer Systems Servicing (CSS) students at Lorenzo S. Sarmiento Sr. National High School in Mawab, Davao de Oro Philippines. The research aims to determine the level of students' digital skills, attitudes toward technology, and learning engagement, as well as to identify the significant relationships and influence among these variables. The study employed a quantitative correlational research design to analyze the relationships between the independent variables, digital skills and attitude toward technology and the dependent variable learning engagement, a total of 136 Grade 11 and Grade 12 CSS students were selected using stratified random sampling from a population of 208 students. Data were collected using an adapted survey questionnaire measuring digital skills, attitudes toward technology, and behavioral, emotional, and learning engagement. This study uses statistical tools this includes Means, Pearson(r) correlation coefficient (r), and multiple regression analysis. The results showed that the level of digital skills among students was high (M = 4.02), while their attitude toward technology was also high (M = 3.83), indicating generally positive perceptions and competencies in using technology for learning. The findings further indicated a significant relationship between digital skills and learning engagement and also attitude toward technology and learning engagement. The regression analysis also showed that selected domains of digital skills and attitudes toward technology significantly influenced students, learning engagement. These findings suggest that strengthening students' digital skills and fostering positive attitudes toward technology can enhance their participation, motivation, and overall engagement in technological educations. The study provides valuable insights for, department of educations, school administrators, teachers, students and finale future researchers.

Keywords: Digital Skills; Attitude Toward Technology; Learning Engagement; Computer Systems Servicing; Technical Education

INTRODUCTION

Rationale

Students with low learning engagement often fail to focus on learning programming instruction and logic, and so, they have difficulty in reviewing programming problems from a different perspective and cannot successfully bridge the old and new (Diao, et al 2024). Research in the United States by Ross-Holmes (2022) found that students become increasingly disengaged as they progress through school, resulting in low student achievement. In China, the meta-analysis revealed 14 factors affecting students' learning participation, and its classification was based on internal and external factors, aiming to explore the main factor influencing students' intention, behavior, and process of learning participation (Jian Li et al., 2023). In London, several challenges related to classroom engagement were highlighted, and one significant issue is the difficulty in maintaining student attention in a passive learning environment, and another challenge is the varying levels of students' preparedness and motivation, which can impact the overall engagement and participation (Tia, Clark, 2024). Therefore, student engagement refers to the degree of attention, curiosity, interest, optimism, and passion that students show when they are learning or being taught, which extends the level of motivation they have learn and progress in their education (Rose Lattanze, 2025).

Technology plays an essential part in shaping students' learning engagement. Digital skills such as the use of devices and software, information literacy, digital communication, content creation, digital security, and problem-solving enable students to perform technical tasks confidently and effectively (Shaji, 2024). Meanwhile, students' attitudes toward technology, including interest, career aspirations, perceptions of difficulty, and beliefs about technology, can either enhance or hinder their behavioral, emotional, and cognitive engagement in learning (Stofkova et al 2022). Therefore, this study examines the influence of digital skills and attitudes toward technology on the learning engagement of CSS students at Lorenzo S. Sarmiento Sr. National High School, Mawab, Davao de Oro, with the goal of providing insights that may help improve teaching technology and create a better way of learning for student and teachers alike (Sartika et al 2023).

Furthermore, the increased use of technology in education, such as computer systems, has made a demand for students to develop strong digital skills and positive learning attitudes (Sartika et al 2023). Classrooms have changed to become more uses of technology, students are expected to know how to operate and learn computer procedures (Stofkova et al 2022). However, students who lack knowledge in digital skills or hold any bad attitudes toward technology may have anxiety or low motivation in turn this makes reduced participation for students (George et al 2024)

In addition, understanding the relationship between digital skills, attitudes toward technology, and learning engagement are essential for improving technical education by Identifying digital skill and attitude towards technology these factors greatly influence student's engagement and also can help teachers to design and create a more effective teaching styles that makes learning more effective (Diao et al 2024). This can also be used to further guide school administrators in developing essential and reliable training programs on technical education, which also further helps to support school systems that enhance students engagement (Doungpitak et al 2023). By strengthening learning engagement, technical students, this them prepared to join technology-related careers. This is why understanding the fundamental elements of students' learning engagement on computer system servicing CSS is crucial (Calma, 2024).

The research gap of this research will only be in the Philippine senior high school of Lorenzo S. Sarmiento Sr. National High School, particularly in Computer Systems Servicing (CSS). Most studies focus on higher education or general academic tracks and are conducted by foreign researchers, limiting their applicability to local public secondary schools (Uyun, 2022). Moreover, few studies have examined digital skills and attitudes toward technology as combined predictors of behavioral, emotional, and cognitive learning engagement (Deschênes, 2024). In the municipality of Mawab, Davao de Oro, limited empirical evidence exists regarding how these factors influence CSS students' engagement in learning. To address this gap, the present study seeks to provide localized, data-driven insights.

Research Objectives

The research examines the digital skills and attitudes towards technology to the learning engagement among the Computer System Servicing students of Lorenzo S. Sarmiento Sr. National High School. This study specifically sought answers to the following objective

1. To determine the level of Digital Skills among the Computer System Servicing students at Lorenzo S. Sarmiento Sr. National High School in terms of:

1.1 use of devices and software;

1.2 information literacy.

1.3 digital communication;

1.4 content creation;

1.5 digital security; and

1.6 problem solving.

2. To determine the level of attitudes towards technology on computers among Computer System Servicing students at Lorenzo S. Sarmiento Sr. National High School in terms of:

2.1 technological career aspiration;

2.2 interest in technology;

2.3 tediousness towards technology;

2.4 technology is for boys and girls;

2.5 consequences of technology; and

2.6 technology is difficult.

3. To determine the level of learning engagement on computers among the Computer System Servicing students at Lorenzo S. Sarmiento Sr. National High School in terms of:

3.1 behavioral learning engagement;

3.3 emotional learning engagement; and

3.4 cognitive learning engagement.

4. To determine the significant relationship between the digital skills and learning engagement among the Computer System Servicing students in Lorenzo S. Sarmiento Sr. National High School

5. To determine the significant relationship between the school's attitude towards technology and learning engagement among the Computer System Servicing students in Lorenzo S. Sarmiento Sr. National High School

6. To determine which of the domains in digital skills would influence learning engagement among the Computer System Servicing students in Lorenzo S. Sarmiento Sr. National High School

7. To determine which of the domains in attitude towards technology would influence learning engagement among the Computer System Servicing students in Lorenzo S. Sarmiento Sr. National High School.

Research Hypotheses

The following hypotheses were tested at a 0.05 level of significance.

1. There is no significant relationship between digital skills and learning engagement among the Computer System Servicing students in Lorenzo S. Sarmiento Sr. National High School.

2. There is no domain in digital skills that would significantly influence learning engagement among the Computer System Servicing students in

3. There is no domain in attitude towards technology that would significantly influence learning engagement among the Computer System Servicing students in Lorenzo S. Sarmiento Sr. National High School.

4. There is no domain in attitude towards technology that would significantly influence learning engagement among the Computer System Servicing students in Lorenzo S. Sarmiento Sr. National High School.

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume X Issue III March 2026

REVIEW OF RELATED LITERATURE

This section reviews literature and studies related to students' digital skills, attitude towards technology, and learning engagement in CSS programs. It also outlines the key indicators used to measure each variable in the study.

Digital Skills

Digital skills are an essential requirement in Computer Systems Servicing (CSS) because they allow students to effectively use computers and different technologies; these skills are not just simply turning on devices or navigating an operating system (Diao et al 2024). This includes much more like data management, saving, organizing, and sharing data, and managing software and troubleshooting. When students are accomplished at these, they are doing a task more effectively and efficiently (George et al 2024). and, they can transfer information learned in one context to the real world, which is very important as they leave school (Diao & Han, 2024).

In addition, factors such as technical education, communication, and content creation account for essential digital skills. Communication is the capacity of students to utilize digital platforms - e-mails, online forums - and the capacity to communicate and collaborate with others (Shaji, 2024). On the other hand, content creation emphasizes the ability to create and edit documents, spreadsheets, and PowerPoint presentations. These skills demonstrate that digital skills are not only about using technology (Sartika et al 2023). But also, about creating meaningful content that supports both academic learning and workplace activities for CSS students, these skills are important and needed in completing projects (Azoulay, 2022).

Furthermore, digital skills also problem solving, which strengthen their brains and independence of learners practicing safe and secure online behavior and problem solving highlights the ability to understand and address hardware and software issues in a logical way, unfortunately, students in underfunded schools often face barriers in developing these skills due to outdated computers and limited access as a result this progress in that need strong digital skills are slowed (Shaji, 2024).

Use of Devices and Software. The use of devices and software is an essential digital skill, enabling individuals to effectively use technological devices and platforms for learning and daily tasks. Students learning computer programming are one of the main factors of their engagement and persistence in computer and CSS education (Milutinović, 2024). Starting with programming at an early age not only helps in the development of positive attitudes towards computational thinking but also towards problem-solving skills (Diao & Han, 2024). If programming is fun and meaningful for children, they will probably get more engaged with technology and computing education in the future (Bawden, 2022). Personal characteristics have been shown to interrelate with students' interest in programming (Milutinović, 2024).

In addition, among such traits are motivation and self-confidence, which can also be determinants in the choice of programming as a subject. A student's perception of their own programming ability and their willingness to take up challenges have direct influences on how they will approach programming tasks (Garcia, 2021). Very often, curious, resilient, and confident students tend to show their interest and participate more actively (Vuorikari & Kluzer, 2022).

Additionally, the classroom setting is an important factor influencing the students' inclination towards coding and programming, parents who cheer their children on, and the availability of attractive learning materials are the factors that contribute to the students' education (Doungpitak et al 2023) A caring and supportive environment will not only facilitate learners' confidence and motivation but also be like a stream keeping their interest in programming alive and thus, through that, their long-term engagement in technology-related fields (Milutinović, 2024).

Information Literacy. Information Literacy refers to students' ability to store, manage, retrieve, and reuse digital information over time for academic and technical purposes (Bawden, 2021). In Computer Systems Servicing, CSS information literacy shows that students save system files, document troubleshooting, and maintain what they learned, and demonstrate what they learn in the real world (Ilomäki et al., 2023). These skills are essential because technical tasks often require previous knowledge, configurations, and instructions to ensure effectiveness (Hsiao, 2022). Students who develop strong information legacy skills are more capable of building up learning experiences, allowing them to work more effectively during hands-on technical activities (Vuorikari & Kluzer, 2022).

Moreover, information literacy contributes significantly to students' learning engagement in technical-vocational education (George et al 2024). When learners can preserve and revisit what they learned from digital information, they become more confident in performing tasks (Ilomäki et al., 2023). This emphasizes that managing and using digital information supports learning, which enhances cognitive engagement. In CSS classes, students who maintain organized digital records and system logs show greater persistence, focus, and initiative during laboratory work (Hsiao, 2022).

Furthermore, information legacy supports independent learning and long-term skill development among students in CSS programs (Ilomäki et al., 2023). By keeping records of completed projects, system configurations, and technical errors, students develop a personal knowledge base that strengthens their problem-solving abilities (Bawden, 2021). This practice reduces frustration and increases emotional engagement, as students feel more prepared when facing new or complex technical challenges (Hsiao, 2022).

Digital Communication. Digital communication refers to the use of emails, social media, learning management systems, and messaging applications to exchange information and interact (Anderson & Rivera, 2021). In recent years, digital communication has become an essential component of teaching and learning (Zhao et al., 2022). Studies indicate effective digital communication, timely feedback, and collaboration between teachers and students (Santos & Delos Reyes, 2023). As technology continues to advance, digital communication tools are increasingly shaping how learners engage with academic content and peers (Kim & Park, 2023).

Research shows that digital communication enhances student participation by providing multiple channels for expression, including discussion forums, chat features, and video conferencing tools (George et al 2024). These platforms allow students to communicate more confidently, particularly those who may feel hesitant in face-to-face interactions (Lopez & Garcia, 2023). Moreover, consistent use of digital communication tools has been linked to higher levels of interaction and engagement in both synchronous and asynchronous learning environments (Ahmed & Hussain, 2024). The accessibility and flexibility of digital communication also support inclusive learning (Cao & Han, 2024).

Recent studies emphasize that the effectiveness of digital communication depends on students' ability to use digital tools responsibly and meaningfully (Nguyen et al., 2024). Poor digital communication practices, such as unclear instructions or limited interaction, may negatively affect students' motivation and engagement (Williams & Turner, 2022). However, when properly implemented, digital communication fosters collaboration, critical thinking, and active learning among students (Chen et al., 2025). Thus, digital communication plays a significant role in shaping learning experiences and influencing students' engagement (Rahman & Salim, 2023).

Content Creation. Content creation is creating and editing using technology, which is an essential skill in technical education (Zhao et al., 2022). Students are expected to create technical documents such as power point reports, and documents. (Dotsenko, et al 2023). This skill helps train students to be more creative and a better way of sharing ideas, this in turn helps to organize their technical knowledge and this also helps them to be more proficient on technology (Cojocariu & Boghian, 2024).

Additionally, content creation in CSS education needs to be productivity in using word processors, spreadsheets for instance, students may prepare a presentation for computer hardware, or even reports for CSS equipment's (Benitez, 2024). This skill reflects on their ability to think and create, and it improves their engagement towards the use of technology, fostering digital skills and critical thinking and enhancing collaboration (Theriomorphic, 2025). This is required if you want to succeed ate technical education this is an essential indicator to digital skills for this show student's creativity (George et al 2024).

Therefore, content creation helps encouraging learners in CSS to be creative and to collaborate with each other, this in turn helps them to be more proficient in the use of technology on students (Dotsenko, et al 2023). By mastering these skills, students enhance their technical knowledge and readiness to create documents, files, power point presentation PPT, more efficiently (Cojocariu & Boghian, 2024). This helps them to be creative ate creating documents or file and to better express ideas to the use of documents and power point presentations this helps in the growth of student's mind and knowledge (Byers, 2024).

Digital security. Digital security refers to learners' ability to protect personal data, manage privacy settings, and practice safe online behaviors in digital learning environments (George et al 2024). Digital security students are required to share personal information and engage in continuous digital interaction (Doungpitak et al 2023). When students possess digital security skills, they are more likely to feel safe and confident using educational technologies, which support sustained participation in online (Garcia, 2022).

in addition, relationship between digital security and learning engagement, emphasizing that students who understand online safety practices tend to engage more actively in digital learning activities (Hatlevik et al., 2022). Awareness of digital security reduces anxiety, allowing learners to focus more on academic tasks and collaborative activities (Kumar & Owston, 2023). Furthermore, digital security competence has been found to strengthen positive attitudes toward technology (Choi et al., 2021).

Furthermore, digital security emerges as a foundational element that enables students to use technology responsibly and confidently (Garcia, 2022). Studies suggest that when learners feel protected in digital spaces, they are more willing to participate in learning about technology (Kumar & Owston, 2023). Thus, digital security not only safeguards learners but also serves as a key factor influencing the relationship between digital skills, attitude toward technology, and learning engagement (Triptjit, 2023).

Problem Solving. Problem-solving is also an essential part of digital skills because it equips students to solve issues by them self, they must think in different perspective (*Ajay*, 2024). In technical education, this means being able to understand what type of hardware or error has accord, troubleshoot issues (Triptjit, 2023). Students who can solve technical problems shows independence, making them better equipped to real world technical tasks (Raghad, 2023).

Effective problem-solving also requires students to apply many ways and approaches (Anasufi, 2024). For instance, identifying the errors and possible causes, testing different solutions, and outcomes *(Ajay*, 2024). Such structured thinking not only improves their ability to be efficient, but this also saves time and resources, this technical ability is valuable in many carries (Moses & Jimoh, 2023).

The benefits of this, shows that problem-solving gives creativity and innovation for individuals (Kim & Park, 2023). This ability to solve issues for technical education strengthen their mind and knowledge and to think more freely and more creatively (Raghad, 2023). This in turn make them more likely to succeed and to be more efficient and creatively and making them more preprepared for the real world (Maria Danzglock, 2024)

Attitude Towards Technology The growing use of remote and digital learning has enhanced the significance of learning attitudes toward technology in education. In this study of self-directed learning with technology by Chinese undergraduates (Byers, 2024). found that self-efficacy with, and acceptance of, technology to be strong predictors of student attitudes toward its use.This exemplifies the changing nature of attitudes that are based on understanding and self-assurance in the use of technology (Byers, 2024).

Students' attitudes toward technology in computer classes have an impact on how engaged they are in their studies and how their professional identities develop. The beliefs and attitudes of undergraduate computer science (Guzdial et al., 2020) showed how these affect learning strategies and motivation in computational thinking and coding. (Guzdial et al., 2020), the results highlight the importance of cultivating positive attitudes toward technology that extend beyond skill acquisition and foster professional attitudes (*Ajay*, 2024).

The recent technological integration problems have also shifted the perception of students concerning their education. (Bivona and Liguori 2025) Note that the same students solve the problems and seize the very opportunities technology offers, such as improved learning flexibility. Students also expressed worries, for example, that technology lowers critical thinking and social interaction. Their study is for well-balanced teachings that would develop positive attitudes-borrowing from technology strengths while minimizing weaknesses in preparing learners for future needs (Bivona & Liguori, 2025)

Technological Career Aspiration. Attitude towards technology is a crucial determinant in how individuals adopt, use, and sustain technological practices in both academic and professional settings (Byers, 2024). Positive attitudes towards technology are often linked to higher engagement levels, where interest in technology drives motivation and willingness to learn (Diao, et al 2024). In the context of education, learners with a strong interest in technology demonstrate enhanced adaptability in utilizing digital platforms, showing that attitude significantly influences technology integration outcomes (Martínez,2022). Moreover, studies suggest that a favorable attitude fosters curiosity and confidence in exploring technological innovations, leading to more effective skill acquisition (Santos, 2022).

The relationship between attitude towards technology and its indicators, particularly interest in technology, has been widely examined across various disciplines (Rahman, 2022). Research findings indicate that students with a high interest in technology tend to have better academic performance in digital-based learning environments (Sartika et al 2023), Similarly, professionals who show interest in technology are more likely to engage in continuous learning and career development in digitally evolving workplaces (Garcia, 2022). Furthermore, empirical results confirm that interest in technology directly enhances problem-solving, critical thinking, and creativity, which are essential in modern-day innovation-driven environments (Cheng, 2022).

In synthesis, the level of attitude towards technology, shaped by interest in technology, plays a vital role in determining how effectively individuals adopt and benefit from technological advancements (Doungpitak et al 2023). The results-based discussions highlight that a positive attitude, strengthened by genuine interest, not only improves academic outcomes but also professional growth in diverse fields (Alvarez, 2021). Therefore, interest in technology can be considered a central predictor of positive technology-related behaviors, making it a key factor for educators, policymakers, and institutions to develop strategies that foster favorable attitudes towards technology (Chen, 2022).

Interest in Technology. Interest technology is a crucial determinant in how individuals adopt, use, and sustain technological practices in both academic and professional settings (Kim,2022). Positive attitudes towards technology are often linked to higher engagement levels, where interest in technology drives motivation and willingness to learn (Li, 2022). In the context of education, learners with a strong interest in technology demonstrate enhanced adaptability in utilizing digital platforms, showing that attitude significantly influences technology integration outcomes (Martínez,2022). Moreover, studies suggest that a favorable attitude fosters curiosity confidence in exploring technological innovations, leading to more effective skill acquisition (Santos, 2025).

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Tediousness Towards Technology. Tediousness towards technology refers to students' feelings of boredom or even frustration, or mental fatigue when engaging with technology, especially when tasks are repetitive and difficult to accomplish (Bivona & Liguori, 2025). In learning, bad experiences with technology can gradually shape students' attitudes that reduce their willingness to participate and to learn (Zhou, Ahmad, 2025). But students still think that technology is hard and difficult to comprehend and learn (Gopo, 2022).

This shows that students who experience tediousness towards technology tend to show lower learning engagement, particularly in technical learning (Uyun et al 2022). When learners perceive technology as exhausting rather than helpful, their motivation decreases, which may lead to fewer hands-on tasks and reduced classroom learning (Sartika et al 2023). When doing something repeatedly without something new, students feel that this is tedious and boring, lowering their motivation to want to continue to learn (Zhou, Ahmad, 2025).

Moreover, tediousness towards technology is often associated with limited digital skills and low confidence in using technological systems effectively (Stofkova et al 2022), Addressing this issue through supportive instruction and meaningful technology integration can help reduce boredom and improve students' overall attitude and engagement toward learning with technology (Bivona & Liguori, 2025). So, in conclusion, when students do something repetitive, they tend to be less motivated to do things that also apply in computer system servicing (Uyun et al 2022).

Technology is for Boys and Girls. Technology is exclusively for boys or girls this gender-based ideas on technology are a bad influence on students' attitudes and participation in technology-related learning (Deschênes, 2024). Technology learning and interest are not determined by gender but by access, encouragement, and learning opportunities provided to students help with learning (Zervas & Stiakakis, 2025). Promoting the idea that technology is for both boys and girls supports equal participation and fosters inclusive learning environments in technical education (Bivona & Liguori, 2025).

Technology should be considered good for both genders, technology contributes to higher learning engagement and confidence among students regardless of sex (Cheng, 2020). When students believe that technology is equally appropriate for boys and girls, they are more likely to explore digital tools, participate in hands-on activities, and develop problem-solving skills (Deschênes, 2024). This inclusive mindset reduces anxiety and increases motivation, particularly in vocational fields such as Computer Systems Servicing (CSS) (Zervas & Stiakakis, 2025).

Furthermore, addressing gender stereotypes in technology education helps close participation gaps and improves overall learning outcomes (Bivona & Liguori, 2025). Schools that promote equal access and representation encourage both boys and girls to pursue technological skills and careers with confidence (Cheng, 2020). Thus, reinforcing the belief that technology is for both boys and girls is essential in building positive attitudes toward technology and sustaining student engagement in technology-based learning (Deschênes, 2024)

Consequences of Technology. The consequences of technology refer to the effects and outcomes of both positive and negative uses of technological tools in learning and everyday life (Bivona & Liguori, 2025). In the context of Computer Systems Servicing (CSS), technology provides students with faster access to information, efficient learning, and enhanced collaboration with group projects (Azoulay, 2021). However, improper or excessive use of technology may lead to negative consequences, such as distraction, reduced critical thinking, and independence they rally to much on technology, making them low-thinking people (George et al 2024). Understanding these consequences helps students develop responsible technology use and improve their overall learning engagement (Doungpitak et al 2023). Furthermore, the positive consequences of technology include the development of digital skills, problem-solving skills, and the ability to enhance technical tasks (Bongers et al 2025). Students who experience these benefits are more likely to engage actively in hands-on activities, demonstrate persistent learning, and help them think independently (Stofkova et al 2022). Technology also allows learners to access educational resources and guidance online that support their learning of technology (Nguyen, 2020). Consequently, recognizing the positive outcomes of technology encourages students to maximize their potential in improving academic and CSS performance (Deschênes, 2024).

But let's not forget that the negative consequences of technology can hinder students' learning engagement and performance (Bivona & Liguori, 2025). Overreliance on devices may reduce students' ability to think critically, solve problems manually, or retain knowledge (Bongers et al., 2025). Excessive screen time can also lead to decreased focus and reduced participation in class activities (Cao & Han, 2024). Therefore, CSS students must be guided to balance the benefits and drawbacks of technology, developing strategies to minimize risks while enhancing engagement and skill acquisition (Martínez, 2025).

Technology is Difficult. Technology is difficult refers to students' belief that technology is difficult to understand, like computers are complex and hard to learn, and very challenging to use, which can negatively affect their attitude towards learning with technology (Deschênes, 2024). Students' perception often comes from limited digital skills, insufficient learning, and a lack of proper knowledge to successfully use technology intern makes it difficult to use when people are not exposed to technology in a learning environment (Zervas & Stiakakis, 2025). When students view technology as difficult, they may develop anxiety and avoid technology, which hinders their engagement in technology and learning (Bivona & Liguori, 2025).

Furthermore, this shows that students who perceive technology as difficult tend to demonstrate lower motivation and reduced skills in hands-on activities (Diao & Han, 2024). These ideas can limit thinking and cognitive engagement, as learners may focus more on avoiding errors rather than understanding and applying technological concepts (Zhang, 2024). In Computer Systems Servicing (CSS), complex troubleshooting procedures and unfamiliar software can reinforce the belief that technology is complex if proper scaffolding is not provided (Deschênes, 2024).

In addition, this further emphasizes that the perception of difficulty with technology can be reduced; effective learning, gradual skill development, and supportive learning environments can greatly help learning in CSS (Bongers et al., 2025). When students receive clear guidance and opportunities for practice, they are more likely to build confidence and view technology as manageable rather than difficult (Zervas & Stiakakis, 2025). Addressing the belief that technology is complex is therefore essential in improving students' attitudes toward technology and sustaining their learning engagement in CSS education (Diao, et al 2024).

Learning Engagement

Learning engagement refers to students' involvement in learning activities through their attention, effort, and motivation in academic learning (Deschênes, 2024). learning engagement is composed of behavioral, emotional, and cognitive components that influence students' academic success and their ability to want to learn (Zhang, 2024). High learning engagement is associated with improved motivation, skill development, and overall learning outcomes in vocational education settings (Zervas & Stiakakis, 2025).

In Computer Systems Servicing (CSS), learning engagement is enhanced when students participate in meaningful and hands-on learning activities (Diao & Han, 2024). Behavioral engagement is demonstrated through active participation and task completion, while emotional engagement reflects students' interest and enjoyment in learning tasks (Wu et al., 2024). learning engagement is an important part of this study because it shows us what students' interest and what they want to learn about CSS (Bongers et al., 2025).

Furthermore, learning engagement is strongly influenced by students' digital skills and their attitudes toward technology. This, in turn, connects to our study to find out what students in CSS are engaged to want to learn (Zervas & Stiakakis, 2025). Students who feel confident using technology are more likely to remain focused and motivated during learning activities in CSS education (Deschênes, 2024). With effective learning engagement, we can better understand the students' minds to make learning more motivating for students to further strengthen engagement, and encourage participation and deeper learning (Zhang, 2024).

Behavioral Engagement. Attitude towards technology is a crucial determinant in how individuals adopt, use, and sustain technological practices in both academic and professional settings (Zhang, 2024). Positive attitudes towards technology are often linked to higher engagement levels, where interest in technology drives motivation and willingness to learn (Fadillah, et al 2022). In the context of education, learners with a strong interest in technology demonstrate enhanced adaptability in utilizing digital platforms, showing that attitude significantly influences technology integration outcomes (Martínez, 2025). Moreover, studies suggest that a favorable attitude fosters curiosity and confidence in exploring technological innovations, leading to more effective skill acquisition (Fadillah, et al 2022).

The relationship between attitude towards technology and its indicators, particularly interest in technology, has been widely examined across various disciplines (Bongers et al., 2025). Research findings indicate that students with a high interest in technology tend to have better academic performance in digital-based learning environments (Nguyen, 2022). Similarly, professionals who show interest in technology are more likely to engage in continuous learning and career development in digitally evolving workplaces (Garcia, 2022). Furthermore, empirical results confirm that interest in technology directly enhances problem-solving, critical thinking, and creativity, which are essential in modern-day innovation-driven environments (Zhang, 2024) In synthesis, the level of attitude towards technology, shaped by interest in technology, plays a vital role in determining how effectively individuals adopt and benefit from technological advancements (Fadillah, et al 2022).

The results-based discussions highlight that a positive attitude, strengthened by genuine interest, not only improves academic outcomes but also professional growth in diverse fields (Deschênes, 2024). Therefore, interest in technology can be considered a central predictor of positive technology-related behaviors, making it a key factor for educators, policymakers, and institutions to develop strategies that foster favorable attitudes towards technology (Vuorikari, Kluzer,2022)

Emotional Learning Engagement. Emotional engagement, where affective reactions students have towards their learning like interest, enjoyment, and belonging are what is aimed for, is a very important element of overall engagement with vocational education and developing this in CSS can really make a difference in quality of learning (Fadillah, et al 2022). Empirical data in vocational training environments demonstrates that emotionally supported students by teachers and positive instructional relationships with positive perceptions also exhibit greater emotional engagement because the support increases persistence and being willing to work on hard, practical activities (Gilbert et al., 2024). An investigation in the context of vocational colleges finds that preference for and faith attitudes towards instructors lead to emotional investment positively, and the association is mediated by psychological empowerment that enhances students' sense of commitment towards studying (Kong et al., 2022). Hybrid learning and virtual vocational settings also indicate that perception of stimulating feedback significantly influences emotional engagement, and students with greater academic self-efficacy and lower test anxiety levels report greater emotional involvement when feedback is positive (Cao & Han, 2024). Lastly, interventions that strengthen students' psychological capital, like self-efficacy, hardness, and positive affect, were found to enhance emotional engagement and academic achievement in blended learning contexts (Wu et al., 2024). Design features that consciously incorporate emotional cues like visually engaging interfaces, encouraging messages, and fascinating elements build emotional engagement due to their ability to minimize cognitive load and elicit enjoyment from learning experiences (Chang, 2024).

In CSS class technical work, hands-on practice is in some cases stressful or redundant, and applying affective design to e-material like motivational questions in tool-use videos can keep learners in good affective states and remain encouraged (Chen, 2024). Affective computing technology that recognizes learner feelings through facial expression or posture can provide real-time empathic feedback, and this leaves learners emotionally supported and heard in remote or self-paced CSS settings (Picard, 2022). Emotionally rich feedback that is given through AI, like positive encouragement and empathy detection, has been found to enhance students' attitudes and emotional responses even when the feedback would not affect outcomes directly, and therefore it is suitable for CSS students (Alsaiari et al., 2024). In addition, multi-role chatbots, such as a role of an "Emotional Supporter Bot," have been proven to heighten emotional involvement by satisfying students' needs for relatedness and support, and the strategy can be well applied in CSS learning (Cao et al., 2023). Research in vocational education indicates the linkage between emotional and behavioral engagement and the strengthening of positive teacher-student emotional bonds to both affective involvement and active participation in training activities (Bivona & Liguori, 2025).

For learners in the CSS context, this suggests that emotional bond strategies, even in the form of support teacher-student interactions during laboratory work or collaborative troubleshooting, are likely to facilitate emotional engagement and active, sustained participation (Cao & Han, 2024). To assess this engagement, the Baker-Rodrigo-Ocumpaugh Monitoring Protocol (BROMP), originally designed to classify the classroom affective state of learners, can be modified to capture emotional cues in CSS labs (Mariano & Tantoco, 2023). Other scholars have proposed that the integration of observations of the lesson, student self-portraits, and logs of their digital activities about the lesson may be the basis for a more comprehensive analysis of emotional engagement of learners in vocational activities (Gilbert et al., 2024). This suggests that advancing CSS instructional practices is tied to the desire to obtain full control over the subject matter while simultaneously documenting the emotional experiences that support the enduring desire to learn (Wu et al., 2024).

Cognitive Learning Engagement. Cognitive learning engagement refers to students' active mental involvement in learning and critical thinking, problem-solving, and reflection on learning (Ilomäki et al., 2021). In Computer Systems Servicing (CSS), Cognitive engagement in computer system servicing can be seen in students engaging with technical issues by applying their current knowledge and making decisions regarding alternative solutions available for hands-on exercises (Diao & Han, 2024). Students who engage cognitively in class are not merely carrying out an instruction but are learning how and why specific computer procedures occur (Zhang, 2024).

Furthermore, this connects to our study because it contributes to digital skills. Students with higher digital knowledge are more capable of planning, learning, monitoring their progress, and applying appropriate strategies when solving computer system servicing (CSS) problems (Ilomäki et al., 2022). In CSS, tasks such as troubleshooting hardware, configuring systems, and managing digital files require logical reasoning and sustained mental effort, which enhance students' cognitive engagement (Bongers et al., 2025). Moreover, access to technology in learning environments encourages students to engage in higher-order thinking and independent learning (Zervas & Stiakakis, 2025).

Attitude toward technology also plays a vital role in shaping cognitive learning engagement. When students perceive technology as applicable and manageable, they are more willing to invest mental effort in understanding complex concepts and completing challenging tasks (Cao & Han, 2024). Conversely, negative perceptions, such as viewing technology as difficult, can limit students' participation in engaging cognitively, which lowers their knowledge (Deschênes, 2024). Research emphasizes that positive attitudes toward technology create curiosity, growth, and critical thinking, which are essential components of cognitive learning engagement in Computer system servicing (Bivona & Liguori, 2025).

Theoretical Framework

This study is anchored to the theory of the Technology Acceptance Model by Davis (1989), which serves as the anchor theory of this study. This theory says that an individual's acceptance and effective use of technology are influenced by the sense of usefulness and perceived usefulness. In the context of this research, digital skills enhance the perceived use, while a positive attitude towards technology strengthens their sense of usefulness of technology. Together, these factors shape how students engage with digital skills, which in turn influences their learning engagement. Thus, the Technology Acceptance Model provides a strong foundation for understanding the direct relationship between digital skills, attitudes towards technology, and the level of student engagement in learning.

This theory, Self-Determination Theory by Lisa Legault (2017), suggests that motivation is driven by the fulfillment of accomplishments, competence, and relatedness. Students with stronger digital skills feel more capable in handling technical tasks, while a positive attitude towards technology enhances their sense of efficacy in using technology for learning. Motivation contributes well to our indicator of learning engagement. Thus, the Self-Determination Theory explains how both digital skills and attitudes towards technology are. In turn, this helps in the motivation and student engagement. The theory connects well with our study to explain the students' learning engagement.

This theory, Bandura's Social Learning Theory and Social Cognitive Learning Theory by Nabavi & Bijandi, 2012, explains that learning takes place through observation, imitation, and modeling, with self-efficacy playing a key role in shaping behavior and motivation. This connects to our study by showing how students acquire digital skills through observing and practicing the use of devices, while a positive attitude towards technology makes them more willing to adapt and apply technical tools in learning. This contributes to our dependent variable in learning engagement, since students who are confident in their digital abilities and have a positive attitude toward technology are more likely to actively participate, which connects with our indicator of learning engagement.

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume X Issue III March 2026

This theory is the Constructivist Learning Theory by Jean Piaget (1972), which emphasizes that learners actively engage in to learn through experiences and interactions with their environment. In the context of this study, students develop digital skills not just by learning in lectures but by engaging in hands-on use of technology and problem-solving. Which in turn helps them to be engaged to learn, thus this connects with our indicator learning engagement. This is also a positive attitude towards technology, which encourages students to explore and interact with digital tools, leading to more meaningful learning engagement. Thus, constructive learning theory highlights how active engagement in learning helps with learning technology and fosters deeper learning engagement. This aligns well with the relationship between digital skills and attitudes towards technology in our study to find the relationship to learning engagement and its impacts.

Furthermore, according to Siemens (2005), A Learning Theory for the Digital Age, this explains that learning in the modern world is shaped by students' ability to engage and understand technology information and tools. This theory connects with our study to figure out whether students' digital skills and attitude towards technology influence their learning engagement. The theory helps us to better understand how students' engagement in learning technical education is essential for our study. Because the theory emphasizes that students with strong digital skills can have a better learning ability, which in turn helps to understand learning engagement, these connections then lead to a stronger understanding of learning engagement.

Conceptual Framework

Presented in Figure 1 is the conceptual framework of the study. The independent variables are Digital Skills and Attitude towards technology. Digital Skills has the indicators: Information legacy which refers to the ability to remember evaluate, and demonstrate what they learn, digital Communication which involves interacting, collaborating, and sharing through digital tools; Content creation defined as producing and editing new digital material, digital security referring to protecting personal data and maintaining digital well-being; and Problem solving which involves identifying needs and applying digital tools to address technical issues (van Laar et al., 2017).

Attitude towards technology has the following indicators: Technological career aspiration refers to students' interest, motivation, and intention to pursue careers related to technology and computing fields. Interested in technology means they want to learn about technology and want to better understand it. Tediousness towards technology refers to students' feelings of boredom or even frustration. Technology is for boys and girls, which refers to equality between users. Consequences of technology, this means technology can be good and evil, technology is complex, which means technology is hard to learn and to understand (Aesaert et al., 2015).

The Dependent variable is Learning engagement, which has the indicators: Behavioral learning engagement, which means students' behavior when learning about technology, and Emotional learning engagement, which means their feelings and motivation about learning about technology. Cognitive learning engagement refers to a student's ability to understand technology. (Manlapig, 2021)

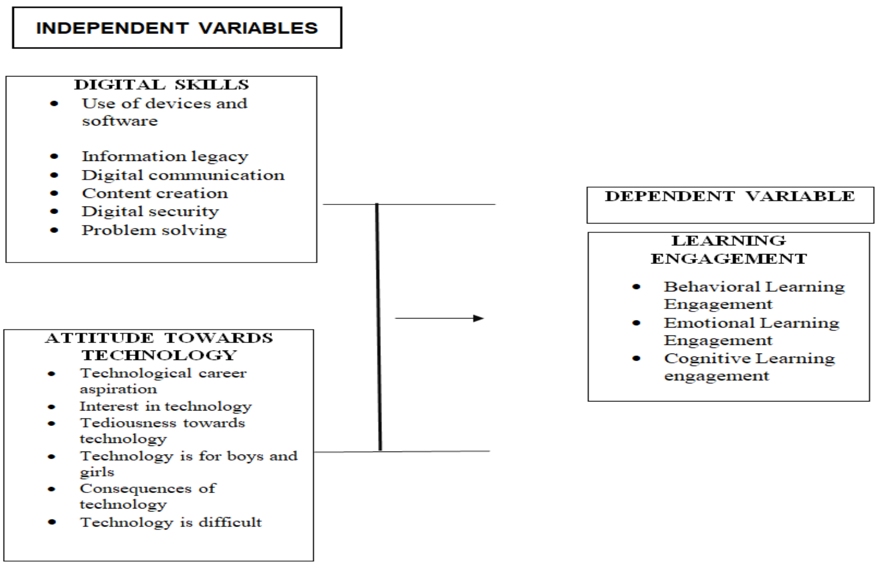

Figure1. The Conceptual Framework of the Study

Significance of the Study

This study contributes to students, teachers, and future researchers because it emphasizes the students' interest and engagement towards education and their attitudes towards education. By highlighting the importance of students interest to engage and motivation, to digital task and technology, the research promotes alignment with digital skills and attitude towards technology, this ensures that future Computer Systems Servicing (CSS) students are motivated and eager to perform this also helps teachers to better understand how to make lessons more interesting, in return they became very knowledgeable and more student are more well equipped to handle real-world technical challenges. In addition, teachers also benefit from this finding of this study because this study helps better understand students' engagements and interests, which will not only help teachers and students but also future researchers. Future researchers will use this study to have a better grasp on students' learning engagement, as well as a reference or even to use our questionnaire to make their own studies, which in turn will add more information on this topic for everyone interested in digital skills, attitude towards technology, and learning engagement.

This study emphasizes the better understanding to students' interest to engage in learning, and to better help a greater learning environment and to improve ways of learning and teachings and to help better motivate student to perform and engage to learn technology and digital skills more effectively improving the learning experience and student engagement, and this also help researchers to better their own studies and better grasp on the subject.

Definition of Terms

In order for the reader to have a better understanding of the terminologies used in the study, the following terms were defined conceptually and operationally.

Digital skills. Digital skills refer to a student's ability to use devices and software, applications, and tools and network, manage documents, and also the ability to solve technical issues, and even communicate digitally and perform CSS tasks it also involves being able to create documents, software systems, and edit documents.

Attitude Towards Technology. Attitude Towards Technology refers to a student's view and feelings toward the use of technology. This contains the beliefs, opinions, and emotions, whether positive or negative, that influence how a student feels using technology in work or daily life. In education, this shows how students view and respond to technology as a tool for enhancing their knowledge, performance, and technical skills in technical education.

Learning engagement. Learning engagement refers to an individual's activeness and meaningful involvement in the process of learning something. This is all about being actively interested and participating as an individual in learning activities, which can lead to better understanding and a better experience. In addition, learners tend to be more curious, focused, and committed to achieving their learning goals or dreams. Individuals demonstrate this engagement through actions such as active participation, asking questions, completing tasks, and interacting with peers and the instrument.

METHOD

This chapter presents the research design and research locale, sample, research instruments, data collection, and statistical tools.

Research Design

This study uses the quantitative correlational research design this helps examine a statistical relationship between two or more variables like the independent variables and dependent variable they are Digital skills And Attitude towards technology servers the independent variables, while learning engagement is the dependent variable, the researchers used a correlational approach because it allows them to collect reliable data from the participants and examine how existing changes in the independent variables influence the dependent variable without manipulating or changing any conditions (Zhang, 2024)

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume X Issue III March 2026

Furthermore, this design enables the observation of patterns and the relationships among the three variables (Calma, 2024). Correlational research is very reliable in the field of education, as it helps determine the strength and direction of relationships between performance outcomes (Diao et al 2024). The findings may also serve as a foundation and improvements to better students' learning and understanding in Computer System Servicing CSS of Lorenzo S. Sarmiento Sr. National High School, Poblacion, Mawab, Davao de Oro.

Research Locale

The findings of this study were specific to the context of secondary schools in Mawab, Davao de Oro. The scope and the sample limited the general applicability of the findings. Accordingly, even though there could be standard features, the findings might not have general applicability to other systems. Presented in Figure 2 was the map of the Philippines consisting of 17 regions, in which the municipality of Mawab, province of Davao de Oro, was in Region XI. Furthermore, presented in the same figure was the vicinity map of the respondents in the municipality of Mawab, Davao de Oro.

Mawab is a landlocked municipality in the Philippine coastal province of Davao de Oro. Mawab is 103 kilometers from Davao City, the regional center of Davao Region (Region XI), and 21.1 kilometers from Davao de Oro's Provincial Capitol. The municipality has a land area of 136.10 square kilometers (52.55 square miles), which constitutes 2.98% of Davao de Oro's total area. Its population, as determined by the 2020 Census, was 39,631. The location of the respondents was Mawab, Davao de Oro. Mawab district consists of six high schools, both public and private. Furthermore, the location of the respondents and the conduct of the study were located in Lorenzo S. Sarmiento Sr. National High School, Andili National High School, Nuevo Iloco National High School, and Tuboran National High School in the Municipality of Mawab, Davao de Oro, Philippines.

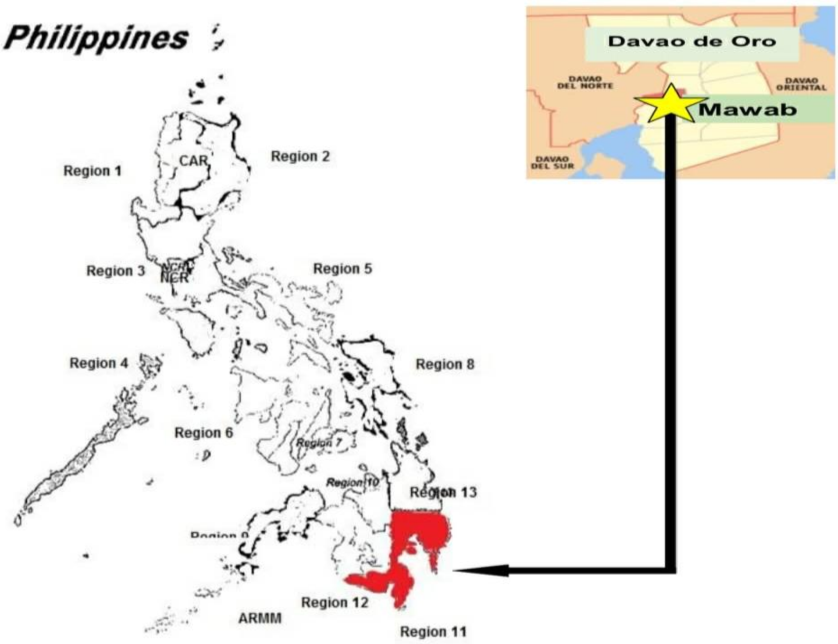

Figure 2. Map of the Philippines, highlighting Mawab, Davao de Oro.

Population And Sample

Stratified random sampling will be employed in selecting the respondents for this study. The subject includes 136 students from Lorenzo S. Sarmiento Sr. National High School, all of whom must be part of the Computer System Servicing class at their respective classrooms in order to participate.

These individuals are considered ideal respondents due to their direct involvement in this problem, aligning with the study's focus on students' Learning Engagement. In the case of Lorenzo S. Sarmiento Sr. National High

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume X Issue III March 2026

School, out of a population of 208 individuals, a random sample of 136 respondents will be selected. The chosen number of students, 136, will be deemed statistically significant for representing the broader population of students in the district. The sample size will be computed using the Raosoft sample size calculator. Shown in Table 1 are the respondents of the study, which are the Computer System Servicing students of Grades 11 and 12 in Lorenzo S. Sarmiento Sr. National High School, Mawab, Davao de Oro, Philippines, for the school year 2025-2026.

Table 3. Population and Sample Size of Respondents

Sections	Population	Respondents
A	59	38
B	52	34
C	50	33
D	48	31
TOTAL	209	136

The distribution of the respondents, as shown in Table 1, are as follows: 38 students from section A; 34 students from section B; 33 students from section D; and 31 students from section E. The total number of students involved in this study is 136.

Research Instrument

The research instrument used in this study was adapted from the standardized survey of Van Laar et al. (2017) for the first independent variable, Digital Skills, it assessed students' ability in computer management and operation, the second independent variable, Attitude towards technology, assessed students' engagement and involvement to learning technology. Meanwhile, the dependent variable, learning engagement this is about what motivates them to learn technology, was measured using indicators developed by Dongmei, Huan, 2025, which assessed students' demonstration of practical skills in applying their technological knowledge, the questionnaire was specifically selected to align with the objectives of this study.

The instrument was composed of 15 indicators distributed across the three variables, for Digital Skills has over six indicators includes, use of devices and software, Information Legacy, Digital security, Content Creation, Problem solving, for Attitude Towards Technology, has six indicators were, Technological career aspiration, Interest in technology, Tediousness towards technology, Technology is for boys and girls, Consequences of technology, Technology is difficult, finally, for Learning engagement three indicators consisted of Behavioral Engagement, Emotional Engagementt, Cognitive learning engagement The first set of the indicators and the first independent variable, digital skills it composed of six (6) indicators they are, use of devices and software, Information Legacy, Digital security, Content Creation, Problem solving, For the adversity quotient, the following five (6) indicators with their respective range of means and descriptions were considered.

Range of Means	**Descriptive Equivalent**	**Interpretation**
4.20 –5.00	Very High	This means that the students' digital skills were very positive.
3.40 – 4.19	High	This means that the students' digital skills were positive.
2.60 – 3.39	Moderate	This means that the students' digital skills were Moderate.
1.80 – 2.59	Low	This means that the students' digital skills were less positive.
1.00 – 1.79	Very low	This means that the students' digital skills were not positive.

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume X Issue III March 2026

The first set of the indicators are independent variable, Digital skills it composed of six (6) indicators they are, use of devices and software, Information Legacy, Digital security, Content Creation, Problem solving, the following six (6) indicators with their respective range of means:

Range of Means	Descriptive Equivalent	Interpretation
4.20 – 5.00	Very high	This means that the students' Attitude towards technology was very much positive.
3.40 –4.19	Agree	This means that the students' Attitude towards technology was positive.
2.60 – 3.39	Moderate	This means that the students' Attitude towards technology were moderate.
1.80 – 2.59	Low	This means that the students' Attitude towards technology was less positive.
1.00 – 1.79	Very Low	This means that the students' Attitude towards technology was not positive.

To ensure the validity of the instrument well be checked by our practical research teacher she evaluated the content of the questionnaire and confirmed its appropriate for the study, each indicator was measured using five-point Liker scale with corresponding descriptive ranges to determine the level of competency and performance of the respondents.

The set of the indicators and the second independent variable, Technological career aspiration, Interest in technology, Tediousness towards technology, Technology is for boys and girls, Consequences of technology, Technology is difficult, it composed following six (6), indicators with their respective range of means and descriptions were considered.

Range of Means	Descriptive Equivalent	Interpretation
3.25 4.00	Very High	This means that the students' learning engagement was very positive.
2.26 – 3.25	High	This means that the students' learning engagement was positive.
1.76– 2.50	Low	This means that the students' engagement was less positive.
1.00 – 1.75	Very Low	This means that the students' learning engagement was not positive.

The set of the indicators and the second independent variable, learning engagement it composed of three (3): behavioral learning engagement, emotional learning engagement, and cognitive learning engagement. The indicators with their respective range of means and descriptions were considered.

Data Collection

To gather reliable information for this study, the researchers followed a proper and careful data collection process.

The first step was to find a questionnaire about our independent variable and dependent variable to match the indicators of the three variables: digital skills, attitude towards technology, and learning engagement. The items were chosen based on the review of related literature and aligned with the objectives of the study. After drafting the questionnaire, it was submitted to our teacher for our practical research to ensure the indicators are connected. He approved our research questionnaire and the independent and dependent variables.

Once the research instrument was validated, the researchers must secured approval from their research to be conducted in the school of Lorenzo S. Sarmiento Sr. National High School, the principal of the school, Mrs. Roberta A. Javier a formal letter was addressed to the School Principal of Lorenzo S. Sarmiento Sr. National High School, requesting permission to distribute the questionnaires to selected Grade 12 CSS students and Grade

11 CSS students, upon receiving approval, the researchers scheduled their time to the CSS classes with coordination from the subject teachers involved.

During the administration of the questionnaire, the researchers provided a brief explanation on how to answer the questioner to the participants, the researchers explained the purpose of the study and emphasized that their participation was voluntary, Students were also assured that their responses would be kept confidential meaning anonymous to keep them safe, and that the data would be used only for academic purposes, the participants were encouraged to answer the questions h Honestly and were given enough time to complete the questionnaire without pressure, the researchers were present throughout the process to guide and clarify any instructions if needed.

After the data collection, the researchers gathered the accomplished questionnaires and began the process of data checking and organization they reviewed the responses to ensure completeness and accuracy before proceeding to the data analysis phase, The responses were then grouped and encoded according to the corresponding indicators of each variable, This step was essential in preparing the data for statistical treatment and interpretation, which aimed to answer the research questions and test the hypotheses presented in the study.

Statistical Tools

The statistical tools that were used for data analysis are the descriptive Statistics Tool.

Mean. This statistical tool was used to determine the level of Digital Skills and Attitude Towards Technology Changes in the students' On Learning Engagement among Lorenzo S. Sarmiento Sr. National High Schools.

Pearson (r). This statistical tool was used to determine the significance of the relationship between Digital Skills teaching competence and Attitude Towards Technology on Learning Engagement among Lorenzo S. Sarmiento Sr. National High Schools.

Multiple regression analysis. This statistical tool was used to determine the influence of Digital Skills and Attitude Towards Technology on the students' On Learning Engagement among Lorenzo S. Sarmiento Sr. National High Schools

Ethical Consideration

This study strictly followed ethical standards throughout the research process to protect the rights and privacy and identity's of the participants, before conducting the survey, the researchers send a formal litter to conduct this research to have permission from the School Principal of Lorenzo S. Sarmiento Sr. National High School to Mrs. Roberta A. Javier the current principal of the school, a formal request letter was presented to allow the researchers to gather data from Grade 11 and Grade 12 computer system servicing CSS students.

The participants were informed about the purpose of the study, and their participation was voluntary; they were told that they had the right to refuse or withdraw from answering the questionnaire questions in the survey at any time without any consequences. This study assures that all their responses will be kept confidential, meaning private and used only for academic purposes.

Voluntary participation. This study was voluntary, meaning students were not forced or pressured to answer the research questionnaire questions. They were informed that they had a choice to participate or not; the study had no consequences for not participating. Participants had the right to stop answering or withdraw entirely without any consequences. The researchers respected each student’s decisions and choices throughout the process.

Privacy and Confidentiality. The researchers ensured that all information collected from the participants was confidentiality meaning anonymous, no names or personally identifying information no ID and phone number and address were included in the final results of the study, all data were securely stored and can only be accessed by the researchers, the findings of the study, the study used solely for academic purposes and the requirement for the subject practical research, the study makes sure that no personal data is collected we insure that all participants are anonymous.

Informed Consent Process. Before any data was collected, the researchers explained the purpose of the study. The participants were given time to ask questions about the survey. After fully explaining the purpose of the study, the participants were given a choice to answer the questionnaire to participate. This ensured that participation had the chose to answer voluntarily.

Recruitment. The participants were chosen using simple random sampling from the Grade 11 and Grade 12 students' computer system servicing CSS students. This method ensured equal chances of selection and prevented any not-so-true answers; no student was forced or pressured to answer the research questionnaire questions of the study.

Risks. There were no physical or psychological risks involved in this research. The research questionnaire only focused on non-sensitive topics such as digital skills, technological exposure, and hands-on performance. The study ensured that all items were safe and not controversial.

Benefits. This study is expected to benefit not only the participants but also the school and teachers. The results provide important insights that may lead to improvements in computer system servicing CSS, which could show us better access to digital resources, enhanced learning styles, and improved the learning environment. These benefits aim to help students become more equipped for real-world problems.

Fabrication and Falsification. The researchers follow a strict research rule, and to be honest, throughout the research process, no data were made up or manipulated to influence the results; all the findings were honestly derived from actual responses, ensuring the credibility and accuracy of the study.

Conflict of Interest (COI). There were no conflicts of interest among the researchers; they had no personal ideas or personal gains from the outcome of the study, the research was conducted solely for academic purposes, and to fulfill the requirements for the subject practical research.

Deceit. The researchers avoided any form of misinformation and controversial topics, participants were clearly informed about the purpose of the study, and nothing was hidden from them all procedures were conducted with full safety and honesty.

Authorship. The researchers are the students of grade 12 from the school of Lorenzo S. Sarmiento Sr. National High School. The authors' list in the references includes names of the individuals who contributed a lot to the research process, including the research design, data collection, data analysis, and many more. No one was left out.

RESULTS

Results, analysis, and intervention drawn out from the study are introduced in this section. The data presented both tabular and textual forms. All inferential results were analyzed and interpreted at a 0.05 level of significance. Chronologically, tables and their interpretations are arranged in the subsequent subheadings: level of Digital Skills, level of Attitude Towards Technology, level of learning engagement, significance on the relationship between Digital Skills and learning engagement, significance on the relationship between Attitude towards Technology and learning engagement, multiple regression analysis on the influence of the domain of Digital Skills to the learning engagement and the multiple regression analysis on the influence of the domain of Attitude Towards Technology to the learning engagement.

Level of Digital Skills

Table 2 shows the level of Digital Skills in terms of Use of Devices and Software, Information Legacy, Digital Communication, Content Creation, Digital Security and Problem Solving. The overall mean is 4.02, which is described as high, with a standard deviation of 0.43. The high level could be attributed to the high ratings the respondents gave in all indicators. This entails that the respondents' responses to the level of teaching competence are much positive in terms of Use of Devices Software, Information Legacy, Digital communication, Content Creation, Digital Security and Problem Solving.

The cited overall mean score was the result obtained from the following computed mean scores from highest to lowest: 4.17 or high for Use Of Devices Software with a standard deviation of 0.58; 4.05 or high for Digital Communication with a standard deviation of 0.56; 4.00 or high for Information Literacy with a standard deviation of 0.57; 4.00 or high for Content Creation with a standard deviation of 0.61; and 3.97 or high for Problem Solving with a standard deviation of 0.74; 3.94 or high for Digital Security with a standard deviation of 0.62.

Table 2. Level of Digital Skills

Indicators	**Mean**	**SD**	**Descriptive Equivalent**
Use Of Devices Software	4.17	0.58	High
Information Literacy	4.00	0.57	High
Digital Communication	4.05	0.56	High
Content Creation	4.00	0.61	High
Digital Security	3.94	0.62	High
Problem Solving	3.97	0.74	High
Overall	**4.02**	**0.43**	**High**

The supreme mean score of 4.17 with a standard deviation of 0.58, which described as high, was gained by *Use of Devices and Software.* The data indicated from appended table 2.3 reveal that the respondents have observed the following order of importance: a mean of 4.08 with a standard deviation of 0.74, described as high for *effectively utilized digital tools to manage scientific literature and generate citations and references.*; a mean of 4.08 with a standard deviation of 0.57, described as high for *feel confident using specializes programs;* a mean of 4.05 with a standard deviation of 0.72, described as high for *Use digital device (e.g., phones, tablets) for conducting scientific research.*

The second highest mean score was gained by *digital communication* with a mean of 4.05 and standard deviation of 0.56, described as highest. The data shown in appended 2.3 bring to light that the respondents have observed following order of importance: a mean of 4;12 with a standard deviation of 0.74, described as very high for *use email and instant messaging applications to communicate with fellow researchers*; a mean of 4.08 with a standard deviation of 0.68, described as high for *use online collaborative tools for working together on research together*; a mean of 3.96 with a standard deviation of 0.78, described as high for *participate in webinars and virtual scientific events to share my research results and engage with others*.

The third high mean score of 4.00 with a standard deviation of 0.61, described as high, was acquired by *content creation*. The data stipulated in appended Table 2.4 unveil the following order of importance observed by the respondents: a mean of 4.02 with a standard deviation of 0.73, described as very high for *use digital tools to write and edit research proposals and scientific papers with ease*; and have proficiency in using software to create and edit graphs and tables for data visualization in my research pronounced as high, attained a mean of 3.98 and a standard deviation of 0.72.

The fourth high mean score of 4.00 with a standard deviation of 0.57, describe as high, was acquired by *Information Literacy*. The data stipulated in appended Table 2.2 unveil the following order of importance observed by the respondents: a mean 4.05 with a standard deviation of 0.68, describe as a high for *critically evaluate the credibility and relevance of scientific articles found online and regularly search for scientific* *literature in academic databases* both describe as high, attained a mean of 3.96 with a standard deviation of 0.74.

The fifth high mean of 3.97 with a standard deviation of 0.74, describe as a high, was acquired by *problem solving*. The data stipulated in appended Table 2.6 unveil the following order of importance observed by the respondents: a mean of 3.97 with a standard deviation of 0.74, describe as high for resolve technical problems with research software independently and resolve technical problems with research hardware independently both describe as high, attained a mean of 3.80 with a standard deviation of 0.83.

The lowest mean score of 3.94 with a standard deviation of 0.62, describe as a high, was acquired by *digital security*. The data stipulated in appended Table 2.5 unveil the following order of importance observed by the respondents; a mean of 3.98 with a standard deviation of 0.69, describe as a high for resolve *technical issues with the software used in my research projects and resolve technical issues with the hardware used in my research projects* both describe as high, attained a mean of 3.90 with a standard deviation of 0.71.

Level of Attitude Towards Technology

Presented in Table 3 are the mean scores for the indicators of Attitude Towards Technology, with an overall mean score of 3.83, which is described as high with a standard deviation of 0.45. The high level could be attributed to the high rating given by the respondents on most indicators in the items of Technological Career Aspiration, Interest in Technology, Tediousness Towards Technology, Technology is for Boys and Girls, Consequences of Technology, and Technology is Difficult.

The cited overall mean score was the result obtained from the following computed mean scores from highest to lowest: 4.07 or high for Consequences of Technology with a standard deviation of 0.58; 4.02 or high for Technological Career Aspiration with a standard deviation of 0.68; 3.97 or high for technology is Difficult with a standard deviation of 0.55; 3.75 or high for Interest of Technology with the standard deviation of 0.51; 3.70 or high for Technology is for Both Boys And Girls with a standard deviation of 0.80; and 3.45 or high for Tediousness Towards Technology with a standard deviation of 0.79.

Table 3. Level of Attitude Towards Technology

Indicators	**Mean**	**SD**	**Descriptive Equivalent**
Technological Career Aspiration	4.02	0.68	High
Interest In Technology	3.75	0.51	High
Tediousness Towards Technology	3.45	0.79	High
Technology Is for Both Boys and girls.	3.70	0.80	High
Consequences Of Technology	4.07	0.58	High
Technology Is Difficult	3.97	0.55	High
Overall	**3.83**	**0.45**	**High**

The highest mean score of 4.07 with a standard deviation of 0.58, which described as high, was gained by *Consequences of Technology*. The data indicated from appended table 3.2 reveal that the respondents have observed the following order of importance: a mean of 4.16 with a standard deviation of 0.72, described as Believe Technology Improves Efficiency; a mean of 4.10 with a standard deviation of 0.78, described as high for Consider Technology Lessons to be Valuable; *believe everyone needs to be proficient in technology and think technology plays a crucial role in daily life* both described as high, attained a mean of 4.04 with a standard deviation of 0.75 and a mean of 4 with a standard deviation of 0.79, respectively.

The second highest mean score was gained by *Technological Career Aspiration* with a mean of 4.02 and standard deviation of 0.68, described as high. The data shown in appended 3.1 bring to light that the respondents have observed following order of importance: a mean of 4.13 with a standard deviation of 0.85, described as high for *Am Likely To Choose a Career in technology* ; a mean of 4.01 with a standard deviation of 0.85, described as high for *would enjoy a career in technology* ; a mean of 3.97 with a standard deviation of 0.78, described as high for *would be interested in pursuing a career in technology in the future;* find working in technology to be appealing attained a mean of 3.96 with a standard deviation of 1.79, described as high.

The third highest mean score of 3.97 with a standard deviation of 0.55, described as high, was acquired by *Technology is Difficult*. The data stipulated in appended Table 3.4 unveil the following order of importance observed by the respondents: a mean of 4.12 with a standard deviation of 0.75, described as high for enjoy learning new technologies to increase productivity; a mean of 4.08 with a standard deviation of 0.78, described as high for *can quickly adapt to changes or updates in the technology I use;* a mean of 4.00 with a standard deviation of 0.79, described as high for *think you need to be exceptionally intelligent to study technology*; a mean of 3.83 with a standard deviation of 0.87, described as high for *feel technology is only for highly intelligent individuals* and *can figure out new digital tools with minimal guidance*, pronounced as high, attained a mean of 3.80 and a standard deviation of 0.80.

The fourth highest mean score of 3.75 with a standard deviation of 0.51, describe as high, was acquired by *interest of technology*. The data stipulated in appended table 3.2 unveil the following order of importance observed by the respondents: a mean of 4.06 with a standard deviation of 0.76, describe as high for *enjoy fixing things around the house*; a mean of 4.05 with a standard deviation of 0.75, *describe as high for believe technology lessons are essential*; a mean 3.87 with a standard deviation of 0.81, describe as a high for *think there should be more focus on technology education; a mean of 3.69 with a standard deviation of 0.93, describe as a high for would join a school technology club if there were one; a mean of 3.64 with a standard deviation of 0.91, describe as a high for prefer not having technology lessons In school; a mean of 3.20 with a standard deviation of 1.02, describe as a high for am not interested in technology.*

The fifth highest mean score of 3.70 with a standard deviation of 0.80, described as high, was acquired by *technology for both boys and girls*. The data stipulated in appended Table 3.4 unveil the following order of importance observed by the respondents: a mean of 3.73 with standard deviation of 0.98, describe as a high for *think machines are uninteresting*; a mean of 3.71 with a standard deviation of 0.96, describe as a high for *don't understand why someone would choose a career in technolo*gy; a mean of 3.65 with a standard deviation of 0.91, describe as a high for *find most technology jobs to be boring*.

The lowest mean score of 3.45 with a standard deviation of 0.79 described as high, was acquired by tediousness towards technology. The data stipulated in appended table 3.3 unveil the following order of importance observed by the respondents: a mean of 3.61 with a standard deviation of 0.97, describe as a high for *don't understand why someone would choose a career in technology; a mean of 3.47 with a standard deviation of 0.92, describe as a high for believe technological hobbies are dull; a mean of 3.46 with a standard deviation of 1.02, describe as a high for find most technology jobs to be boring and think machines are uninteresting both describe as a high, attained a mean of 3.27 with a standard deviation of 0.92, respectively.*

Level of Learning Engagement

Table 4 shows the level of students' learning engagement in terms of behavioral, emotional, and cognitive engagement. The overall mean is 4.11, described as high, with a standard deviation of 0.49. The high level could be attributed to the high ratings the respondents gave in all indicators. This entails that the respondents' responses to the level of students' learning engagement are much positive in terms of behavioral engagement, emotional engagement, and cognitive engagement.

The cited overall mean score was the result obtained from the following computed mean scores from highest to lowest: 4.14 or high for behavioral engagement with a standard deviation of 0.65; 4.09 or high for emotional engagement with a standard deviation of 0.53; and 4.10 or high for cognitive engagement with a standard deviation of 0.53

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume X Issue III March 2026

Table 4. Level of Learning Engagement

Indicators	Mean	SD	Descriptive Equivalent
Behavioral Learning Engagement	4.14	0.65	High
Emotional Learning Engagement	4.09	0.53	High
Cognitive Learning Engagement	4.10	0.53	High
Overall	**4.11**	**0.49**	**High**

The highest mean score of 4.14, with a standard deviation of 0.65, which was described as the highest, was gained by *behavioral learning engagement*. The data indicated from appended table 4.1 reveal that the respondents have observed the following order of importance: a mean of 4.20 with a standard deviation of 0.75, described as high for *deliver a well-prepared presentation on a research topic during class:* a mean of 4.16 with a standard deviation of 0.83, described as high for *participate actively in group assignments and experimental tasks* and actively ask questions or participate in discussions during classes a mean both describes as high, attained a mean 4.05 with a standard deviation of 0.73.

The second-highest mean score was gained by cognitive learning engagement, with a mean of 4.10 and a standard deviation of 0.53, described as high. The data shown in appended 4.3 bring to light that the respondents have observed following order of importance: a mean of 4.20 with a standard deviation of 0.77, described as high for *connect new material to my existing*; a mean of 4.13 with a standard deviation of 0.78, described as high for *strive to understand others viewpoints by putting myself in their shoes*; a mean of 4.08 with a standard deviation of 0.79, described as high for *take through notes on key points during class*; a mean of 4.05 with a standard deviation of 0.87, described as high for *.develop well-supported opinions through logical reason*ing and *solve problems by considering multiple perspectives* attained a mean of 4.00 with a standard deviation of 0.83, described as high.

The lowest mean score of 4.09 with a standard deviation of 0.53, described as high, was acquired by *Emotional Learning Engagement*. The data stipulated in appended Table 4.3 unveil the following order of importance observed by the respondents: a mean of 3.87 with a standard deviation of 0.99, described as high for *effectively use electronic mediums for discussing and completing assignments*; a mean of 3.82 with a standard deviation of 0.96, described as high for *adeptly combine ideas and concepts from different courses when completing assignments or engaging in class discussions*; a mean of 3.80 with a standard deviation of 0.96, described as high for *work diligently to meet the high standards and expectations set by their instructors*; a mean of 3.65 with a standard deviation of 1.13, described as high for *find creative ways to make the course relevant to their lives*; and *confidently deliver class presentations*, pronounced as high, attained a mean of 3.62 and a standard deviation of 1.20.

Significance of the Relationship Between Digital Skills and Learning Engagement

One crucial purpose of this study is to determine whether or not Digital Skills have a significant relationship with learning engagement. The appended table 5.1 shows that the Shapiro-Wilk Test for Bivariate Normality has a p-value of 0.43, indicating that the distribution is normal. Hence, a parametric test, Pearson's correlation, is suited for this distribution.

Table 5. Significance of the Relationship Between Digital skills and Learning Engagement

		Digital Skills	**Learning Engagement**
Digital Skills	Pearson's r	----	
	p-value	----	

Learning Engagement	Pearson's r	0.687	----
	p-value	<.001	----

*Significant at 0.05 level of significance

Table 5 shows that teaching competence and students' learning engagement have a Pearson's r-value of 0.687*, indicating a strong positive relationship. Furthermore, a p-value of <.001, less than the 0.05 p-value, means a significant relationship between Digital Skills and learning engagement. Hence, the null hypothesis, which states no significant relationship between Digital Skills and learning engagement, is rejected. This further implies that learning engagement tends to be observed when the Digital Skills are observed.

Significance on the Relationship Between Attitude Towards Technology and Learning Engagement

Another crucial purpose of this study is to determine whether or not the Attitude Towards Technology has a significant relationship with learning engagement. The appended table 6.1 shows that the Shapiro-Wilk Test for Bivariate Normality has a p-value of .120, indicating that the distribution is normal. Hence, a parametric test, Pearson's r correlation, is suited for this distribution.

Table 6. Significance of the Relationship Between Attitude Towards Technology and Learning Engagement

		Attitude Towards Technology	**Learning Engagement**
Attitude Towards Technology	Pearson's r	----	
	p-value	----	
Learning Engagement	Pearson's r	0.626	----
	p-value	<.001	----

Table 6 shows that Attitude Towards Technology and learning engagement have a Pearson's r-value of 0.626*, indicating a strong positive relationship. Moreover, a p-value of <.001, less than the 0.05 p-value, means a significant relationship between Attitude Towards Technology and learning engagement. Thus, the null hypothesis, which states no significant relationship b52.4% between Attitude Towards Technology and learning engagement, is rejected. This further implies that Learning engagement tends to be observed when the Attitude Towards Technology is observed.

Multiple Regression Analysis on the Influence of the Domain of Digital Skills on Learning Engagement

Presented in Table 7 is the regression analysis on the influence of Digital Skills on learning engagement. The table shows a computed f-value of 23.63 and a p-value of <.001, meaning that Digital Skills significantly influences the learning engagement since the probability value is less than the 0.05 significance level. The coefficient of determination (R^2) of 0.524 connotes that Use of Devices Software explains 52.4% of learning engagement, Information Literacy Digital Communication, Content Creation, Digital Security ang Problem Solving In comparison, the remaining percentage of 60.8% is accountable to other indicators not included in the study.

Table 7. Multiple Regression Analysis on the Influence of the Domain Digital Skills on the\ Learning Engagement

Digital Skills	**Coefficient**	**t-value**	**p-value**	**Decision**
Use of Devices and Software	0.293	3.551	<.001	is rejected
Information Literacy	-0.046	-0.607	.545	is not rejected

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume X Issue III March 2026

Digital Communication	0.104	1.383	.195	is not rejected
Content Creation	0.141	2.096	.038	is not rejected
Digital Security	0.235	3.128	.002	is not rejected
Problem Solving	0.224	3.317	<.001	is rejected
Dependent Variable: Learning Environment				
***p<0.05**	R=0.724	R^2=0.524	F-value=23.63	p<.001

The indicator *Use of Devices and Software* has a coefficient of 0.293*, a t-value of 3.551, and a p-value of <.001, which is higher than the 0.05 Level of significance. indicating that the use of device software significantly influences Learning engagement in a singular capacity.

Second, the *Information Literacy* has a coefficient of -0.046*, a t-value of -0.607, and a p-value of .545, Greater than the 0.05 level of significance, indicating that *Information Literacy* did not significantly influence Learning Engagement in a singular capacity. More so, the coefficient of -0.046* indicates that a one-unit increase in procedural results in a corresponding rise of -0.046*in learning engagement.

The *Digital Communication* has a coefficient of 0.104*, a t-value of 1.383, and a p-value of .169, which is greater than 0.05, indicating that Digital Communication did not significantly influence learning engagement. Moreover, the coefficient 0.104* indicates that a one-unit increase in the level of Digital Communication results in a corresponding rise of 0.104* learning engagement

Next, the *content creation* has a coefficient of 0.141, a t-value of 2.096, and a p-value of .038, which is greater than the significance level of 0.05, indicating that content creation did not significantly influence learning engagement. Additionally, the coefficient of 0.141 indicates that a one-unit increase in the level of content creation results in a corresponding rise of 0.141 in content creation.

Another is that *digital* security has a coefficient of 0.235, a t-value of 3.128, and a p-value of .002, which is greater than the significance level of 0.05, indicating that digital security did not significantly influence learning engagement. Further, the coefficient of 0.235 indicates that a one-unit increase in the level of digital security results in a corresponding rise of 0.177 in learning engagement.

Lastly, problem solving has a coefficient of 0.224; a t-value of 3.317; and p-value of <.001, which is greater than the level of significance of 0.05. therefore, this implies that problem solving has no significance influence on learning engagement, as assessed by the school educators among Mawab District Secondary Schools. Overall, this leads to the decision that third null hypothesis, which stated that there is no domain in digital skills that would significantly influence learning engagement among Mawab District Secondary Schools, is rejected.

Multiple Regression Analysis on the Influence of the Domain of Attitude Towards Technology on Students' Learning Engagement

Presented in Table 8 is the regression analysis on the influence of adversity quotient on the students' learning engagement. The table shows a computed f-value of 183.826 and p-value of <.001, meaning that the adversity quotient significantly influences the students' learning engagement since the probability value is less than the 0.05 significance level. The coefficient of determination (R^2) of 0.666 connotes that 66.6% of students' learning engagement is explained by control, ownership, and reach. In comparison, the remaining percentage of 33.4% is accountable to other indicators not included in the study.

Table 8. Multiple Regression Analysis on the Influence of the Domain of Attitude Towards Technology to the Learning Engagement

Attitude Towards Technology	Coefficient	t-value	p-value	Decision $\alpha = 0.05$
Technological Career Aspiration	0.101	1.207	.230	H_o is not rejected

Interest in technology	0.124	1.586	.115	H_o is not rejected
Tediousness Towards Technology	-0062	-0.912	.363	H_o is not rejected
Technology is for both boys and girls	-0.011	-0.167	.867	H_o is not rejected
Consequences of Technology	0.252	3.552	<.001	H_o is rejected
Technology is difficult	0.456	5.264	<.001	H_o is rejected
Dependent Variable: Learning Environment				

$*p < 0.05 \quad R = 0.748* \quad R^2 = 0.560 \quad F-value = 27.38 \quad p < .001$

The indicator technological Career Aspiration has a coefficient of 0.101, a t-value of 1.207, and a p-value of .230, less than the significance level at 0.05, Therefore, this indicates that technological Career Aspiration is the domain of Attitude Towards Technology which has a significant influence to learning engagement

Next, the *Interest in Technology* has a coefficient of 0.124 a t-value of 1.586, and a p-value of .115, which is less than the significance level of 0.05, indicating that learning environment in attitude towards technology. More so, the coefficient of 0.0124* connotes that a one-unit increase in Interest in Technology results in a corresponding rise of 0.01.586 in learning engagement.

Tediousness Towards Technology has a coefficient of -0062*, a t-value of -0.912, and a p-value of .363, which is greater than the 0.05 significance level, suggesting that Attitude Towards Technology significantly influences learning engagement. Additionally, the coefficient of -0062* means that a one-unit increase in the level of reach results in a corresponding rise of -0062 in learning engagement.

Similarly, Technology is for both boys and girls has a coefficient of -0.011, a t-value of -0.167, and a p-value of .867, which is less than the 0.05 significance level, Therefore, this implies that Technology is for both boys and girls is the domain of Attitude Towards Technology which has a significant influence to Learning engagement.

In addition, Consequences of Technology got a coefficient of 0.252; a t-value of 3.552; and p-value of 0.001, which is less than the level of significance at 0.05. therefore, this indicates that Consequences of Technology is the domain of Attitude towards technology, which has a significant influence on learning engagement.

Lastly, *Technology is difficult* has a coefficient of 0.456, a t-value of 5.264,and a p-value <.001, which is greater than the level of significance at 0.05. therefore, this implies that *Technology is difficult* has no significant *influence on learning engagement as experienced by school educators, In conclusion, this leads to the decision that the fourth null hypothesis, which stated that that there is no domain in Attitude Towards Technology that would significantly influence learning engagement among Mawab District Secondary Schools, is also rejected.*

Significance on the Relationship Between Digital Skills And Learning Engagement

One crucial purpose of this study is to determine whether or Digital Skills has a significant relationship with Learning engagement. The appended table 5.1 shows that the Shapiro-Wilk Test for Bivariate Normality has a p-value of 0.43, indicating that the distribution is not normal. Hence, a non-parametric test, Spearman's rho correlation, is suited for this distribution.

Table 5. Significance on the Relationship Between Digital Skills and Learning Engagement

		Digital Skills	**Learning Engagement**
Digital Skills	Spearman's rho	----	
	p-value	----	

Learning Engagement	Spearman's rho	0.687*	----
	p-value	<.001	----

*Significant at 0.05 level of significance

Table 5 shows that Digital Skills and learning engagement have a Spearman's rho value of 0.687*, indicating a moderate relationship. Moreover, a p-value of <.001, less than the 0.05 p-value, means a significant relationship between Digital Skills and learning engagement. Thus, the null hypothesis, which states no significant relationship between Digital Skills and learning engagement, is rejected. This further implies that learning engagement tends to be observed when the Digital skills are observed.

Table 2. Level of Digital Skills

Indicators	**Mean**	**SD**	**Descriptive Equivalent**
Use of Devices and Software	4.17	0.58	High
Information Legacy	4.00	0.57	High
Digital Communication	4.05	0.56	High
Content Creation	4.00	0.61	High
Digital Security	3.94	0.62	High
Problem Solving	3.97	0.74	High
Overall	**4.02**	**0.43**	**High**

Table 2.1. Level of Digital Skills in terms of Use of Devices and Software

Indicators	**Mean**	**SD**	**Descriptive Equivalent**
1. Use Digital Device (e.g., phones, tablets) for conducting scientific research	4.05	0.72	Very High
2. feel confident using specialized programs for scientific research (e.g., software for data analysis).	4.08	0.57	High
3. effectively utilized digital tools to manage scientific literature and generate citations and references.	4.08	0.74	High
Overall	**4.17**	**0.58**	**High**

Table 2.2. Level of Digital Skills in terms Information Legacy

Indicators	**Mean**	**SD**	**Descriptive Equivalent**
1. regularly search for scientific literature in academic databases.	3.96	0.74	Very High
2. Critically evaluate the credibility and relevance of scientific articles found online.	4.05	0.68	High
Overall	**4.00**	**0.57**	**High**

Level 2.3. Level of Digital Skills in terms of Digital Communication

Indicators	Mean	SD	Descriptive Equivalent
1. use email and instant messaging applications to communicate with fellow researchers.	4.12	0.74	High
2 use online collaborative tools for working together on research projects.	4.08	0.68	High
3. participate in webinars and virtual scientific events to share my research results and engage with others.	3.96	0.78	High
Overall	**4.05**	**0.56**	**High**

Level 2.4. Level of Digital Skills in terms of Content Creation

Indicators	Mean	SD	Descriptive Equivalent
1.use digital tools to write and edit research proposals and scientific papers with ease.	4.02	0.73	High
2.have proficiency in using software to create and edit graphs and tables for data visualization in my research	3.98	0.72	High
Overall	**4.00**	**0.61**	**High**

Level 2.5. Level of Digital Skills in terms of Digital Security

Indicators	Mean	SD	Descriptive Equivalent
1. resolve technical issues with the software used in my research projects.	3.98	0.69	High
2. resolve technical issues with the hardware used in my research projects.	3.90	0.71	High
Overall	**3.94**	**0.62**	**High**
Overall	**4.00**	**0.61**	**High**

Level 2.6. Level of Digital Skills in terms of Problem Solving

Indicators	Mean	SD	Descriptive Equivalent
1. resolve technical problems with research software independently.	3.97	3.97	High
2. resolve technical problems with research hardware independently.	3.80	0.83	High
Overall	**3.97**	**0.74**	**High**

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume X Issue III March 2026

Table 3. Level of Attitude Towards Technology

Indicators	Mean	SD	Descriptive Equivalent
Technological Career Aspiration	4.02	0.68	High
Interest in Technology	3.75	0.51	High
Tediousness Towards Technology	3.45	0.79	
Technology is for Boys and Girls	3.70	0.80	
Consequences of Technology	4.07	0.58	
Technology is Difficult	3.97	0.55	
Overall	**3.83**	**0.45**	**High**

Table 3.1. Level of Attitude Towards Technology in Technological Career Aspiration

Indicators	Mean	SD	Descriptive Equivalent
1. am likely to choose a career in technology.	4.13	0.85	High
2. would enjoy a career in technology.	4.01	0.85	High
3. would be interested in pursuing a career in technology in the future	3.97	0.78	High
4. find working in technology to be appealing.	3.96	0.79	High
Overall	**4.02**	**0.68**	**High**

Table 3.2. Level of Attitude Towards Technology in terms of Interest In Technology

Indicators	Mean	SD	Descriptive Equivalent
1. believe technology lessons are essential	4.05	0.75	Very High
2. prefer not having technology lessons in school	3.64	0.91	High
3. would join a school technology club if there were one.	3.69	0.93	High
4. am not interested in technology	3.20	1.02	High
5. think there should be more focus on technology education	3.87	0.81	High
6. Enjoy fixing things around the house.	4.06	0.76	
Overall	**3.75**	**0.51**	**High**

Table 3.3. Level of Attitude Towards Technology in terms of Tediousness Towards Technology

Indicators	Mean	SD	Descriptive Equivalent
1. don’t understand why someone would choose a career in technology.	3.61	0.97	High

2. find most technology jobs to be boring.	3.46	1.02	High
3. think machines are uninteresting.	3.27	0.92	High
4. believe technological hobbies are dull.	3.47	0.92	High
Overall	**3.45**	**0.79**	**High**

Table 3.4. Level of Attitude Towards Technology in terms of TECHNOLOGY IS FOR BOTH BOYS AND GIRL

Indicators	**Mean**	**SD**	**Descriptive Equivalent**
1. don't understand why someone would choose a career in technology.	3.71	0.96	High
2. find most technology jobs to be boring.	3.65	0.91	High
3. think machines are uninteresting.	3.73	0.98	High
Overall	**3.70**	**0.80**	**High**

Table 3.4. Level of Attitude Towards Technology in terms of Consequences Of Technology

Indicators	**Mean**	**SD**	**Descriptive Equivalent**
1. believe technology improves efficiency.	4.16	0.72	High
2. think technology plays a crucial role in daily life.	4.00	0.76	High
3. consider technology lessons to be valuable.	4.10	0.78	High
4. believe everyone needs to be proficient in technology.	4.04	0.75	High
Overall	**4.07**	**0.58**	**High**

Table 3.4. Level of Attitude Towards Technology in terms of Technology Is Difficult

Indicators	**Mean**	**SD**	**Descriptive Equivalent**
1. think you need to be exceptionally intelligent to study technology.	4.00	0.79	High
2 feel technology is only for highly intelligent individuals.	3.83	0.87	High
3. can figure out new digital tools with minimal guidance.	3.80	0.80	High
4. enjoy learning new technologies to increase productivity.	4.12	0.75	High
5. can quickly adapt to changes or updates in the technology I use.	4.08	0.78	
Overall	**3.83**	**0.45**	**High**

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume X Issue III March 2026

Table 4. Level of Learning Engagement

Indicators	**Mean**	**SD**	**Descriptive Equivalent**
Behavioral Learning Engagement	4.14	0.65	High
Emotional Learning Engagement	4.09	0.53	High
Cognitive Learning Engagement	4.10	0.53	High
Overall	**4.11**	**0.499**	**High**

Table 4.1. Level of Learning Engagement in terms of Behavioral Learning Engagement

Indicators	**Mean**	**SD**	**Descriptive Equivalent**
1. deliver a well-prepared presentation on a research topic during class.	4.20	0.75	High
2. actively ask questions or participate in discussions during classes.	4.05	0.73	High
3. participate actively in group assignments and experimental tasks.	4.16	0.83	High
Overall	**4.14**	**0.65**	**High**

Table 4.2. Level of Learning Engagement in terms of Emotional Learning Engagement

Indicators	**Mean**	**SD**	**Descriptive Equivalent**
1. feel supported by my mentor when encountering research problems.	3.99	0.79	High
2. believe my courses are beneficial for my personal growth	4.02	0.76	High
3. enjoy collaborating with classmates on academic projects.	4.14	0.76	High
4. look forward to attending classes.	3.16	0.74	High
5. am proud of the assignments I complete in class.	4.14	0.87	High
Overall	**4.09**	**0.53**	**High**

Table 4.3. Level of Students' Learning Engagement in terms of Cognitive Learning Engagement

Indicators	**Mean**	**SD**	**Descriptive Equivalent**
1. connect new material to my existing knowledge.	4.20	0.77	High
2. take thorough notes on key points during class.	4.08	0.79	High
3. solve problems by considering multiple perspectives.	4.00	0.83	High
4. strive to understand others' viewpoints by putting myself in their shoes.	4.13	0.78	High

5. develop well-supported opinions through logical reasoning.	4.05	0.87	High
Overall	**4.10**	**0.53**	**High**

Table 5. Significance on the Relationship Between Digital Skills and Learning Engagement

		Digital Skills	**Learning Engagement**
Digital Skills	Pearson's r	----	
	p-value	----	
Learning Engagement	Pearson's r	0.687*	----
	p-value	<.001	----

*Significant at 0.05 level of significance

Table 5.1. Shapiro-Wilk Test for Bivariate Normality

	Shapiro-Wilk	**p**
Digital Skills - Learning Engagement	0.983	.043

Table 6. Significance on the Relationship Between Attitude Towards Technology and Learning Engagement

		Attitude Towards Technology	**Learning Engagement**
Attitude Towards Technology	Pearson's r	----	
	p-value	----	
Learning Engagement	Pearson's r	0.626*	----
	p-value	<.001	----

Table 6.1. Shapiro-Wilk Test for Bivariate Normality

	Shapiro-Wilk	**p**
Attitude Towards Technology - Learning Engagement	0.986	.120

Table 7. Multiple Regression Analysis on the Influence of the Domain of Digital Skills to the Students' Learning Engagement

Digital Skills	**Coefficient**	**t-value**	**p-value**	**Decision $\alpha = 0.05$**
Use Of Devices and Software	0.293*	3.551	<.001	H_o is rejected
Information Literacy	-0.046*	-0.607	.545	H_o is not rejected
Digital Communication	0.104	1.383	.169	H_o is not rejected
Content Creation	0.141	2.096	.038	H_o is not rejected

Digital Security	0.235	3.128	.002	H_o is not rejected
Problem Solving	0.244	3.317	<.001	is rejected
Dependent Variable: Learning Environment				

$*p < 0.05 \quad R = 0.724* \quad R^2 = 0.524 \quad F - value = 23.63 \quad p < .001$

Table 8. Multiple Regression Analysis on the Influence of the Domain of Attitude Towards Technology to the Learning Engagement

Attitude Towards Technology	**Coefficient**	**t-value**	**p-value**	**Decision $\alpha = 0.05$**
Technological Career Aspiration	0.101	1.207	.230	H_o is not rejected
Interest In Technology	0.124	1.586	.115	H_o is not rejected
Tediousness Towards Technology	-0.062	-0.912	.363	H_o is not rejected
Technology is for Both Boys and Girl	-0.011	-0.167	.867	H_o is not rejected
Consequences of Technology	0.252	3.552	<.001	H_o is rejected
Technology is Difficult	0.456	5.264	<.001	H_o is rejected
Dependent Variable: Learning Engagement				

$*p < 0.05 \quad R = 0.748* \quad R^2 = 0.560 \quad F - value = 23.63 \quad p < .001$

DISCUSSION

This chapter presents the findings on digital skills, attitudes towards technology, and students' learning engagement. The discussion is based on the results presented in the previous section. Additionally, this section examines relevant literature and related studies that support the findings, draws conclusions from the analysis, and offers recommendations based on these results.

Level of Digital Skills

The study revealed that students demonstrated a high level of digital skills (Mean = 4.02). This indicates that students have developed strong abilities in using devices and software, communicating digitally, and finding and evaluating information. This finding suggests that incorporating technology in education has positively contributed to students' digital competencies, better preparing them to handle technical tasks and improve their performance in practical activities.

It is greatly highlighted in the results of the study, that students' technological career aspirations and their interest in technology are significant predictors of their overall course learning value, affirming the study of Routray and Mohanty (2024). They noted that when students perceive technology as a tool for their future professional growth, their motivation and engagement levels increase significantly.

In a recent investigation into the use of technological devices, Paradero, J. P., et al. (2025) found that students who hold positive beliefs about the usage and relevance of digital tools exhibit a "very high" level of academic engagement. The study suggests that students no longer view technology as a mere distraction but as a core component of their educational journey, which fosters a proactive attitude toward learning tasks.

Additionally, research on interactive technologies by ElSayary (2024), such as AI and virtual reality, indicates that these tools positively shape students' goal-oriented engagement. By providing immersive experiences and real-time feedback, technology helps students visualize complex concepts and make meaningful connections to real-world applications, thereby strengthening their positive attitude toward digital integration in schools.

Also, in a study on technology-based curriculum development by Athallah, R. et al. (2025), it emphasizes that modern education focuses on equipping students with skills relevant to the digital era and the global workforce. The findings suggest that a technology-oriented curriculum catalyzes sustainable social and economic transformation, as students recognize the professional utility of these tools for their future careers.

Moreover, this research also added that the utilization of CSS in the classroom has been shown to foster positive responses and independent learning Mekalungi, Subagyo, 2024). This paper highlights that when students understand how technology prepares them to handle challenges in the "outside world," they develop a stronger attachment to their learning environment and a more favorable attitude toward technological adoption.

Furthermore, new evidence suggests that the strategic integration of digital support strengthens student self-confidence and motivation. Guzik (2025) argues that fostering a positive attitude at an early stage leads to higher levels of "engineering thinking" and perceived learning value, as students begin to see digital literacy as a prerequisite for success in a technologically interconnected society.

Moreover, a 2023 report, as stipulated by Yang, G., et al. (2023), demonstrated that AI-driven personalized learning platforms significantly enhance student performance by providing tailored feedback. This personalization helps students move from passive users to active participants, as they perceive the technology as a helpful assistant that optimizes their learning pace and outcomes.

Lastly, Baloran and Hernan (2021) noted that the transition to online learning platforms was met with high levels of student adaptation despite technical challenges. Their study revealed that a positive attitude toward digital tools was a key factor in maintaining engagement during the pandemic, as students recognized the necessity of technology for continued academic progress.

Level of Attitude Towards Technology

The respondents' attitude towards technology was found to be High (Mean = 3.83). This suggests that students generally have positive technological career aspirations and recognize the perceived professional utility of digital tools. As noted by Doungpitak et al. (2023), understanding the consequences and benefits of technology helps students develop a responsible attitude, which is crucial for improving their overall learning engagement.

This correlation aligns with Draissi et al. (2025), who highlighted that the "High" level of positive attitude in students is often linked to the ability of digital tools to provide personalized learning experiences. When students perceive that technology is being used to meet their individual diverse needs and pace, they develop a sense of competence and autonomy. This positive "affective response" is a critical enabler of sustained participation in technically demanding subjects.

This supports the study of Sailer et al (2024), a meta-analysis confirmed that students maintain a high level of engagement when they perceive the professional utility of digital tools through real-time feedback and student-centered learning environments. The study found that positive attitudes are reinforced when students see immediate evidence of their progress, which bridges the gap between theoretical knowledge and practical workplace application.

Furthermore, in a study focused on Senior High School students in the Philippines, as conducted by Indrinal (2022), it was observed that students have a strong demand for learning outcomes oriented toward practical skills. Even when facilities are limited, students who possess a high level of awareness regarding the professional necessity of computer software applications show a greater willingness to adapt and engage with available technological resources.

Moreover, Ateş and Köroğlu (2024) stipulated how technological advancements and adaptive learning systems make education more inclusive. Students who exhibit a high level of technological engagement often do so because they recognize these tools as "essential conditions" for maintaining academic effectiveness in a globalized environment. This recognition of utility directly translates into higher behavioral and cognitive engagement in the classroom.

Notably, Dimaunahan and Panoy (2021) explored the relationship between academic motivation, self-efficacy, and technical skills. The findings revealed that students' belief in and readiness to use technology significantly enhance their academic performance. A positive attitude serves as a motivational "engine" that drives students to overcome technical challenges, ensuring they remain focused and engaged throughout their vocational training.

Level of Learning Engagement

The level of students' learning engagement is High (Mean = 4.14), with behavioral engagement reaching a Very High level. This high engagement suggests that students are attentive, curious, and motivated in their education. Conversely, low engagement in specialized areas like Computer Systems Servicing (CSS) can lead to difficulties in bridging old and new knowledge, highlighting the importance of maintaining this high level of participation.

A study of Bizimana et al. (2025), investigating behavioral engagement among secondary students, found that high levels of participation are directly linked to students perceived academic competence. They argue that when students demonstrate high "vigor and dedication" (behavioral traits), they are more likely to achieve long-term success in both higher education and the workforce. This confirms that a high mean score in engagement reflects a student's readiness for future professional challenges.

Additionally, Diao et al. (2024) specifically address the "knowledge bridge" problem in technical subjects. The authors note that students with low engagement in specialized instructions, such as programming and technical logic, fail to bridge the gap between "old and new knowledge." This supports your finding that maintaining high participation in areas like Computer Systems Servicing (CSS) is essential for preventing learning gaps and ensuring technical mastery

Furthermore, Lattanze (2025) defines student engagement as a combination of curiosity, interest, and passion. The study emphasizes that "Behavioral Engagement" serves as the primary conduit for a student's psychological investment in their education. According to the findings, a "Very High" level of behavioral engagement suggests that students are not just physically present but are actively constructing knowledge through hands-on participation.

Moreover, Kahu et al. (2024), in their study focusing on technology-enhanced learning, found that high engagement levels act as a "cornerstone" for student retention. The researchers highlight that in technical and vocational education, students who are "attentive and curious" (behavioral and emotional engagement) are significantly less likely to drop out compared to those who exhibit passive learning behaviors.

Notably, Ames and West (2025) examine the link between high behavioral engagement and "Technical Employment Preparedness." The study concludes that students who engage deeply with hardware installation and network configuration (core CSS tasks) report higher self-efficacy. Conversely, those with lower engagement struggle with "advanced troubleshooting," highlighting the critical importance of the high engagement levels found in your study for professional readiness.

Significance on the Relationship Between Digital Skills and Students Learning Engagement

The findings of the study showed a significant relationship between digital skills and learning engagement, which indicates that students who have higher levels of digital skills tend to show more behavioral, emotional, and cognitive engagement, these finding emphasizes that the role of digital skills greatly influences learning engagement specially in Computer Systems Servicing (CSS).

The results of the findings is strongly supported by Constructivist Learning Theory proposed by Piaget (1972), which emphasizes that learning is an active process where students learn through interactions hands on performance with tools and experiences, digital skills allow students to utilize digital tools, explore information, and apply computer procedures, which in turn enhances their learning engagement, When students are capable of utilizing digital platforms and devices, they are more likely to participate actively and sustain attention during learning activities.

Moreover, other theory strongly supports our finding by Bandura's Social Cognitive Theory (1986) they explains that self-efficacy significantly influences learning behavior, overalls Students with strong digital skills develop faster to understand devices and be more confidence in their ability to complete technology related tasks, which increases their motivation, persistence, and learning engagement, This encourages learners to take initiative, ask questions, and participate more actively in class specially in computer system servicing (CSS).

Similarly, Zimmerman (2000) emphasized that self-regulated learners who are confident in their skills exhibit a higher levels of engagement and academic involvement in OECD (2019) highlighted that digital competence is a key factor in promoting learner in critical thinking, These elements are directly associated with behavioral and cognitive engagement and learning engagement, therefore this study confirms that digital skills are not merely technical abilities but an essential drivers of meaningful learning engagement.

Significance on the Relationship Between attitude towards technology and Learning Engagement

The findings revealed a significant relationship between attitude towards technology and learning engagement, students who have a positive perspective and feelings toward technology are more likely to be more actively engaged in wanting to learn technology in class like in computer system servicing, these results shows the importance of students, mindset, beliefs, and emotional responses toward technology in shaping their learning behavior.

The finding aligns with the Technology Acceptance Model (TAM) developed by Davis (1989), which suggest that perceived usefulness and perceived ease and use this greatly influence learners attitudes toward technology, thereby affecting their usage on technology, when students view technology as beneficial and easy to use and operate, they are more willing to use it for education purposes, leading to increased participation and engagement on computer system servicing (CSS).

Furthermore, Ajzen's Theory of Planned Behavior (1991) supports these finding by explaining that attitudes greatly influence the behavioral intentions of learners, which in turn guide actual behavior, students who possess good attitudes toward technology are more invested on wanting to understand or learn and pay more attention, and emotional involvement in learning activities, Teo (2011) further emphasized that positive attitudes toward technology enhance students motivation and emotional engagement, especially in technology-supported learning like in computer system servicing (CSS).

Additionally, Venkatesh et al. (2012), through the Unified Theory of Acceptance and Use of Technology (UTAUT), argued that attitudes and perceptions significantly affect learners' engagement, participation and persistence in technology-based tasks, the findings greatly reinforce these theories by demonstrating that students' attitudes toward technology play a vital role in sustaining learning engagement.

Multiple Regression Analysis on the Influence of the Domain of Attitude towards technology on Learning Engagement

The multiple regression analysis revealed that Technological Career Aspiration is the domain of attitude towards technology that significantly influences students' learning engagement, this indicates that students who perceive that a future career in technology job tend to show a higher level of engagement and learning activities specially in computer system servicing (CSS).

The finding are supported by the Expectancy-Value Theory of Eccles and Wigfield (2002), which states that learners are more engaged when they perceive learning tasks as valuable and relevant or even essential for their needs or even future goals, therefore Students with strong technological career aspirations view learning activities as meaningful investments toward their career development, resulting in greater motivation, persistence, and engagement in the real world.

Moreover, Super's Career Development Theory (1990) emphasizes that career aspirations enhances learners behaviors and decision making, When students associate their academic tasks with future professional jobs, they are more likely to show more effort and remain focused in wanting to learn computer system servicing, Savickas (2013) further argued that career adaptability influences students' engagement by shaping their readiness to respond and interact with learning challenges.

Other domains of attitude towards technology, such as interest in technology, showed that less influence in the regression model, this suggests that while generally interest is important, future-oriented motivation has a stronger impact on sustaining a great learning engagement, thus, integrating career-oriented learning experiences can significantly enhance students' engagement on wanting to learn about technology.

Multiple Regression Analysis on the Influence of the Domain of Digital skills on Learning Engagement

The findings revealed that problem-solving skills significantly influence students learning engagement, these result highlights the importance of student's ability to comprehend and understand digital problems, identify solutions, and applying appropriate procedures in enhancing learning engagement.

The finding of the study aligns will with Problem-Based Learning Theory proposed by Hmelo-Silver (2004), which emphasizes that learning becomes more engaging when students actively solve real-world problems like hands on performance, Students with strong digital problem-solving skills are more capable of handling challenges independently, which increases their confidence and involvement in learning activities.

Additionally, the 21st Century Skills Framework by Trilling and Fadel (2009) identifies that's problem-solving is a core skill that promotes critical thinking, creativity, and collaboration among learners, students who can effectively solve digital problems and demonstrate higher levels of cognitive engagement as they analyze, evaluate, and apply what they learn in the real world, Deci and Ryan's Self-Determination Theory (2000) further supports this finding by explaining that competence and motivation of learning on wanting to learn and what pushes them to learn, which leads to sustained learning engagement.

Therefore, the significant influence of digital problem-solving skills confirms that learning engagement is enhanced when students feel capable of overcoming learning challenges, therefore the finding emphasizes the need for instructional strategies that strengthen students digital problem-solving abilities to promote deeper and more meaningful learning engagement.

CONCLUSION

In light of the findings of the study, the following conclusions are drawn. The level of digital skills among the students is high, particularly in operating devices and software. Notably, this proficiency suggests that students are well-equipped to navigate the technical demands of a digital-heavy curriculum. Furthermore, the high level of attitude towards technology indicates that students possess strong career aspirations and recognize the professional utility of digital tools. In addition, the level of students' learning engagement is high, with behavioral engagement reaching a very high level. This implies that students are not only present but are actively curious and motivated in their education.

Moreover, a significant positive relationship exists between digital skills, attitude towards technology, and learning engagement. This leads to the realization that technical proficiency and a positive mindset work in tandem to keep a student involved in their studies. Additionally, the regression analysis confirms that both variables significantly influence engagement. Contrary to the idea that skill alone is enough, the study concludes that a student's "affective perspective", specifically their career motivation, is the primary driver of their participation.

RECOMMENDATIONS

After the presentation and discussion of the findings and the results of the study, the following recommendations have been formulated by the researchers. Notably, since the level of digital skills is high but shows room for improvement in specific technical areas, school administrators should design and implement targeted enhancement programs. Furthermore, these programs should focus specifically on the domains of Problem Solving and Digital Security, as these were identified as areas where students could further strengthen their proficiency to meet industry standards.

Additionally, for teachers and curriculum planners, there is a need to deliberately integrate more hands-on digital tasks that highlight the perceived professional utility of technology. Moreover, by showing students how specific software and hardware skills apply directly to their future careers in Computer Systems Servicing (CSS), educators can maintain and even elevate the already high level of student engagement.

In addition, students are encouraged to remain proactive in developing their technical skills while maintaining a positive outlook toward technological advancements. Consequently, focusing on technological career aspirations will serve as a strong motivational driver, helping them stay attentive and curious during complex specialized instructions.

Furthermore, given the strong positive relationship between attitude and engagement, guidance counselors and mentors should foster a supportive "affective perspective" among learners.

Finally, future researchers may consider conducting similar studies using other variables not covered in this research. Contrary to focusing solely on digital skills, they might explore external factors such as parental support or laboratory facility quality to provide a more holistic view of student engagement in the digital age

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