

ACCESSIBILITY AND PERCEPTIONS OF E-LEARNING IN MATHEMATICS AMONG GRADE 11 STUDENTS AT MABOLO NATIONAL HIGH SCHOOL

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Abstract. The study aims to investigate how students use e-learning resources and interact with computers to learn mathematics. Furthermore, senior high school students and those in basic and secondary education are taught utilizing e-learning tools, which are perceived as a level of ICT application. The researchers used a descriptive-correlational design to determine students' accessibility and use of ICTs and their perceptions of e-learning use in Mathematics. The study was conducted at Mabolo National High School, and using Raosoft's formula, the study drew two hundred fifty-seven (257) respondents selected randomly to represent the Grade 11 students. The researchers used an adapted tool to gather data from the respondents, and the tool underwent validity and reliability testing. The study employed frequency and percentage, weighted mean, and Pearson correlation coefficient to analyze the data. The results indicate a Pearson's correlation of 0.741, which indicates a moderate positive correlation with a critical r value of 0.123. As a result, the study rejects the null hypothesis and concludes that there is a substantial correlation between the level of ICT access and use and the level of perception of the use of e-learning in mathematics education. This indicates that students are more likely to view e-learning favorably the more they are exposed to the various e-learning resources. This finding shows that perceptions of e-learning for mathematics are closely tied to the availability and accessibility of Internet access. This value suggests that as students' access to and use of ICTs increase, their perceptions of these technologies' effectiveness and relevance in their studies also improve. This strong correlation underscores the importance of providing students with greater access to ICT resources.

Keywords: Accessibility, Cebu City, e-learning, digital Platform, mathematics, Philippines

Introduction

Technology has made the world more and more digital. Given how important education is to academia and students, the industry will be greatly impacted by rapid technological advancements and the more complex inventions that follow. A recent study mentioned by Coman et al. (2024) states that rapid technological advancements, such as artificial intelligence, virtual reality, and blockchain technology, contribute to the dawn of Industry 5.0, influencing business processes and everyday life.

Falling behind other nations in educational systems due to the enormous use of technology in education. In taking on the task of competing with them both locally and internationally, since graduates are created. In terms of education, educators are embracing the latest developments in

educational systems, which incorporate and make use of e-learning resources in the classroom for instruction, particularly in mathematics. YouTube has the potential to serve as a viable platform for mathematical education, with 30% of participants using it as a resource for learning mathematics, as indicated in the study by Anisa et al. (2023).

One of the disciplines most students detest is mathematics. Mathematics is the foundation of advancement in many disciplines, including science and technology. Studying mathematics seriously also develops critical thinking, problem-solving skills, and creativity (Andrei, 2024). Nevertheless, many kids find learning mathematics difficult and discouraging. Several studies have identified factors that contribute to difficulty in this subject, such as low motivation (Mahadiyanti, 2024), ineffective teaching methods (Mangarin & Caballes, 2024), negative feelings (Acharya, 2017), and inadequate foundational knowledge (Mahmudah et al., 2026). Furthermore, researchers from various countries have investigated technology integration as a solution to students' mathematics problems, pointing to a game-based approach as a methodology (Fadda et al., 2021; Pan et al., 2022; Ratinho et al., 2026; Tokac et al., 2019).

Mathematics has long been recognized as a discipline that nurtures higher-order cognitive skills, and recent neuroscientific evidence further substantiates this claim. Dr. Tanya Evans at Stanford University demonstrated that math-proficient children consistently activate specific brain regions and have greater gray matter volume in those areas than peers with weaker mathematical skills, suggesting that mathematical engagement fosters neurological growth and cognitive resilience (Digitale, 2015). This finding resonates with Butterworth's (1999) concept of an innate "number sense" and Dehaene's (2011) assertion that mathematical learning reshapes neural pathways to support abstract reasoning. Augmenting these perspectives, Schoenfeld (2016) emphasized mathematics as a vehicle for developing metacognitive regulation and problem-solving strategies, while Simms (2016) highlighted its role in cultivating creativity, adaptability, and perseverance in learners. Collectively, these studies affirm that mathematics is not merely a technical skill but a multidimensional discipline that enhances reasoning, creativity, spatial and abstract thinking, and critical problem-solving, while also arming individuals with organizational capacities that reduce chaos and structure everyday life.

As a result, e-learning platforms, such as games, can be tools teachers use in their classes to motivate students and encourage participation and interaction with mathematics lessons. Since youngsters nowadays are fond of using gadgets such as mobile phones, laptops, tablets, and computers for leisure, these devices can be used not only for entertainment but also for learning and teaching. They spend a lot of time checking their social media accounts and playing mobile games, even in the classroom, which is considered a distraction. To maximize the use of technology and reduce distractions, it is time to integrate it into their learning.

E-learning tools have received substantial attention in mathematics education, particularly among Grade 11 students. Educators have recognized technology's growing influence on student learning and have sought to leverage this trend to enhance the effectiveness of their teaching methods.

However, implementing e-learning games in the mathematics classroom is challenging. Multiple studies found that teachers may face obstacles in this context. Math teachers using game-based learning encounter challenges such as lack of resources, poor training exposure, limited time, and issues in handling classroom, resulting to ineffective integration (Kar, 2026). Also, other

studies mentioned that technophobia (Saal et al., 2024), problem in suitability of lesson (Arellano et al., 2026), and lack of knowledge in using tools (Matic et al., 2023).

In response to these issues, a study was initiated to explore the use and impact of e-learning among Grade 11 students at Mabolo National High School. The study aimed to understand how these digital tools are integrated into classroom activities and how effective they are in enhancing learning outcomes. As part of the study, students were given opportunities to engage with various e-learning materials within their respective classes, including interactive games and digital platforms. This approach sought to assess students' experiences, engagement levels, and overall learning performance when using these innovative educational tools.

In this context, the study demonstrated the benefits of incorporating educational games and interactive learning materials into student activities, which in turn positively influenced learning outcomes. Integrating these techniques gave learners more opportunities to engage actively in the learning process, turning abstract mathematical concepts into experiences that were more relatable, concrete, and stimulating. Such approaches not only enhanced comprehension but also fostered motivation and sustained interest in mathematics, a subject often perceived as difficult or intimidating.

Methodology

Design

This study utilized a descriptive-correlational design to determine the extent of the students' accessibility to e-learning in learning mathematics. In this study, the descriptive method was used to assess the level of accessibility of e-learning for mathematics and Grade 11 students' perceptions of its use, using a survey questionnaire with a 4-point Likert scale. The correlational design focuses on exploring the relationship between the level of accessibility and Grade 11 students' perceptions of using e-learning in learning mathematics.

Locale

This study was conducted at Mabolo National High School, specifically within its Senior High School Department, situated along Juan Luna Avenue in Barangay Mabolo, Cebu City, Philippines. The institution is a public secondary school under the Department of Education (DepEd) and serves a diverse population of learners from urban and nearby communities.

Respondents

In this study, the respondents were Grade 11 students enrolled in the Senior High School Department of Mabolo National High School during the School Year 2024–2025. A total of 257 students participated, selected through simple random sampling to ensure that each eligible student had an equal chance of inclusion. These students were considered appropriate respondents because they had substantial exposure to mathematics-related subjects, including General Mathematics, Business Mathematics, Calculus, and Statistics and Probability, which made them suitable participants for the investigation.

The following inclusion criteria were applied to determine eligibility: (1) the participant must be a bona fide student of Mabolo National High School; (2) they must be officially enrolled

as a Grade 11 student during the School Year 2024–2025, and (3) they must be willing to take part in the data-gathering process and provide informed consent by signing the consent form.

Instrument

The study utilized a questionnaire adapted from the *Handbook of Technology-Enabled Learning Implementation* authored by Adrian Kirkwood and Linda Price under the Commonwealth of Learning (2016). To ensure relevance and applicability, the instrument was modified and contextualized to align with the specific objectives and setting of the present study.

The questionnaire was organized into three major parts: (1) Respondents' Personal Information – This section gathered demographic data such as age and sex. (2) Access and Use of Information and Communication Technologies (ICTs) – This section asked respondents to indicate the frequency with which they accessed and utilized ICT tools. (3) Perception of the Use of eLearning – This central section contained items designed to measure respondents' perceptions regarding the use of eLearning, with responses captured through a structured scale.

Data Gathering Procedure

The researchers have to seek approval from the Dean of the Graduate School. Next, the researchers sent a request letter and a transmittal letter to the Office of the Schools Division Superintendent of the Division of Cebu City to request permission and approval to conduct the study at Mabolo National High School.

After the Schools Division Superintendent approved, a letter was sent to the school to allow the researchers to conduct the study. Then, the letter was sent to the Senior High School Department and disseminated to each of the classroom advisers assigned to each section.

The questionnaires were personally administered to the respondents via Google Forms in the computer Laboratory. In addition to written instructions, oral instructions were provided to assist and guide the respondents in answering the questionnaire. The respondents were given 30 minutes to read the directions and answer the questions.

Data Analysis

Once the data was collected and organized, Microsoft Excel was employed to carefully tabulate and analyze the survey results. The statistical treatments applied in this study included weighted mean, standard deviation, and Pearson correlation coefficient.

The weighted mean was calculated to determine the level of access and use of ICTs as well as students' perceptions of eLearning in mathematics. Standard deviation was then used to measure the degree of variability in the responses, providing insight into how consistently or differently students perceived and utilized ICTs and eLearning tools. A smaller standard deviation indicated more uniform responses, while a larger value suggested greater diversity in student experiences and perceptions. Meanwhile, the Pearson correlation coefficient (Pearson-r) was utilized to examine the relationship between the two primary variables: ICT access and use, and perceptions of eLearning.

Together, these descriptive and inferential statistical methods ensured a comprehensive analysis, capturing both central tendencies and data variability while identifying the strength and direction of associations between variables.

Ethical Considerations

The study was conducted prior to the appointment set by the respective authority in the DepEd Cebu City Division Office. Questions were not forced on the respondents and remained confidential for both researchers and respondents.

During the study, the researchers took every precaution to safeguard the participants' rights. Participants gave informed consent after being fully informed of their right to discontinue participation at any time without repercussions. All information gathered was kept private and safely stored, respecting their privacy rights. We adhered to ethical standards to guarantee that study participants were not harmed, exploited, or subjected to excessive pressure.

The confidentiality of all participants in this study was guaranteed. All personal information provided by the Grade 11 students, including their survey responses and results, was kept strictly confidential. Data were anonymized, and any identifying information was removed before analysis. Only the researchers had access to the raw data, which was stored securely to prevent unauthorized access. Any publications or presentations from this study reported results in aggregate form, ensuring no individual participant could be identified. This commitment to confidentiality is a critical part of the ethical standards guiding this research, and every effort was made to protect participants' privacy throughout the study.

Participation in this research was entirely voluntary. All Grade 11 students were invited to participate and received detailed information about the study's purpose, procedures, and potential risks and benefits. Before participation, students and their guardians received consent forms outlining these details. Students were asked to sign the consent form, and minors required a parent or guardian signature. No participant was forced or pressured to participate, and they had the opportunity to ask questions or seek clarification before giving consent. By ensuring participants understand the study and willingly agree to participate, the research adheres to high ethical standards for voluntary participation.

Participants in this study have the right to withdraw at any time without consequences or penalties. If a student feels uncomfortable or no longer wishes to continue, they may inform the research team and immediately stop participating. Furthermore, participants were not obligated to answer every question and may choose to withhold specific information if they prefer not to disclose it. This right to withdraw or withhold information ensures that participants maintain control over their involvement and can freely decide the extent of their participation. Respecting this self-governance was a fundamental aspect of this study's ethical framework.

Results and Discussions

Level of Accessibility and Use of Information and Communication Technology (ICT) in Learning Mathematics for Grade 11 Students.

Table 1.

Results on the Level of Access and Use of ICTs in terms of Ownership and Access to ICT

Items	Weighted Mean	Standard Deviation	Descriptive Equivalent
I have personal ownership of essential ICT devices (e.g., smartphones, computers, tablets, laptops) that I use for learning mathematics.	3.07	0.63	Mostly Accessible
The ICT resources I own meet my daily technological needs, including those for learning mathematics.	2.96	0.63	Mostly Accessible
I have access to shared ICT facilities (e.g., community computer labs and workplace equipment) when learning mathematics.	2.60	0.74	Mostly Accessible
Overall Mean	2.88	0.50	Mostly Accessible

Interpretation: 4.0-3.25 Fully Accessible; 3.24-2.50 Mostly Accessible; 2.49-1.75 Somewhat Inaccessible; 1.74-1.0 Not Accessible

Table 1 shows the findings on students' ownership and access to ICTs. Most students had the necessary digital tools, such as cellphones, computers, or tablets, indicating a generally high level of digital readiness, as shown by the item on personal ownership of ICT devices, which had the highest weighted mean of 3.074 (SD = 0.630). The moderate standard deviation reflects students' consistent yet uneven access.

However, with a mean score of 2.961 (SD = 0.630), these devices received a somewhat lower score for appropriateness for everyday academic use. This suggests that although ownership is widespread, not all devices meet the functional requirements for studying mathematics, which may require additional specialized features.

In terms of accessibility or dependability, shared ICT facilities had the lowest mean score of 2.603 (SD = 0.744). The wider range of responses suggests unequal access, which could be due to differences in school infrastructure, economic standing, or geographic location.

The findings on students' ownership and access to ICTs resonate with existing studies on digital readiness and educational equity. Multiple studies affirm that ownership of ICT devices such as smartphones and laptops is increasingly common among students, reflecting a preparedness for technology-enhanced learning (Cruz & Cruz, 2020; UNESCO, 2021). However,

consistent with these findings, Samartin et al. (2022) emphasize that ownership alone does not guarantee adequacy for academic purposes, particularly in mathematics, where specialized applications and reliable connectivity are required. This supports the observation that while students possess devices, their functional suitability for sustained academic use remains questionable. Moreover, the relatively lower mean score for access to shared ICT facilities corresponds to research highlighting persistent disparities in infrastructure across schools and communities.

Studies on the digital divide in the Philippines and other developing contexts note that shared facilities are unevenly distributed, with rural and economically disadvantaged students experiencing restricted access compared to their urban counterparts (Soriano & Cabañes, 2020; Asian Development Bank, 2022). These inequities underline the structural challenges that hinder equitable ICT integration in mathematics education. At the same time, a study suggests that students creatively adapt to limited resources, using smartphones and community facilities to sustain learning despite constraints (Salac & Kim, 2019), which partially negates the assumption that inadequate devices completely obstruct academic engagement.

Overall, the above-mentioned studies support the conclusion that while ICT ownership among students is widespread, issues of adequacy, infrastructure, and equity continue to shape the effectiveness of technology use in mathematics learning.

Table 2.
Results on the Level of Accessibility and Use of ICTs in terms of Internet Access

Items	Weighted Mean	Standard Deviation	Descriptive Equivalent
I have consistent access to high-speed internet for personal, professional, and learning mathematics purposes (home, school, and open areas).	2.97	0.70	Mostly Accessible
I have access to multiple internet options (e.g., home broadband, mobile data, public Wi-Fi) for personal use and learning mathematics.	2.94	0.64	Mostly Accessible
I frequently access the internet using my mobile phone, tablet or iPad, laptop, or desktop for personal use and learning mathematics.	3.11	0.64	Mostly Accessible

I can access the internet at convenient times to complete educational assignments, research, and learn mathematics (classrooms, computer laboratories, lobby, e-library, open areas).	2.91	0.72	Mostly Accessible
I have reliable internet connectivity on campus whenever I need it to learn mathematics.	2.69	0.74	Mostly Accessible
I always use the internet for various purposes, including learning mathematics	3.05	0.68	Mostly Accessible
I always spend 3-5 hours on internet-related activities such as email, browsing, social media, and learning mathematics daily.	2.88	0.73	Mostly Accessible
Overall Mean	2.93	0.45	Mostly Accessible

Interpretation: 4.0-3.25 Fully Accessible; 3.24-2.50 Mostly Accessible; 2.49-1.75 Somewhat Inaccessible; 1.74-1.0 Not Accessible

Table 2 shows the Grade 11 students' accessibility and utilization of Information and Communication Technology (ICT) for learning mathematics. The overall mean score of 2.93, with a standard deviation of 0.45, indicates that students generally find ICT resources to be "Mostly Accessible".

Based on the finding that Students' learning of mathematics was made easier in a variety of contexts, including public spaces, schools, and homes, by their consistent access to high-speed internet (mean = 2.97) and multiple online options (mean = 2.94). Using a variety of devices, the majority regularly visit the internet (mean = 3.11), demonstrating how ICT is incorporated into their everyday academic routines. Students indicated convenient access to the internet during appropriate times for completing assignments and research (mean = 2.91), supporting their educational activities effectively. While students reported reliable internet connectivity on campus (mean = 2.69), this was the lowest among the parameters, suggesting potential areas for improvement in institutional infrastructure. On average, students spend 3–5 hours daily on internet-related activities, including learning mathematics (mean = 2.88), reflecting a significant commitment to online learning.

The results on students' internet accessibility and utilization are consistent with existing literature on ICT integration in education. Several studies affirm that while students generally report regular internet use through multiple devices, the quality and reliability of connectivity

remain uneven, particularly in school settings. For instance, Salac and Kim (2019) and Aquino et al. (2021) highlighted that internet connectivity in the Philippines is often unstable and that internet is critical to the continuity of learning, which supports the present finding that campus connectivity received the lowest mean score (2.69). Similarly, Samortin et al. (2022) and Tang et al. (2023) noted that although students frequently rely on mobile data and broadband services as these provide flexibility, portability, and social interactivity, these options are not always sufficient for sustained academic engagement, especially in mathematics where stable access is critical for research and problem-solving. The finding that students spend an average of 3–5 hours daily on internet-related activities corresponds with UNESCO's (2021) report, which observed that learners worldwide increasingly integrate online platforms into their daily routines, reflecting the normalization of ICT use in education.

However, Soriano and Cabañes (2020) and Banerjee (2022) caution that reliance on mobile devices and public Wi-Fi may exacerbate inequalities, as not all students can afford consistent high-speed access. This suggests that while internet use is widespread and mostly accessible, structural challenges in infrastructure and affordability continue to shape the effectiveness of ICT integration in mathematics learning.

Overall, the literature supports the conclusion that students are digitally active and incorporate internet use into their academic routines, but institutional and socio-economic disparities remain barriers to fully equitable access.

Table 3.

Results on the Level of Accessibility and Use of ICTs in terms of Information and Communication Technology

Items	Weighted Mean	Standard Deviation	Descriptive Equivalent
Word Processor (MS Word, Libre Office, WPS Word)	2.69	0.79	Mostly Accessible
Spreadsheet (MS Excel)	2.41	0.82	Mostly Accessible
Presentation(MS PowerPoint)	2.81	0.83	Mostly Accessible
Search Engines (Yahoo, Google)	3.14	0.83	Mostly Accessible
Multimedia			Mostly Accessible
Authoring(integration of text, audio, video, animation)	2.76	0.80	
Graphics Editing (Adobe Photoshop, Canva)	2.72	0.82	Mostly Accessible

Web Page Design (HTML, WordPress)	2.27	0.83	Mostly Accessible
Learning Management System (Google Classroom, MS Teams, Schoology, Khan Academy, Quizizz, Kahoot)	2.69	0.83	Mostly Accessible
Overall Mean	2.69	0.56	Mostly Accessible

Interpretation: 4.0-3.25 Fully Accessible; 3.24-2.50 Mostly Accessible; 2.49-1.75 Somewhat Inaccessible; 1.74-1.0 Not Accessible

Table 3 shows how easily Grade 11 students can use different ICT (information and communication technology) instruments for math study. With an aggregate mean of 2.69 and a standard deviation of 0.56, all tools rank in the "Mostly Accessible" category, suggesting generally favorable but somewhat varying access.

With mean scores ranging from 2.69 to 2.81, students have reasonable access to word processors (MS Word, LibreOffice, WPS Word), presentation software (MS PowerPoint), and graphics editing software (Adobe Photoshop, Canva) for their mathematical education. With respective means of 2.41 and 2.27, spreadsheet software (MS Excel) and web page design tools (HTML, WordPress) received lower scores, suggesting that these resources are not widely available. With an average score of 2.69, platforms such as Google Classroom, MS Teams, Schoology, Khan Academy, Quizizz, and Kahoot indicate moderate access to learning management systems.

The findings on students' accessibility and use of ICT tools align with recent literature on technology integration in Philippine education. A 2023 UNESCO case study on the Philippines emphasized that while students commonly use basic applications such as word processors, search engines, and presentation software, access to more specialized tools like spreadsheets and web design platforms is limited by inadequate training and uneven infrastructure (Espinosa et al., 2023). This supports the present results, where MS Word and PowerPoint scored higher than MS Excel and HTML/WordPress.

Similarly, Cabasan (2024) highlighted that effective technology integration strategies in high schools must address disparities in digital literacy and access. His study found that while students are familiar with everyday ICT tools, gaps remain in advanced applications such as multimedia authoring and graphics editing, which require higher technical skills and stronger institutional support. This resonates with the moderate accessibility scores for multimedia and graphics tools in your data.

Moreover, Campado et al. (2023) examined assistive technology integration in Philippine schools and noted that while ICT tools enhance participation and learning, challenges such as poor internet connectivity, insufficient teacher training, and lack of institutional support hinder effective use. This finding parallels the moderate accessibility of learning management systems (mean = 2.69), which depend heavily on stable connectivity and teacher facilitation.

Overall, the literature supports the conclusion that Filipino students have reasonable access to basic ICT tools but face barriers in advanced and collaborative platforms, reflecting the need for improved infrastructure, teacher training, and equitable resource distribution to maximize ICT's role in mathematics education.

Table 4.
Results on the Level of Accessibility and Use in terms of Social Media Platforms Usage

Items	Weighted Mean	Standard Deviation	Descriptive Equivalent
I have a social Media Platform account(Facebook, Instagram, YouTube, etc.)	3.66	0.58	Fully Accessible
I have regular access to social media platforms for communication and networking.	3.37	0.605	Fully Accessible
I find it affordable to use social media regularly as part of my daily activities.	3.23	0.67	Mostly Accessible
I always spend 3-5 hours on my social media daily.	3.15	0.85	Mostly Accessible
Overall Mean	3.35	0.53	Fully Accessible

Interpretation: 4.0-3.25 Fully Accessible; 3.24-2.50 Mostly Accessible; 2.49-1.75 Somewhat Inaccessible; 1.74-1.0 Not Accessible

Table 4 shows data on Grade 11 students' accessibility and usage of social media platforms. The overall mean score of 3.35 indicates that students have "Fully Accessible" experiences with social media, reflecting high engagement and usage.

The vast majority of students have social media accounts (mean = 3.66), suggesting that YouTube, Facebook, and Instagram play a crucial role in their everyday lives. The fact that students frequently use these platforms for networking and communication (mean = 3.37), highlights the importance of social media in preserving interpersonal relationships. The affordability of frequent social media use (mean = 3.23) indicates that students regard the expenses as reasonable, possibly due to the widespread availability of mobile data.

Students use social media for 3 to 5 hours a day on average (mean = 3.15), which is consistent with national statistics showing that Filipinos use social media for 3 hours and 34 minutes on average every day.

The findings on students' accessibility and usage of social media platforms are strongly supported by recent literature highlighting the Philippines' global leadership in social media engagement. The high mean score for account ownership (3.66) corresponds with DataReportal (2024) statistics showing that over 86% of Filipinos actively use platforms such as Facebook, YouTube, and Instagram. This widespread adoption underscores social media's role as a primary communication and networking tool among youth, consistent with the present study's finding of regular access (mean = 3.37). Moreover, the affordability of social media use (mean = 3.23) aligns with research by Hampton et al. (2021), which noted that internet access can increase students' interest in school and help them complete their homework faster.

The average daily usage of 3–5 hours (mean = 3.15) is also consistent with national reports indicating that Filipinos spend approximately 3 hours and 34 minutes per day on social media (DataReportal, 2024). However, scholars caution that while social media enhances connectivity and learning opportunities, excessive use may contribute to distraction and negatively impacts their academic performance (Espinosa et al., 2023; Guinchiglia et al., 2018).

Overall, the literature supports the conclusion that social media is fully accessible to students and deeply integrated into their daily routines, but its educational value depends on balanced and purposeful use.

Table 5.
Results on the Level of Accessibility and Use in terms of Technology-Enabled Learning Environment

Items	Weighted Mean	Standard Deviation	Descriptive Equivalent
E- Classroom Facilities (computers, projectors)	3.00	0.78	Mostly Accessible
Computer Laboratories (Practical/ Internet Lab)	3.93	0.78	Fully Accessible
Learning Management System (Edmodo, Quizizz, Kahoot)	2.74	0.78	Mostly Accessible
Access to Microsoft software (Office, Excel)	2.91	0.78	Mostly Accessible
e-Journals	2.62	0.82	Mostly Accessible
e-Books	2.71	0.84	Mostly Accessible
e-Newspapers	2.64	0.87	Mostly Accessible
Over All Mean	2.79	0.53	Mostly Accessible

Interpretation: 4.0-3.25 Fully Accessible; 3.24-2.50 Mostly Accessible; 2.49-1.75 Somewhat Inaccessible; 1.74-1.0 Not Accessible

Table 5 shows the accessibility of various educational ICT resources among Grade 11 students, with an overall mean of 2.79, indicating that these resources are "Mostly Accessible". Students report complete accessibility to computer laboratories with a mean score of 3.93, indicating that these spaces are well-equipped and available for both online and hands-on instruction. Digital learning is facilitated by classrooms having the necessary ICT gear, such as computers and projectors, according to a mean score of 3.00. With a mean score of 2.74, platforms like Edmodo, Quizizz, and Kahoot indicate that students have a reasonable amount of access to these interactive learning resources.

With a mean score of 2.74, platforms like Edmodo, Quizizz, and Kahoot show that students have moderate access to these interactive learning resources. Microsoft Access to programs like Office and Excel receives a score of 2.91, meaning that while there could be sporadic restrictions, students often have access to these necessary resources. As indicated by the lower mean ratings for e-journals (2.62), e-books (2.71), and e-newspapers (2.64), students may have limited or inconsistent access to these resources.

The findings on technology-enabled learning environments among Grade 11 students align with recent Philippine and Southeast Asian studies. Espinosa et al. (2023), in a UNESCO-commissioned case study, emphasized that while schools have invested in computer laboratories and classroom ICT facilities, access to digital academic resources such as e-journals and e-books remains limited due to subscription costs and uneven institutional support. This supports the present study's result where computer laboratories scored highest (mean = 3.93), but e-journals and e-newspapers received lower accessibility ratings (means = 2.62 and 2.64).

Similarly, Mangoranda and Basmayor (2024) found that ICT-based learning in Philippine secondary schools is positively perceived by students, but actual integration into academic tasks is hindered by socio-economic disparities and insufficient teacher training. Their study highlighted that while students are comfortable using Microsoft Office and presentation tools, access to specialized platforms such as learning management systems (mean = 2.74 in your data) remains inconsistent, echoing your findings.

Mandar (2024) further noted that learner engagement is highest when interactive technologies and gamified platforms are employed, yet teachers report low utilization of such tools due to limited digital literacy and institutional support. This resonates with the moderate accessibility scores for LMS platforms like Edmodo, Quizizz, and Kahoot in your results.

Overall, the literature supports the conclusion that computer laboratories and basic ICT facilities are fully accessible, but digital academic resources and LMS platforms remain moderately accessible, reflecting the need for stronger institutional investment, teacher training, and equitable access to subscription-based resources.

Table 6.

Results on the Level of Accessibility and Use in terms of Digital Platforms Usage

Items	Weighted Mean	Standard Deviation	Descriptive Equivalent
I have experience using interactive platforms in my classes, such as online portals for quizzes or games and activities, particularly in mathematics.	3.70	0.62	Fully Accessible
I am satisfied with the speed and performance of the digital platforms I use for learning mathematics.	3.02	0.64	Mostly Accessible
The digital platforms I use for learning provide all the necessary resources and tools to support my studies.	3.02	0.62	Mostly Accessible
The digital platforms I use for learning offer a clear and organized structure that helps me stay on track with my mathematics coursework.	3.01	0.60	Mostly Accessible
The digital platforms I use for learning enhance my overall educational experience in learning mathematics.	3.09	0.61	Mostly Accessible
Over All Mean	3.04	0.46	Mostly Accessible

Interpretation: 4.0-3.25 Fully Accessible; 3.24-2.50 Mostly Accessible; 2.49-1.75 Somewhat Inaccessible; 1.74-1.0 Not Accessible

Table 6 shows the data that indicates that Grade 11 students generally perceive digital platforms as "Mostly Accessible" for learning mathematics, with an overall mean score of 3.04 and a standard deviation of 0.46.

The typical score for students who reported using interactive platforms in their classes—such as online portals for games and activities or quizzes—was 3.70, especially in mathematics. This shows that students are using internet resources to improve their education. Students that

utilize digital platforms to learn mathematics showed satisfaction with the speed and performance of these platforms, with a mean score of 3.02, suggesting that the platforms' functionality meets their expectations. Digital platforms are excellent at providing complete learning materials, as evidenced by the same mean score of 3.02 obtained for the assertion that these platforms offer all the tools and resources needed to support students' studies.

Students gave digital platforms a 3.01 rating for organization and clarity in terms of keeping them on track with their math assignments, indicating that these platforms provide a controlled learning environment. Students believe that digital platforms improve their overall educational experience when learning mathematics, as indicated by their mean score of 3.09, which also highlights the beneficial effects of these tools on their learning results.

The findings on students' use of digital platforms for mathematics learning are consistent with recent studies emphasizing the growing role of interactive and gamified technologies in secondary education. The high accessibility score for interactive platforms (mean = 3.70) is consistent with Pan et al. (2026) and Zainuddin et al. (2020), who found that gamified materials increases students' engagement, engagement, motivation, participation, and strategic thinking in mathematics. This supports the observation that students actively use online portals for quizzes and activities to enhance their mathematics learning.

However, the moderate scores for satisfaction with speed and performance (mean = 3.02) and adequacy of resources (mean = 3.02) reflect challenges noted by Mangoranda and Basmayor (2024), who reported that while students appreciate the availability of digital platforms, inconsistent internet connectivity and limited institutional support hinder their full effectiveness. Similarly, Okoye et al. (2022), in Latin America, highlighted that digital technologies can revolutionize teaching and learning, but lack of training, infrastructure, and internet access are major challenges.

Overall, the literature supports the conclusion that digital platforms are mostly accessible and beneficial for mathematics learning, particularly through interactive tools, but their effectiveness depends on reliable infrastructure, adequate training, and equitable access to resources.

Perception of Grade 11 Students in Using eLearning in Learning Mathematics

Table 7.

Results on the Level of Perception of e-learning usage for Mathematics among Grade 11 Students on the use of technology in studies

Items	Weighted Mean	Standard Deviation	Interpretation
It will help me get better results in my mathematics subjects	3.19	0.65	Agree
It will help me understand the material of mathematics more	3.18	0.68	Agree

deeply.

It makes completing work in my subjects in mathematics more convenient	3.17	0.67	Agree
It motivates me to explore many topics I may not have seen before	3.21	0.71	Agree
It allows me to collaborate with others easily, both on and outside of the campus.	3.15	0.67	Agree
It will improve my IT/Information Management skills in general.	3.14	0.67	Agree
It will improve my career or employment prospects in the long term.	3.13	0.62	Agree
It will improve your test scores in mathematics.	3.11	0.66	Agree
It will help you retain mathematical concepts better.	3.08	0.65	Agree
It will improve the critical skills in mathematics	3.06	0.69	Agree
Over-all Mean	3.14	0.49	High Perception

Interpretation: 4.0-3.25 Strongly Agree; 3.24-2.50 Agree; 2.49-1.75 Disagree; 1.74-1.0 Strongly Disagree

Table 7 shows the results on the level of perception of Grade 11 students on how technology is used in their studies. The data reveal that Grade 11 students hold a "Agree" of the role of technology in enhancing their mathematics education, with an overall mean score of 3.14. This indicates a strong belief in the positive impact of technological tools on various aspects of their learning experience. According to the students, technology will help them do better in math (mean = 3.19) and score higher on tests (mean = 3.11). Utilizing technology is thought to improve their recollection of mathematical concepts (mean = 3.08), as well as deepen their understanding of them (mean = 3.18). Technology is viewed as a motivator that makes studying more convenient (mean = 3.17) and encourages students to explore new subjects (mean = 3.21). Students believe that technology improves their IT and information management skills (mean = 3.14), and makes

peer collaboration simpler (mean = 3.15). Students believe that technology will enhance their long-term employment or career chances (mean = 3.13).

The findings on Grade 11 students' perceptions of e-learning in mathematics mirror broader trends in recent educational research. Students' agreement that technology improves performance, understanding, and motivation (overall mean = 3.14) aligns with several studies reporting that ICT-based learning fosters deeper comprehension and engagement among learners, particularly when interactive tools (e.g., GeoGebra) are integrated into mathematics instruction (Dageo-a, 2025; Pacaldo et al., 2025; Querido, 2023; Radović). Similarly, Mandar (2024) emphasized that technology-enhanced environments increase learner motivation and collaboration (Liu et al., 2024; Zhang & Zou, 2011), supporting the present study's results, in which students highlighted convenience (mean = 3.17) and collaboration (mean = 3.15) as key benefits.

Overall, recent studies affirm that students view e-learning as a valuable tool for mathematics education, enhancing motivation, collaboration, and skill development, but its impact is maximized when paired with reliable access and effective instructional strategies.

Table 8.

Results on the Level of Perception of e-learning usage for Mathematics among Grade 11 Students on how useful the following technology is in studies

Items	Weighted Mean	Standard Deviation	Interpretation
Create and present multimedia shows as part of our course requirement (e.g, PowerPoint)	3.02	0.74	High Perception
Create and present audio/video as part of your course requirements	2.92	0.75	Agree
Download or access online audio/video recordings of lectures you could not attend.	2.99	0.74	Agree
Download or access online audio/video recordings to revise the content of lectures you have already been to.	2.95	0.76	Agree
Download to access online audio/video recordings of supplementary content materials.	2.84	0.76	Agree
Use your mobile phones to access Web services of the school.	3.13	0.70	Agree

Use instant messaging/chat (e.g. SKYPE, Messenger, Hangout, MS Teams) on the web to communicate or collaborate with other students in the course.	3.11	0.75	Agree
Use social media platforms (e.g., Facebook) on the Web to communicate or collaborate with other students on the course.	3.20	0.70	Agree
Use Vlogging to share information about class-related activities.	2.57	0.83	Agree
Keep your own blog as part of your course requirements.	2.60	0.81	Agree
User web to share digital files related to the course	2.76	0.75	Agree
Use web conferencing or video chat to communicate or collaborate with other students in the course.	2.88	0.80	Agree
Receive alerts about course information.	2.91	0.75	Agree
Overall Mean	2.91	0.53	Agree

Interpretation: 4.0-3.25 Strongly Agree; 3.24-2.50 Agree; 2.49-1.75 Disagree; 1.74-1.0 Strongly Disagree

Table 8 shows how useful each technology is that is currently used in their studies. The study shows that, with an overall mean score of 2.91, Grade 11 students had a "High Perception" of the importance that multimedia technologies play in their mathematical education. It would appear from this that students understand how. Students actively participated in creating digital learning resources, as shown by their high levels of engagement with making and presenting multimedia content, including audio/video recordings (mean = 2.92) and PowerPoint presentations (mean = 3.02).

Students' active use of digital resources to strengthen their grasp of mathematical ideas is demonstrated by the availability of online audio/video recordings of lectures and supplemental content materials for download or access (means ranging from 2.84 to 2.99), which are important multimedia resources to improve their education. Students can effectively use digital communication tools for cooperation and information sharing, as seen by their high mean scores for using mobile phones to access school web services (mean = 3.13), instant messaging/chat platforms (mean = 3.11), and social media platforms (mean = 3.20). Additionally, students share

course-related digital assets (mean = 2.76) and work with peers via web conferencing or video chat (mean = 2.88), underscoring the participatory character of their learning environment.

The findings on Grade 11 students' perceptions of technology use in their studies highlight the growing importance of multimedia and digital communication tools in mathematics education. The high mean score for creating and presenting multimedia shows (mean = 3.02) reflects the increasing reliance on presentation software, which has been shown to enhance student engagement and comprehension when integrated into classroom activities (Ananayo, 2024). Similarly, Lena and Nikolov (2025) emphasized that technology-based tasks enhances learners' motivation and engagement in learning, supporting the present study's results where students valued the use of audio/video presentations (mean = 2.92) and online recordings (means ranging from 2.84 to 2.99).

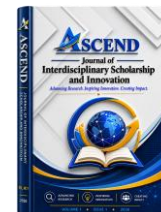
The strong perception of communication tools such as instant messaging (mean = 3.11) and social media platforms (mean = 3.20) aligns with Ateş and Koroğlu et al. (2024), who noted that students who use online collaboration tools strengthens their knowledge in science and improves their outputs as well as it makes them more engaged compared to traditional learning approaches. However, the relatively lower scores for vlogging (mean = 2.57) and blogging (mean = 2.60) suggest that while students recognize the utility of these tools, they are less commonly integrated into formal coursework, a trend also observed in recent studies that highlight limited institutional emphasis on content creation platforms for academic purposes.

Overall, the literature supports the conclusion that students perceive multimedia and communication technologies as highly useful for mathematics learning, particularly in enhancing collaboration, accessibility, and engagement. Yet, the integration of creative digital outputs such as vlogs and blogs remains underutilized, pointing to opportunities for schools to expand the range of technology-enabled learning activities.

Table 9.
Results on the Level of Perception of e-learning usage for Mathematics among Grade 11 Students on the extent on how students are involved with the Technology

Items	Weighted Mean	Standard Deviation	Interpretation
I get more actively involved in courses that use technology	3.04	0.62	Agree
I am more likely to skip classes when materials from course lectures are available online	2.26	0.84	Agree
When I entered Senior High, I was adequately prepared to use the technology needed in my courses.	3.02	0.61	Agree

Technology makes me feel connected to what is going on at the school.	3.07	0.60	Agree
Technology makes me feel connected to other students.	3.04	0.69	Agree
Technology interferes with my ability to concentrate and think deeply about subjects I care about.	2.95	0.64	Agree
I am concerned that technological advances may increasingly invade my privacy.	3.01	0.69	Agree
I am concerned about cyber security protection and hacking	3.12	0.69	Agree
In class use of mobile devices is distracting to my teachers	3.00	0.83	Agree
Use of tablets/laptops in class improves my engagement with the content and class	2.81	0.83	Agree
Multitasking with my technology devices sometimes prevents me from concentrating on or doing the most important work.	2.98	0.67	Agree
When it comes to social media (Facebook, Twitter, LinkedIn), I like to keep my academic life and social life separate.	3.19	0.61	Agree
I wish my teachers in the school would use and integrate more technology into their teaching	2.94	0.64	Agree
Educational computer games make learning mathematics more enjoyable.	3.04	0.71	Agree
Using educational games helps me understand mathematical concepts better.	3.02	0.68	Agree
I feel motivated to participate in mathematics lessons that involve educational games.	3.05	0.69	Agree



Educational games improve my problem-solving skills in mathematics.	3.10	0.67	Agree
The use of educational games makes mathematics less intimidating	3.02	0.73	Agree
Overall Mean	2.98	0.39	Agree

Interpretation: 4.0-3.25 Strongly Agree; 3.24-2.50 Agree; 2.49-1.75 Disagree; 1.74-1.0 Strongly Disagree

Table 9 data shows that, with an overall mean score of 2.98, Grade 11 students have an "Agree" response regarding the importance that technology plays in their mathematical education. This suggests that they strongly acknowledge the beneficial effects of technology on their educational experiences. Digital technologies appear to encourage greater participation and interest in mathematics, as students report higher involvement in technology-enhanced courses (mean = 3.04). While digital tools are useful, they may lessen the perceived need for in-person sessions. This is seen in the correlation between the availability of online course materials and a higher risk of students missing classes (mean = 2.26), and the availability of the technology necessary in their courses (mean = 3.02). Technology encourages collaboration and an awareness of community by enhancing students' sense of connection to classmates (mean = 3.04) and to school activities (mean = 3.07). Although students acknowledge that technology can be distracting, they also recognize that it can interfere with their ability to focus (mean = 2.95) and multitask (mean = 2.98), underscoring the need for balanced use. Students demonstrate awareness of digital threats and the importance of protecting personal information, as reflected in their concerns about cybersecurity (mean = 3.12) and privacy (mean = 3.01). Teachers perceive the use of mobile devices in class as distracting (mean = 3.00), suggesting that rules are necessary to properly control device use. According to students, educational games help them learn mathematics by improving their involvement (mean = 3.05), conceptual understanding (mean = 3.02), and problem-solving abilities (mean = 3.10). They also make studying less daunting and more pleasurable.

The findings on Grade 11 students' involvement with technology in mathematics learning reflect both the benefits and challenges of digital integration in education. The positive perception that technology increases active participation (mean = 3.04) is consistent with Hussein et al. (2021), who found that digital game-based learning (DGBL) in K-12 mathematics education shows positive gains in knowledge acquisition, perceptual and cognitive skills, and affective, motivational, and behavioral change, with traditional teaching being the most popular comparison approach. Likewise, Bellhäuser et al. (2025) emphasized that digital collaborative learning in higher education can improve learning curve of the students, but challenges and training are needed to overcome technical limitations and cultural differences.

At the same time, students acknowledged potential drawbacks, such as distraction (mean = 2.95) and multitasking interference (mean = 2.98). This aligns with Martin et al. (2025), who noted that too much exposure in technology causes distractions in education with consequences of personal performance, and ineffective classroom productivity, issues reflected in students' awareness of digital threats (mean = 3.12 for cybersecurity concerns). The perception that mobile

devices can be distracting to teachers (mean = 3.00) further underscores the need for balanced policies on classroom technology use.

Finally, the strong agreement that educational games improve problem-solving skills (mean = 3.10) and make mathematics more enjoyable (mean = 3.04) resonates with recent studies highlighting the role of gamification in lessening mathematical anxiety and enhances mathematical concept understanding (Nurazizah et al., 2025). Overall, the literature supports the conclusion that students view technology as a valuable tool for engagement, collaboration, and skill development, but its effectiveness depends on structured integration, teacher guidance, and safeguards against digital risks.

Test of the Significant Relationship between the ICT Level of Access and Use and the Perception of eLearning among Grade 11 Students.

Table 10.

Correlation Result Between Level of Access and Use of ICTs and Level of Perception of e-learning usage among Grade 11 Students

Variables Correlated	df	Computed r	Critical r value	Decision	Interpretation
Level of Access and Use of ICTs and Level of Perception	255	0.741	0.123	Reject the H_0	Significant Relationship

Table 10 shows that Pearson's correlation is 0.741, which means a moderate positive correlation with critical r value of 0.123. Thus, the study rejects the null hypothesis and proceed to the conclusion that there is a significant relationship between the level of Access and Use of ICTs and the level of perception of e-learning usage in learning mathematics. This means that as students have more exposure on the different eLearning tools, they tend to access e-learning more positively. This finding shows the level of perception of using eLearning for mathematics is closely tied to the availability and accessibility of Internet access. This value suggests that as students' access to and use of ICTs increase, their perceptions of these technologies' effectiveness and relevance in their studies also improve. This strong correlation underscores the importance of providing students with greater access to ICT resources. Improving ICT infrastructure and integrating technology into the curriculum may have a favorable impact on students' perspectives, which could raise academic achievement and engagement.

The significant positive correlation between ICT access and students' perception of e-learning ($r = 0.741$) is strongly supported by recent studies on digital readiness and educational outcomes. Chowdhury et al. (2021) emphasized that there is a positive attitude towards e-learning that significantly enhances the preference for e-learning education. Another study found positive attitude toward e-learning due to flexibility and accessibility as mentioned by postgraduate

students in India (Kumar & Pandey, 2024). This aligns with the present study's finding that improved ICT access enhances students' confidence in e-learning for mathematics.

Similarly, Adebayo et al. (2024) found that ICT in education enhances student engagement through personalized learning experiences, active instructor presence, and gamification strategies, but technology access disparities still need to be addressed. Consoli et al. (2024) also reported that quality of technology integration substantially affects students' behavioral engagement and digital competencies for learning, while quantity of technology use also plays a role. These findings reinforce the conclusion that access to ICT resources is not only a prerequisite for effective e-learning but also a determinant of students' attitudes toward its relevance and effectiveness.

Overall, the literature supports the strong correlation observed in this study, underscoring that expanding ICT infrastructure and integrating technology into the curriculum can positively shape students' perceptions of e-learning, consequently enhancing academic achievement and engagement in mathematics.

Conclusion

This study highlights the vital role of technology in shaping the educational experiences of Grade 11 learners, particularly in fostering motivation, engagement, and positive perceptions of eLearning. By integrating digital tools into classroom instruction, students are provided with opportunities to connect abstract concepts to more relatable contexts, thereby enhancing comprehension and sustaining interest in mathematics and other academic subjects. The findings affirm that technology-enabled learning environments are not merely supplementary but essential components of modern education, as they encourage active participation, collaboration, and critical thinking among learners.

At the same time, the study acknowledges certain limitations. The scope was confined to a single institution and grade level, which restricts the generalizability of the conclusions to broader populations. The reliance on self-reported data may also introduce biases, as responses are shaped by students' perceptions rather than direct observation of behavior or performance. Furthermore, external factors such as socioeconomic status, infrastructure quality, and teacher preparedness were not fully accounted for, even though these variables can significantly influence the effectiveness of technology integration.

Despite these constraints, the study underscores the importance of expanding access to ICT resources and designing pedagogical strategies that maximize the benefits of technology in education. Future research should therefore involve multiple schools, diverse grade levels, and a wider range of contextual variables to provide a more comprehensive understanding of how technology can be leveraged to improve learning outcomes. Ultimately, the conclusion emphasizes that equitable access to digital tools and thoughtful integration of technology into instruction are fundamental to preparing students for success in an increasingly digital world.

Recommendations

Based on the findings and conclusions, it is recommended that the Department of Education strengthen efforts to provide ICT resources by distributing devices such as laptops and smart TVs, while also ensuring adequate training for educators to maximize their use.

School administrators should integrate eLearning into their strategic plans, guarantee equitable access to digital tools, and conduct workshops to enhance the digital skills of both teachers and students. They are further encouraged to promote the responsible use of social media for academic purposes and equip classrooms with modern technologies to foster engaging learning environments.

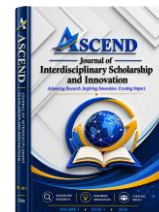
Teachers are advised to invest in the development and maintenance of reliable digital platforms, while continuously monitoring and evaluating eLearning initiatives to ensure their effectiveness. Students, on the other hand, should actively utilize school-provided platforms and explore supplementary tools such as Khan Academy, Desmos, and GeoGebra to strengthen their learning, while also seeking opportunities to improve digital literacy through training and peer collaboration.

Researchers are encouraged to expand future studies to diverse institutions, examine the long-term effects of ICT integration, and investigate its impact on different learning styles and levels of digital literacy.

Finally, future researchers should explore the effectiveness of professional development programs in enhancing teachers' ICT competencies and consider socio-cultural factors, including socio-economic background and cultural attitudes toward technology, to inform more inclusive and context-sensitive ICT integration strategies.

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