

Application of digital learning resources and student engagement: A case study at a state university campus in the Philippines



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ABSTRACT

This study examined the application of digital learning resources and their relationship with student engagement at Nueva Ecija University of Science and Technology–Gabaldon Campus. Using a descriptive-correlational case study design, the study focused on digital access, frequency of digital resource use, perceived effectiveness, attitudes toward technology use, and self-perceived digital competence. Data were collected from 98 higher education learners using a validated survey questionnaire. The results showed that respondents frequently used external digital resources, particularly video tutorials, mobile applications, and web-based materials, while institutional learning platforms were used less frequently. Digital resources were perceived as effective in supporting comprehension, motivation, and learning engagement. Correlation results indicated that digital access and frequency of digital resource use were positively associated with engagement, whereas age and gender showed no significant relationship. The findings suggest that, within the selected campus context, engagement in digitally supported learning is influenced more by access conditions and the actual use of digital resources than by demographic characteristics. The study highlights the need to strengthen digital infrastructure, improve the usability of institutional platforms, and provide structured support for digital competence development. Because the study was limited to one campus and a small sample, the findings should be interpreted as context-specific evidence rather than general conclusions for higher education as a whole.

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1. Introduction

Digital learning resources have become an important part of higher education because they provide students with flexible access to instructional materials, supplementary explanations, and technology-supported learning activities. Resources such as video tutorials, mobile applications, online assessments, learning management systems, and web-based materials allow learners to review lessons, practice independently, and access learning support beyond regular classroom time. When these tools are properly integrated into instruction, they

can help improve comprehension, motivation, and participation in learning tasks.

In technology-supported learning environments, student engagement is influenced not only by the availability of digital tools but also by students' access to devices, internet connectivity, digital competence, and the usability of institutional platforms. Previous studies have shown that digital resources and e-learning tools can support academic engagement and learning outcomes when students have the confidence and opportunity to use them effectively (Heidari et al., 2021; Wang et al., 2021). However, access remains uneven, especially in contexts where learners rely heavily on smartphones and prepaid mobile data. This makes mobile-friendly, low-bandwidth, and user-friendly digital resources important for supporting student participation.

Although many higher education institutions provide official learning platforms, students may still prefer external digital resources such as video tutorials, mobile applications, and web searches

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because these are often more familiar, accessible, and easier to use. This creates a need to examine how students actually use digital learning resources in specific institutional settings. Understanding this pattern can help institutions improve platform usability, strengthen digital support services, and design learning materials that match students' access conditions and learning needs.

This study examined the application of digital learning resources and their relationship with student engagement at Nueva Ecija University of Science and Technology–Gabaldon Campus. Specifically, it investigated students' digital access, frequency of digital resource utilization, perceived effectiveness of digital tools, attitudes toward technology use, and self-perceived digital competence. As a campus-based case study, the findings are intended to provide context-specific evidence that may guide improvements in digital infrastructure, institutional platform use, and technology-supported learning practices.

2. Literature review

Previous studies have shown that digital resources can improve learning when they are meaningfully integrated into instruction. [Rissanen and Costello \(2023\)](#) found that interactive online tutorials can support performance in large first-year courses, while [Acharya \(2023\)](#) emphasized that multimedia resources help learners manage their own pace and improve understanding. [Heidari et al. \(2021\)](#) reported that students' digital competence is related to academic engagement, suggesting that effective use of technology depends not only on access but also on the learner's confidence and skill in using digital tools. Similarly, [Wang et al. \(2021\)](#) found that e-learning self-efficacy contributes to better digital learning outcomes.

Access remains a major issue in digital learning implementation. Although many students own mobile phones and can connect to the internet, the quality of access may vary depending on device type, internet reliability, and platform compatibility. [Yaseen et al. \(2021\)](#) showed that online learning effectiveness differs across access conditions, while [Pham and Truong \(2023\)](#) emphasized the growing role of mobile learning in higher education. These findings suggest that mobile-compatible, lightweight, and user-friendly platforms are important in contexts where students rely heavily on smartphones and prepaid mobile data.

Student engagement is also influenced by the design and usability of digital platforms. [Greenhalgh et al. \(2023\)](#) noted that students' perceptions of educational technologies affect how they use digital tools, while [Sun et al. \(2022\)](#) found that collaborative digital learning experiences can support cognitive engagement. [Li et al. \(2024\)](#) further showed that motivation and engagement are shaped by the digital learning environment, particularly when tools are interactive and relevant to learners' needs. In addition, [Alenezi \(2024\)](#) and [Limantara et al. \(2023\)](#)

emphasized that learning management systems should promote interaction, usability, and meaningful participation rather than simply function as repositories of materials. Digital equity and institutional support are also important in technology-supported learning. [Caparas and Yango \(2023\)](#) highlighted the continuing importance of digital equity in online learning engagement, while [Weigand et al. \(2024\)](#) emphasized that technology-supported learning requires thoughtful integration to improve learning experiences. [Jacoba et al. \(2024\)](#) also emphasized the importance of institutional alignment and governance in improving university systems and performance. These studies suggest that student engagement in digital learning is shaped not only by the availability of tools but also by access conditions, platform usability, institutional support, and the meaningful integration of technology into teaching and learning.

3. Methodology

This study employed a descriptive-correlational case study design to determine the relationship between digital learning resource utilization and student engagement at Nueva Ecija University of Science and Technology–Gabaldon Campus. The descriptive aspect of the study focused on profiling students' access to technology, frequency of digital resource use, perceived effectiveness of digital tools, attitudes toward technology-supported learning, and self-perceived digital competence. The correlational component examined whether selected respondent characteristics and digital resource variables were significantly associated with engagement in a technology-supported learning context.

The respondents of the study were ninety-eight 98 higher education learners enrolled at Nueva Ecija University of Science and Technology–Gabaldon Campus. They were selected using purposive sampling. Inclusion criteria required that respondents be currently enrolled during the semester of the study and have experience using digital resources such as mobile applications, video tutorials, web-based materials, or online learning platforms in course-related learning activities. Since the study was limited to one campus and used a purposive sample, the findings were treated as case-specific and were not intended to represent all higher education institutions.

The data-gathering tool was a structured survey questionnaire partly adapted from a previously validated instrument and modified to fit the context of higher education learners using digital resources. The questionnaire covered five areas: 1 demographic profile, including access to devices and internet connectivity; 2 types and frequency of digital resources used in learning activities; 3 perceived effectiveness of these resources in supporting comprehension and performance; 4 attitudes and motivation toward technology-supported learning; and 5 self-perceived digital competence and engagement in digitally supported tasks.

Engagement was measured using basic self-report indicators related to participation in digital learning activities, completion of learning tasks using digital tools, use of digital applications outside class time, and ability to explain learning outputs with the aid of digital resources. These indicators were used to describe respondents' perceived engagement in digitally supported learning tasks. However, the engagement measure was limited in scope and was not equivalent to a comprehensive validated engagement scale. Therefore, the engagement findings were interpreted cautiously and were limited to the specific indicators included in the survey.

Content and face validation were performed to ensure the appropriateness, clarity, and contextual relevance of the questionnaire items before the instrument was distributed to the respondents. Data were collected through an online survey form distributed via institutional platforms and student organizations. Participation was voluntary, and all responses were anonymous. The purpose of the study was clearly stated in the informed consent section at the beginning of the form. Respondents were assured that all information gathered would be used solely for academic research purposes and treated with strict confidentiality.

Responses were encoded and processed using the Statistical Package for the Social Sciences SPSS. Descriptive statistics such as frequency counts, percentages, weighted means, and standard deviations were used to summarize the respondent profile, digital access, digital resource utilization, perceived effectiveness, attitudes toward technology use, and engagement. Pearson Product-Moment Correlation Coefficient r was used to determine the relationships between respondent characteristics, digital resource variables, and engagement. To strengthen the interpretation of the correlation results, effect sizes were interpreted based on the magnitude of the r -values, and 95% confidence intervals were reported using Fisher's z transformation. The level of significance was set at 0.05.

The engagement measure used in this study was basic and limited to selected self-report indicators of participation, task completion, use of digital tools, and perceived ability to explain learning outputs with digital support. It did not use a comprehensive validated engagement instrument. As such, the findings on engagement should be interpreted cautiously and only within the scope of the indicators included in the questionnaire. Future studies may use a validated scale such as the Student Engagement Instrument (SEI) to measure engagement more comprehensively across cognitive, behavioral, and emotional dimensions (Appleton et al., 2006).

4. Results

The study involved ninety-eight 98 respondents from Nueva Ecija University of Science and

Technology-Gabaldon Campus. Among them, 62% were female and 38% were male. Most respondents 72.4% were between 18 and 21 years old, while 27.6% were between 22 and 25 years old. Most were in their first or second year of study. Smartphones were the most common digital device. A total of 94.9% of the respondents reported owning a smartphone. Laptops were available to 41.8% of the respondents, while only 22.4% had access to desktop computers. For internet connectivity, 71.4% relied on prepaid mobile data, while 28.6% had home Wi-Fi or broadband internet. These results indicate that most respondents had some form of digital access. However, access was not equal in quality. Many students depended on smartphones and prepaid mobile data rather than laptops, desktop computers, or stable broadband connections.

Respondents were asked how often they used different digital tools to support their learning activities. Using a four-point scale, video tutorials received the highest weighted mean of 3.55, interpreted as "Always." This was followed by mobile applications, with a mean of 3.43, and web searches for explanations or solutions, with a mean of 3.40. Other digital resources were also used, but less frequently. Downloading PDF materials or e-books obtained a weighted mean of 3.20. The use of online calculators or computational tools had a mean of 3.11. The lowest-rated item was the use of school-provided platforms or official institutional websites, with a mean of 2.85. The overall weighted mean of 3.26 indicates regular use of digital learning resources. The results also show that respondents used external digital resources more often than institutional platforms.

Respondents generally viewed digital resources as useful for learning. The highest-rated item was the statement that video tutorials improve understanding of difficult concepts, with a weighted mean of 3.58. Applications and simulations that make abstract content more understandable followed with a mean of 3.45. Digital resources were also rated positively for providing additional practice opportunities, with a mean of 3.39. The item on supporting faster learning obtained a mean of 3.30. The statement comparing digital tools with traditional materials received a slightly lower mean of 3.23. The average weighted mean of 3.39 suggests that respondents perceived digital resources as effective in supporting comprehension, motivation, and engagement in learning tasks.

Respondents reported a positive attitude toward technology-supported learning. The item on confidence in using digital tools obtained the highest mean of 3.42. The belief that technology increases motivation had a mean of 3.36. Enjoyment in using digital tools received a mean of 3.34, while the perception that digital resources reduce learning-related anxiety had a mean of 3.31. The overall mean of 3.33 indicates that respondents had favorable attitudes toward the use of technology in learning. They generally saw digital tools as helpful,

motivating, and manageable. Engagement was measured using basic self-report indicators. These included participation in digital learning activities, completion of learning tasks using digital tools, use of digital applications outside class time, and ability to explain learning outputs with the aid of digital resources. The highest-rated engagement indicator was the regular use of digital applications or tools outside class time, with a mean of 3.27. Completing learning tasks using digital tools obtained a mean of 3.21. Participation in class activities had a mean of 3.15. The lowest-rated item was the ability to explain solutions using digital aids, with a mean of 3.12. The average mean of 3.18 suggests that respondents were generally engaged in digitally supported learning tasks. However, the relatively lower score for explaining solutions using digital aids suggests that students may need more support in using technology to communicate ideas, present outputs, and explain their reasoning. Self-perceived digital competence was also measured in a limited way. The study focused mainly on students' confidence and perceived ability to use digital tools for learning tasks. It did not measure full digital competence. A fuller measure would include skills such as evaluating online information, creating digital content, communicating and collaborating online, protecting privacy and security, solving technical problems, and using technology ethically.

The detailed correlation results between respondent profile, digital resource variables, and engagement are presented in Table 1. Pearson correlation was used to determine the relationships between respondent profile, digital resource variables, and engagement. Digital access had a moderate positive relationship with engagement, $r = 0.41$, 95% CI [0.23, 0.56], $p < 0.05$. This means that respondents with better access to digital devices and internet connectivity tended to report higher engagement. The effect size suggests that digital access accounted for approximately 16.8% of the variance in engagement. Frequency of digital resource utilization had a stronger positive relationship with engagement, $r = 0.52$, 95% CI [0.36, 0.65], $p < 0.01$. This indicates that respondents who used digital learning resources more often also tended to report higher engagement. Among the variables examined, frequency of use had the strongest relationship with engagement. It accounted for approximately 27.0% of the variance in engagement.

Gender showed a very weak relationship with engagement, $r = 0.09$, 95% CI [-0.11, 0.28]. Age also showed a very weak negative relationship with engagement, $r = -0.04$, 95% CI [-0.24, 0.16]. Since both confidence intervals included zero, age and gender did not show meaningful relationships with engagement in this sample.

Table 1: Correlation between respondent profile, digital resource variables, and engagement

Variable correlated with engagement	r-value	Effect size interpretation	r^2	95% confidence interval	Significance
Digital access	0.41	Moderate positive relationship	0.168	0.23 to 0.56	Significant
Frequency of digital resource utilization	0.52	Moderate to strong positive relationship	0.270	0.36 to 0.65	Significant
Gender	0.09	Very weak relationship	0.008	-0.11 to 0.28	Not significant
Age	-0.04	Very weak negative relationship	0.002	-0.24 to 0.16	Not significant

Confidence intervals were computed using Fisher's z transformation. The r^2 value indicates the approximate proportion of variance in engagement associated with each variable

5. Discussion

This case study found that students at Nueva Ecija University of Science and Technology-Gabaldon Campus used digital learning resources regularly, especially video tutorials, mobile applications, and web-based materials. These tools were used more often than institutional platforms. This pattern supports earlier studies showing that digital resources can improve learning when they are accessible, familiar, and useful for students' immediate academic needs (Acharya, 2023; Jacoba et al., 2024; Rissanen and Costello, 2023; Wang et al., 2021).

Students' access conditions help explain these results. Most respondents owned smartphones, but fewer had laptops or desktop computers. In addition, 71.4% relied on prepaid mobile data. Because of this, students may prefer tools that are mobile-friendly, quick to load, searchable, and less costly in terms of data use. This is consistent with Pham and Truong (2023) and Yaseen et al. (2021), who noted that online and mobile learning effectiveness depends on access quality, device availability, and platform compatibility.

The lower use of school-provided platforms may be linked to usability and implementation issues. Institutional platforms may require stronger internet connections, repeated log-ins, larger file downloads, or more complex navigation. Students may also avoid them when they have limited training or when teachers do not use the platforms consistently for quizzes, feedback, announcements, discussions, and submission of outputs. Greenhalgh et al. (2023) noted that students' perceptions of educational technologies affect how they use them, while Spreadborough and Glasser (2022) emphasized that learning management systems are more effective when they are clearly integrated into teaching and learning. Thus, low platform use may reflect convenience, design, training, and course-integration issues rather than student resistance.

Respondents also viewed digital resources as effective, especially video tutorials and applications. These tools helped them understand difficult or abstract concepts and supported additional practice. This agrees with Li et al. (2024) and Sun et al. (2022), who found that interactive digital environments can support motivation, cognitive engagement, and learning participation. The positive

attitudes reported by students also suggest that technology can support learning when it is useful, manageable, and aligned with their needs.

The correlation results further showed that digital access and frequency of digital resource use were positively related to engagement. Frequency of use had the stronger relationship, suggesting that access alone is not enough. Students also need regular and purposeful opportunities to use digital tools in learning tasks. This supports Caparas and Yango (2023), who emphasized the role of digital equity in online learning engagement.

These findings have practical implications. Since many students rely on prepaid mobile data, institutions should provide downloadable modules, compressed slide decks, short video tutorials, offline worksheets, and low-bandwidth versions of learning materials. Long videos may be divided into shorter clips. Institutional platforms should also be mobile-friendly, easy to navigate, and fast to load. Students may benefit from short orientation sessions, video guides, and simple manuals on how to use official platforms. Teachers should also connect platform use to actual course activities, such as quizzes, feedback, class discussions, announcements, and submission tracking.

Finally, the findings should be interpreted with caution. Engagement was measured using basic self-report indicators such as participation, task completion, use of digital tools outside class, and ability to explain outputs using digital aids. Future studies may use a validated scale such as the Student Engagement Instrument to measure behavioral, cognitive, and emotional engagement more fully. Digital competence was also measured mainly as self-perceived confidence in using digital tools. A fuller measure should include information evaluation, digital content creation, online collaboration, privacy and security, technical problem-solving, and ethical technology use.

Overall, students were more likely to engage with digital resources that were familiar, affordable, mobile-compatible, and directly useful for coursework. In this campus context, improving institutional platform usability, strengthening student training, and providing low-bandwidth learning materials may help support stronger engagement.

6. Conclusions

This case study examined the use of digital learning resources for student engagement at Nueva Ecija University of Science and Technology–Gabaldon Campus. The results showed that students regularly used digital tools, especially video tutorials, mobile applications, and web-based materials. These resources were perceived as useful for understanding lessons, completing tasks, and supporting motivation. School-provided platforms were used less often than external digital resources. This suggests a gap between the availability of institutional platforms and students' actual use of

them. Possible reasons include limited mobile compatibility, higher data requirements, navigation issues, lack of user training, and weak integration of the platform into regular course activities. Correlation results showed that digital access and frequency of digital resource use were positively related to engagement. Frequency of use had the stronger relationship, $r = 0.52$, 95% CI [0.36, 0.65], while digital access had a moderate relationship, $r = 0.41$, 95% CI [0.23, 0.56]. Age and gender showed very weak relationships with engagement, and their confidence intervals included zero. This suggests that, in this sample, engagement was more closely linked to access and actual use of digital resources than to demographic characteristics. The findings should be interpreted within the limited scope of the study.

The sample came from one campus and included only 98 respondents. Therefore, the results should not be generalized to all higher education institutions. Still, the study provides useful campus-based evidence for improving digital learning support. Based on the results, the institution should improve the usability of official learning platforms, make them mobile-friendly, and provide low-bandwidth learning materials. Since 71.4% of respondents relied on prepaid mobile data, instructors should consider downloadable modules, compressed slide decks, short video tutorials, and offline worksheets. Student orientation and technical support should also be strengthened so that learners can use institutional platforms with more confidence.

This study was limited to one campus and 98 purposively selected respondents; therefore, the findings should be treated as case-specific evidence from Nueva Ecija University of Science and Technology–Gabaldon Campus and not generalized to all higher education institutions. The study also relied on self-reported, cross-sectional survey data, which may reflect response bias and cannot capture changes over time. The engagement measure was basic and used selected indicators such as participation, task completion, use of digital tools outside class, and ability to explain outputs using digital aids. Future studies may use the Student Engagement Instrument or similar validated scales to measure behavioral, cognitive, and emotional engagement more fully. Digital competence was also measured mainly as self-perceived confidence in using digital tools. Future research should use a validated digital competence framework that includes information evaluation, digital content creation, online collaboration, privacy and security, technical problem-solving, and ethical technology use. Finally, the study did not include interviews or open-ended comments to directly explain why institutional platforms were used less often. Future studies may use qualitative methods to examine whether low platform use is due to poor design, lack of training, weak internet access, limited mobile compatibility, or low integration with course requirements.

List of abbreviations

CI	Confidence interval
r	Pearson product-moment correlation coefficient
r ²	Coefficient of determination
SEI	Student engagement instrument
SPSS	Statistical package for the social sciences

Compliance with ethical standards

Ethical considerations

The study involved human participants through a survey questionnaire. The research was reported to the Research Department Office of Nueva Ecija University of Science and Technology. Participation was voluntary, and informed consent was obtained from all respondents prior to data collection. No personally identifiable information was collected, and all responses were treated with strict confidentiality. The data were used solely for academic research purposes.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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