

Cyber Technology Use in Relation to Academic Enhancement among Criminology Students: A Descriptive-Correlational Study of Digital Engagement, Academic-Related Technology Use, Self-Regulation, and Learning Outcomes in a Higher Education Institution in Pagadian City, Philippines

Christian Lloyd C. Reyes¹ & Edmar R. Daniel^{2*}

¹College of Criminology, Pagadian Capitol College, Rizal Ave, Pagadian City, Zamboanga del Sur 7016, Philippines. ²College of Criminology, Misamis University, H.T. Feliciano St., Barangay Aguada, Ozamiz City, Misamis Occidental 7200, Philippines.
Corresponding Author (Edmar R. Daniel) Email: edmardaniel1993@gmail.com*

DOI: <https://doi.org/10.46382/mjbas.2026.10308>



Copyright © 2026 Christian Lloyd C. Reyes & Edmar R. Daniel. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Article Received: 07 July 2026

Article Accepted: 12 September 2026

Article Published: 21 September 2026

ABSTRACT

Cyber technology has become an integral component of contemporary higher education, providing students with access to information, digital learning resources, communication platforms, and interactive educational experiences. This study examined the relationship between cyber technology use and academic enhancement among criminology students in a higher education institution in Pagadian City, Philippines. Specifically, it assessed the students' level of cyber technology use in terms of frequency of use, purpose of use, academic-related use, recreational use, and self-regulation; determined their level of academic enhancement in terms of academic engagement, learning efficiency, academic motivation, skill development, and academic confidence; and examined the relationship between the two variables. The study employed a quantitative, descriptive-correlational research design involving 323 criminology students selected through stratified random sampling. Data were collected using researcher-developed questionnaires that underwent pilot testing and reliability assessment, obtaining Cronbach's alpha coefficients of 0.834 for cyber technology use and 0.878 for academic enhancement. The data were analyzed using mean, standard deviation, and Pearson product-moment correlation coefficient. Results showed that students demonstrated a high level of cyber technology use ($M = 3.78$, $SD = 0.71$) and a high level of academic enhancement ($M = 3.74$, $SD = 0.75$). Cyber technology use was significantly and positively associated with all dimensions of academic enhancement, with correlation coefficients ranging from $r = 0.338$ to $r = 0.559$, $p < .001$. Academic-related use and purpose of use demonstrated the strongest associations with academic enhancement. The findings suggest that purposeful, academically oriented, and self-regulated use of cyber technology is associated with more favorable academic outcomes among criminology students. The study recommends strengthening digital literacy, responsible technology use, self-regulation, and technology-supported learning strategies within criminology education.

Keywords: Academic Enhancement; Academic Engagement; Academic Motivation; Criminology Students; Cyber Technology; Digital Learning; Digital Literacy; Higher Education; Learning Efficiency; Self-Regulation; Technology Use; Technology-Enhanced Learning.

1.0. Introduction

In today's digitally driven world, cyber technologies had become an essential part of students' daily lives (Arkan & Bal, 2025). Smartphones, tablets, online platforms, social media, and educational applications were widely used for communication, learning, entertainment, and academic tasks (Noviandy & Idroes, 2026). The integration of Technology Enhanced Learning (TEL) significantly transformed education by improving access to learning resources, promoting independent learning, and supporting student engagement (Rigopouli et al., 2025). However, studies also showed that excessive or ineffective technology use negatively affected students' concentration, motivation, emotional wellbeing, and academic performance (Okpako et al., 2026).

Social media and AI-driven platforms further reshaped how students interacted with digital content and learning environments (Petrovic & Jaksic, 2026). While these technologies provided opportunities for collaboration, information access, and academic support, constant exposure to online platforms also influenced mental wellbeing and learning behaviors. Research highlighted that students' self-efficacy, digital skills, and engagement greatly influenced the effectiveness of TEL and their academic success. For criminology students, the use of cyber technologies was particularly important because of the demanding nature of their field. Criminology education

required students to understand complex theories, analyze case studies, interpret laws, and engage in practical applications related to crime and justice (Svingen et al., 2026). Digital tools such as online learning platforms, research databases, and collaborative applications supported learning, critical thinking, and academic productivity (Almaqtari et al., 2026). At the same time, these students experienced academic stress and emotional strain because of exposure to sensitive topics such as violence and criminal behavior.

Despite the growing body of literature on educational technology, there remains limited empirical research specifically examining the relationship between cyber technology use and academic enhancement among criminology students in the Philippine higher education context. Existing studies have generally focused on students from broader academic populations, leaving a gap in understanding how technology use, particularly academic-related use, recreational use, purpose of use, frequency of use, and self-regulation, is associated with the academic development of students preparing for careers in criminology and criminal justice. Recent studies have likewise emphasized that digital technology can provide meaningful academic benefits when supported by appropriate digital skills, self-regulation, and purposeful engagement, while excessive or poorly regulated use may present challenges to academic performance and student well-being (Faza, & Lestari, 2025).

In the context of criminology education, this issue is particularly relevant because students are expected to develop analytical, research, communication, technological, and problem-solving competencies necessary for professional practice. Digital platforms can provide access to legal materials, scholarly literature, case studies, instructional resources, and collaborative learning opportunities (Ergasheva et al., 2025). However, the benefits of cyber technology depend substantially on how students use and regulate these technologies. Recent research involving criminology students in the Philippines similarly highlights the importance of digital learning environments, self-regulation, and students' ability to cope with technology-related challenges (Mohd Bahar et al., 2026).

Thus, the present study examined the relationship between cyber technology use and academic enhancement among criminology students in a higher education institution in Pagadian City, Philippines. The findings are expected to provide an empirical basis for developing technology-supported instructional strategies, digital literacy initiatives, student support programs, and responsible technology-use policies within criminology education.

1.1. Study Objectives

This study aimed to examine the relationship between cyber technology use and academic enhancement among criminology students. Specifically, it sought to:

1. Determine the level of cyber technology use among criminology students in terms of frequency of use, purpose of use, academic-related use, recreational use, and self-regulation;
2. Assess the level of academic enhancement among criminology students in terms of academic engagement, learning efficiency, academic motivation, skill development, and academic confidence;
3. Determine the relationship between frequency of cyber technology use and the different dimensions of academic enhancement;

4. Examine the relationship between purpose of cyber technology use and the different dimensions of academic enhancement;
5. Determine the relationship between academic-related cyber technology use and the different dimensions of academic enhancement; and
6. Examine the relationship between recreational use, self-regulation, and the different dimensions of academic enhancement among criminology students.

2.0. Literature

2.1. Cyber Technology Use in Higher Education

Cyber technology has become an important component of contemporary higher education (Nazyrova et al., 2025), providing students with access to information, communication platforms, digital learning materials, online databases, collaborative applications, and other resources that support academic activities. The increasing integration of digital technologies has changed how students search for information, communicate with teachers and peers, complete academic requirements, and participate in learning activities (Shahzad et al., 2025). In higher education, technology is no longer limited to the delivery of instructional content but has become part of students' broader academic and social learning environments (Zhang et al., 2025).

The academic value of cyber technology, however, depends largely on how students use digital resources. Technology may facilitate access to information and learning opportunities, but its presence alone does not necessarily result in improved learning outcomes (Forsström et al., 2025). A systematic review and second-order meta-analysis of technology-enhanced learning in higher education found that digital technology produced stronger cognitive learning outcomes when it provided support for specific learning activities rather than merely replacing traditional instructional methods (Staneviciene & Žekienė, 2025). The findings emphasize that the educational value of technology is influenced by the type and quality of learning activity it facilitates.

Digital literacy is similarly important in determining how students benefit from technology. Li et al. (2025), through a meta-analysis of research on digital literacy and academic achievement, reported a significant positive relationship between students' digital literacy and academic achievement. Their findings suggest that the ability to effectively locate, evaluate, understand, and use digital information is an important component of students' academic development.

Recent research has further demonstrated the relationship between digital literacy and academic performance. A 2025 study Zakir et al. examining university students found that digital literacy was positively related to academic performance, with digital informal learning and students' digital competence playing important roles in this relationship. Similarly, research among graduate students in online learning environments found that digital literacy was associated with knowledge sharing and academic performance, highlighting the importance of students' digital competencies in technology-mediated learning (Dang Tran et al., 2026).

These findings are relevant to the present study because the respondents reported a high level of cyber technology use. However, the present research goes beyond determining whether students use technology by examining

different dimensions of use, including frequency of use, purpose of use, academic-related use, recreational use, and self-regulation. This multidimensional perspective is important because students may use the same technology for substantially different purposes, with potentially different implications for their academic development.

2.2. Technology-Enhanced Learning and Academic Enhancement

Technology-enhanced learning (TEL) refers to the use of digital technologies to facilitate, support, enrich, or transform teaching and learning processes (Pérez-Conde et al., 2026). In higher education, TEL may include learning-management systems, online databases, multimedia materials, virtual classrooms, digital assessment tools, collaborative platforms, educational applications, and other technology-supported learning resources (Rashidi et al., 2025). These technologies can provide students with greater flexibility and access to educational resources while supporting independent and collaborative learning.

The effectiveness of TEL is strongly influenced by the manner in which technology is integrated into learning activities. A recent systematic review of meta-analyses by Wang et al. in 2026 concluded that technology-enhanced instruction does not automatically produce better cognitive learning outcomes. Instead, stronger outcomes were observed when digital technology provided learning-activity-specific support and enabled more advanced forms of learning activity. This finding is particularly relevant to the present study because the respondents' academic-related technology use was more strongly associated with academic enhancement than recreational use.

Digital technology may also support several dimensions of academic development, including learning efficiency, academic engagement, motivation, skill development, and academic confidence. Recent evidence indicates that digital literacy is positively associated with academic achievement, suggesting that students who possess stronger abilities to navigate and use digital environments may be better positioned to take advantage of technology-supported learning opportunities (Li et al., 2025).

Chen (2025) further demonstrated that digital literacy was positively associated with college students' academic achievement and that learning adaptation and online self-regulated learning helped explain this relationship. The findings suggest that the academic benefits of digital technology are not solely attributable to technology itself but are also influenced by students' ability to adapt to digital learning environments and regulate their learning behaviors.

The present study reflects this broader understanding of academic enhancement. Rather than treating academic development solely as academic grades or achievement scores, the study considers academic engagement, learning efficiency, academic motivation, skill development, and academic confidence. These dimensions provide a broader perspective on how students perceive the academic benefits associated with their use of cyber technology. The findings of the present study, in which cyber technology use demonstrated significant positive relationships with all five dimensions of academic enhancement, are therefore consistent with literature emphasizing the importance of purposeful and academically relevant technology use. However, because the present study employed a correlational design, the findings indicate association rather than causation.

2.3. Digital Technology Use among Criminology Students

The integration of digital technology is particularly relevant to criminology education because contemporary criminology increasingly intersects with information technology, digital evidence, cybercrime, crime analysis, electronic databases, digital investigation, geographic information systems, and technology-supported criminal justice practices. Consequently, criminology students require not only theoretical knowledge but also the ability to locate, evaluate, analyze, and communicate information using appropriate digital tools (Tressyalina et al., 2026).

Digital technologies can provide criminology students with access to scholarly literature, statutes and jurisprudence, police and criminal justice resources, case studies, crime-related datasets, online learning materials, and collaborative research platforms (Gerard et al., 2025). These resources can potentially support the development of research skills, analytical thinking, communication skills, and other competencies relevant to criminology education.

Recent research specifically involving criminology students reinforces the relevance of digital learning. Bongcac and Culanag (2026) examined perceived usefulness of technology, digital academic self-efficacy, and self-regulated learning among criminology students in a digital learning environment. Their study highlights the increasing importance of digital technologies in criminology education and emphasizes the role of self-regulation and digital academic self-efficacy in students' academic engagement and learning performance.

The criminology context is also important because students may encounter unique academic requirements involving legal research, case analysis, crime documentation, investigative concepts, and professional preparation. Digital technology can provide efficient access to these resources, but students must also develop the capacity to distinguish credible information from unreliable online content. This makes digital literacy and responsible technology use particularly important in criminology education.

The present study contributes to this emerging area by examining cyber technology use across five dimensions: frequency of use, purpose of use, academic-related use, recreational use, and self-regulation. It further examines how these dimensions are associated with academic engagement, learning efficiency, academic motivation, skill development, and academic confidence. This approach provides a more detailed understanding of how criminology students use cyber technology and how such use is related to their perceived academic enhancement.

2.4. Self-Regulation and Responsible Technology Use

Self-regulation refers to students' ability to manage their thoughts, behaviors, motivation, time, effort, and learning strategies in pursuit of academic goals (Verdugo & Martínez-Líbano, 2026). In technology-mediated learning environments, self-regulation becomes particularly important because students frequently have greater autonomy over when, where, and how they access digital resources (Ussenova et al., 2025). The same device or platform may therefore be used for academic activities, communication, entertainment, social media, or other purposes.

Recent research has consistently emphasized the relationship between self-regulated learning and academic performance. Cheng et al. (2025), in a meta-analysis of higher education research, found a small positive

relationship between self-regulated learning strategies and online academic performance. Their findings indicate that metacognitive, behavioral, and environmental self-regulation strategies can contribute to students' academic performance in online learning environments.

Similarly, Zhao et al. (2025) examined self-regulated learning strategies in online and blended learning environments and found significant associations between self-regulation strategies and academic performance. Strategies involving organization, metacognition, time management, effort regulation, and other forms of self-regulated learning were particularly relevant to academic outcomes.

Recent intervention research further indicates that self-regulation can be strengthened through structured learning strategies. A 2025 study of Huang and Lee-Post, found that combining self-assessment and commitment strategies produced sustained changes in students' self-regulated learning behaviors and improved long-term academic performance in an online college course.

The study of Juarez Lopez et al. (2026), likewise emphasizes the continuing importance of self-regulation in digital learning. Research among university students found that self-regulated learning was associated with academic success in digitally unequal environments and that institutional support could influence this relationship. Other study in 2025 by Banihashem et al. has examined how digital tools can support the development of self-regulated learning among university students, further demonstrating the increasing intersection between technology use and students' capacity to regulate their learning behaviors.

These findings are particularly relevant to the present study because self-regulation obtained a high rating but was among the lower-rated dimensions of cyber technology use. This suggests that although students generally reported the ability to regulate their technology use, there remains room for improvement in managing digital distractions and maintaining an appropriate balance between academic and recreational activities.

Responsible technology use therefore involves more than simply having access to digital devices. It includes purposeful use, time management, critical evaluation of online information, protection of privacy, appropriate digital communication, avoidance of excessive use, and the ability to prioritize academic responsibilities. For criminology students, responsible technology use is especially important because their future professional activities may involve sensitive information, digital evidence, personal data, and technology-assisted investigations.

2.5. Theoretical Foundation

The present study is primarily anchored on the Technology Acceptance Model (TAM) and supported by Vygotsky's Sociocultural Theory.

Technology Acceptance Model

The Technology Acceptance Model, originally proposed by Davis (1989), explains users' acceptance and use of technology through important perceptions such as perceived usefulness and perceived ease of use (O'Dea et al.,

2025). When users perceive a technology as useful and relatively easy to operate, they are more likely to develop favorable attitudes toward the technology and use it more frequently.

TAM provides a relevant theoretical basis for the present study because the research examines the frequency, purpose, and academic-related use of cyber technology among criminology students. Students who perceive digital technologies as useful for searching information, completing academic requirements, communicating with classmates and instructors, conducting research, and accessing learning resources may be more likely to integrate these technologies into their academic activities (Alshammari & Alkhwalidi, 2025).

The findings of the present study are consistent with this theoretical perspective because purpose of use and academic-related use demonstrated some of the strongest relationships with the dimensions of academic enhancement. This suggests that the academic value associated with cyber technology may depend substantially on students' perceived usefulness and the purposes for which technology is employed.

However, TAM alone does not fully explain the role of social interaction, collaboration, and guided learning in technology-supported education. Therefore, the study also draws on Vygotsky's Sociocultural Theory.

Vygotsky's Sociocultural Theory

Vygotsky's Sociocultural Theory emphasizes that learning develops through social interaction, cultural tools, communication, and participation in meaningful activities (Malik et al., 2025). Digital technologies can function as contemporary cultural and learning tools through which students communicate, collaborate, access information, receive feedback, and participate in shared learning environments (Al-Jarf, 2026).

Within the context of the present study, digital platforms can provide opportunities for criminology students to collaborate with peers, communicate with instructors, discuss cases, access learning resources, and participate in technology-supported academic activities. Such interactions may contribute to academic engagement, learning efficiency, skill development, and academic confidence.

The integration of TAM and Sociocultural Theory provides a broader framework for understanding cyber technology use. TAM explains why students may accept and use technology based on perceived usefulness and ease of use, while Sociocultural Theory explains how technology can function as a mediating tool for interaction, collaboration, and learning.

The two perspectives therefore complement the present study's findings. Technology may be readily accepted when students perceive it as useful and accessible, but its academic value may be realized more effectively when it is used within meaningful learning activities and supported by appropriate social interaction and self-regulation.

2.6. Research Gap

The literature demonstrates that digital technology has become increasingly important in higher education and that digital literacy, technology-supported learning, and self-regulated learning are associated with various aspects of students' academic development. Recent studies have provided stronger empirical evidence regarding digital

literacy and academic achievement, technology-enhanced learning, and self-regulated learning in online and blended environments.

However, several gaps remain. First, much of the existing literature examines general university or college populations rather than students enrolled specifically in criminology programs. Although recent research has begun to examine digital learning and self-regulation among criminology students, the field remains comparatively underdeveloped.

Second, previous studies frequently examine technology use in terms of general digital literacy, technology acceptance, online learning, or digital competence. Fewer studies simultaneously examine frequency of use, purpose of use, academic-related use, recreational use, and self-regulation as dimensions of cyber technology use. The present study addresses this gap by examining these dimensions collectively.

Third, academic outcomes in previous research are commonly represented by academic achievement, academic performance, or grade-based measures. The present study adopts a broader concept of academic enhancement, encompassing academic engagement, learning efficiency, academic motivation, skill development, and academic confidence. This multidimensional approach provides a more comprehensive understanding of students' perceived academic development.

Fourth, there remains a need for research situated within the Philippine criminology education context. Educational technology practices are influenced by institutional resources, student characteristics, digital access, instructional practices, and local educational conditions. Findings from other countries and academic disciplines may therefore not fully explain the experiences of criminology students in Philippine higher education.

Finally, although recent studies indicate positive associations between digital literacy, self-regulated learning, and academic outcomes, they also emphasize that the benefits of technology depend on how it is used, the learning activities it supports, and students' ability to regulate their behavior. The present study responds to this gap by examining the relationship between cyber technology use and academic enhancement among criminology students in a higher education institution in Pagadian City, Philippines. Specifically, it investigates whether different dimensions of technology use are significantly associated with academic engagement, learning efficiency, academic motivation, skill development, and academic confidence.

Thus, the present study contributes to the literature by providing field-specific, Philippine-based empirical evidence on the relationship between multidimensional cyber technology use and multidimensional academic enhancement among criminology students. The findings may provide a basis for developing more purposeful digital learning strategies, digital literacy initiatives, self-regulation programs, and technology-supported instructional practices in criminology education.

3.0. Methodology

This study employed a quantitative research approach using a correlational research design to determine the relationship between cyber technology use and academic enhancement among criminology students. The study

was conducted in a selected higher education institution in Pagadian City, with 323 criminology students serving as respondents. Stratified random sampling was utilized to ensure equal representation and minimize selection bias. Data were gathered through researcher-developed questionnaires that assessed cyber technology use and academic enhancement. The instruments underwent pilot testing and reliability testing using Cronbach's Alpha, yielding reliability values of 0.834 and 0.878, respectively.

The researcher secured the necessary permissions from school authorities before conducting the study and ensured that ethical standards, confidentiality, informed consent, and compliance with the Data Privacy Act of 2012 were observed throughout the research process. The collected data were analyzed using mean, standard deviation, and Pearson product-moment correlation coefficient to determine the relationship between cyber technology use and academic performance among criminology students.

4.0. Results and Discussion

4.1. Students' Level of Cyber Technology Use

Table 1 showed that students utilized cyber technology at a high overall rate ($M = 3.78$, $SD = 0.71$), indicating consistent involvement with digital tools across domains. Recreational use had the highest mean ($M = 3.96$, $SD = 0.76$), indicating that students were more likely to use cyber technology for leisure and amusement. This was followed by the purpose of use ($M = 3.90$, $SD = 0.72$), which indicated that students used technology for a variety of functional needs. Academic-related use ($M = 3.72$, $SD = 0.69$) and frequency of use ($M = 3.66$, $SD = 0.70$) were both in the high group, demonstrating that students used cyber technology in their academic tasks and daily routines. Meanwhile, self-regulation had a somewhat lower but still high mean ($M = 3.67$, $SD = 0.70$), suggesting that although students often used technology, their capacity to govern its use was weaker.

The study revealed that criminology students demonstrated a high level of cyber technology use, particularly in recreational activities, academic-related tasks, and general digital engagement. Students commonly utilized digital tools for communication, learning, entertainment, and academic purposes, indicating that cyber technologies had become an important part of their daily routines. However, although self-regulation was also rated high, it received the lowest mean among the indicators, suggesting that some students still experienced difficulty in managing and balancing their technology use.

The findings emphasized that while students were highly engaged with cyber technologies, there was a greater tendency toward recreational use, highlighting the need to encourage more productive and academically oriented digital practices. This finding supported the Technology Acceptance Model (TAM), which explained that students were more likely to use technologies they perceived as useful and easy to use (Lah et al., 2020). Almogren and Aljammaz (2022) further emphasized that students' attitudes and engagement with technology were influenced by the effectiveness and accessibility of digital tools.

Similarly, Alfadda and Mahdi (2021) found that students were more willing to adopt educational technologies when they perceived them as beneficial to learning and simple to operate.

Table 1. Mean and Standard Deviation of Students' Cyber Technology Use According to Frequency of Use, Purpose of Use, Academic-Related Use, Recreational Use, and Self-Regulation.

Constructs	M	SD	Remarks
Frequency Use	3.66	0.70	High
Purpose of Use	3.90	0.72	High
Academic-Related Use	3.72	0.69	High
Recreational Use	3.96	0.76	High
Self-Regulation	3.67	0.70	High
Overall Level of Use	3.78	0.71	High

Note: 4.20-5.00 (Very High); 3.40-4.19 (High); 2.60-3.39 (Moderate); 1.30-2.59 (Low); 1.00-1.29 (Very Low).

4.2. Students' Level of Academic Enhancement

Table 2 showed the students' academic progress across five constructs: academic engagement, learning efficiency, academic motivation, skill development, and academic confidence. The total mean score of $M = 3.74$ ($SD = 0.75$) suggested a high level of academic improvement among respondents, implying that students generally demonstrated favorable academic behaviors and outcomes. Learning efficiency ($M = 3.88$, $SD = 0.73$) and skill development ($M = 3.86$, $SD = 0.71$) had the highest mean scores among the components, showing that students were proficient at regulating their learning processes and developing relevant academic skills. Academic confidence ($M = 3.76$, $SD = 0.78$) and academic motivation ($M = 3.64$, $SD = 0.77$) were similarly in the high range, indicating that students had a strong sense of self-belief and a willingness to attain academic goals. Meanwhile, academic engagement had the lowest mean ($M = 3.54$, $SD = 0.75$), despite being rated as high, indicating that, while students were generally involved in their academic work, their level of active participation was less evident. The study found that criminology students exhibited a high level of academic enhancement, particularly in learning efficiency and skill development. This indicated that students were capable of effectively managing their learning processes, developing relevant academic skills, and maintaining confidence and motivation in their studies. However, academic engagement obtained the lowest mean score among the dimensions, implying that although students performed well academically, their active participation and involvement in learning activities could still be improved. These findings aligned with Vygotsky's Sociocultural Theory, which emphasized that technology-mediated learning environments promoted collaboration and guided learning. Glăveanu (2020) explained that learning and creativity were socially constructed through interaction, tools, and participation within cultural contexts. Likewise, Lantolf and Xi (2023) highlighted that digital technologies created opportunities for collaboration, scaffolding, and meaningful interaction that enhanced students' learning experiences and self-regulation.

Table 2. Mean and Standard Deviation of Students' Academic Enhancement According to Academic Engagement, Learning Efficiency, Academic Motivation, Skill Development, and Academic Confidence.

Constructs	M	SD	Remarks
Academic Engagement	3.54	0.75	High
Learning Efficiency	3.88	0.73	High

Academic Motivation	3.64	0.77	High
Skill Development	3.86	0.71	High
Academic Confidence	3.76	0.78	High
Overall Level of Enhancement	3.74	0.75	High

Note: 4.20-5.00 (Very High); 3.40-4.19 (High); 2.60-3.39 (Moderate); 1.30-2.59 (Low); 1.00-1.29 (Very Low).

4.3. Relationship between Students' Level of Cyber Technology Use and Academic Enhancement

Table 3 presented the relationship between students' level of cyber technology use and academic enhancement across five dimensions: academic engagement, learning efficiency, academic motivation, skill development, and academic confidence. All variables yielded p-values less than 0.001, indicating that there is a significant relationship between students' level of cyber technology use and all dimensions of academic enhancement. The correlation coefficients (r), ranging from 0.338 to 0.559, reflected moderate positive relationships, suggesting that increased engagement with cyber technology was associated with improvements in academic engagement, learning efficiency, motivation, skill development, and academic confidence. Notably, academic-related use and purpose of use showed the strongest correlations, underscoring the importance of intentional, educational use of technology; thus, the null hypothesis (Ho) was rejected in all cases.

Furthermore, the study revealed a significant positive relationship between cyber technology use and academic enhancement among criminology students. The results showed that increased and purposeful use of cyber technologies was associated with improvements in academic engagement, learning efficiency, academic motivation, skill development, and academic confidence. Academic-related use and purpose of use demonstrated the strongest correlations, suggesting that intentional and educational cyber technology use was positively associated with academic enhancement. Baytiyeh (2021) emphasized that digital tools and cyber technologies supported flexible learning, collaboration, and access to academic resources that enhanced students' critical thinking and academic performance. In addition, Bauzon and Moyao (2023) stated that students who were supported by effective learning strategies and coping mechanisms were more likely to achieve academic success and emotional resilience. The findings also aligned with the Technology Acceptance Model, where perceived usefulness and ease of use influenced students' acceptance and utilization of technology for academic purposes (Wilson et al., 2021). Tahar et al. (2020) further noted that students were more likely to engage with technologies that were accessible, manageable, and beneficial to their academic needs.

Table 3. Pearson Correlation Coefficients Showing the Relationship Between Dimensions of Cyber Technology Use and Dimensions of Academic Enhancement Among Criminology Students.

Variables	Academic Engagement	Learning Efficiency	Academic Motivation	Skill Development	Academic Confidence	Decision on Ho
Frequency of Use	r = 0.441***	r = 0.499***	r = 0.379***	r = 0.414***	r = 0.426***	Rejected
	p < .001	p < .001	p < .001	p < .001	p < .001	
Purpose of Use	r = 0.427***	r = 0.525***	r = 0.443***	r = 0.501***	r = 0.559***	Rejected
	p < .001	p < .001	p < .001	p < .001	p < .001	

Academic-Related Use	$r = 0.537^{***}$	$r = 0.559^{***}$	$r = 0.506^{***}$	$r = 0.554^{***}$	$r = 0.539^{***}$	Rejected
	$p < .001$	$p < .001$	$p < .001$	$p < .001$	$p < .001$	
Recreational Use	$r = 0.375^{***}$	$r = 0.474^{***}$	$r = 0.362^{***}$	$r = 0.434^{***}$	$r = 0.500^{***}$	Rejected
	$p < .001$	$p < .001$	$p < .001$	$p < .001$	$p < .001$	
Self-Regulation	$r = 0.426^{***}$	$r = 0.464^{***}$	$r = 0.338^{***}$	$r = 0.351^{***}$	$r = 0.396^{***}$	Rejected
	$p < .001$	$p < .001$	$p < .001$	$p < .001$	$p < .001$	

Ho: There is no significant relationship between cyber technology use and academic enhancement.

Notes: * $p < .05$; ** $p < .01$; *** $p < .001$. All reported correlations are statistically significant at $p < .001$.

5.0. Conclusion and Future Recommendations

Students demonstrated a high level of engagement with cyber technology, primarily for recreational purposes, although they also effectively utilized it for academic and practical or utilitarian tasks. Their academic performance was generally excellent, particularly in terms of learning efficiency and skill development; however, their participation in learning activities was comparatively lower. Overall, cyber technology use demonstrated statistically significant positive relationships of moderate magnitude with the dimensions of academic enhancement, especially when it was intentionally directed toward academic purposes. These findings highlight the importance of maintaining a balanced, regulated, and purposeful use of digital tools to maximize their benefits for learning outcomes.

5.1. Conclusions

The findings of the study indicate that criminology students demonstrated a high level of cyber technology use, with an overall mean of 3.78 (SD = 0.71). Recreational use obtained the highest mean, followed by purpose of use, academic-related use, self-regulation, and frequency of use. These results indicate that cyber technology is deeply integrated into the students' daily activities and is used for both academic and non-academic purposes.

The respondents likewise demonstrated a high level of academic enhancement, with an overall mean of 3.74 (SD = 0.75). Learning efficiency and skill development obtained the highest mean scores, while academic engagement obtained the lowest mean, although it remained within the high category. This suggests that students generally perceived themselves as capable of managing their learning and developing academic competencies, while opportunities remain to strengthen active participation and engagement in learning activities.

The correlation analysis further demonstrated statistically significant positive relationships between the dimensions of cyber technology use and academic enhancement, with correlation coefficients ranging from $r = 0.338$ to $r = 0.559$, $p < .001$. The strongest associations were observed for academic-related use and purpose of use, suggesting that the academic value of cyber technology may be more closely associated with how purposefully and appropriately students use digital resources than with technology use alone.

The findings support the view that cyber technology can serve as a valuable educational resource when used intentionally, responsibly, and with adequate self-regulation. However, the results should not be interpreted as

evidence that cyber technology directly causes academic enhancement because the study employed a descriptive-correlational design. Rather, the findings demonstrate that higher levels of reported cyber technology use were significantly associated with higher levels of reported academic enhancement among the respondents.

5.2. Future Recommendations

Based on the findings, the following recommendations are proposed:

1. **Strengthen digital literacy programs:** The institution should provide regular digital literacy activities that develop students' abilities to locate, evaluate, organize, and appropriately use online academic information, particularly scholarly and evidence-based sources.
2. **Promote academically purposeful technology use:** Faculty members should integrate appropriate digital tools, online databases, learning-management systems, virtual learning resources, and collaborative platforms into criminology instruction to encourage students to use technology more intentionally for academic purposes.
3. **Develop student self-regulation strategies:** The institution should implement activities addressing time management, digital self-discipline, distraction management, and responsible screen use to help students balance academic, recreational, and social technology activities.
4. **Strengthen technology-supported criminology instruction:** Faculty members may incorporate digital case studies, online legal databases, virtual simulations, crime-mapping applications, digital research tools, and other technology-supported activities that are relevant to criminology and criminal justice education.
5. **Establish digital academic support and mentoring:** Colleges or departments may develop online academic support platforms, peer-mentoring initiatives, and faculty consultation mechanisms to assist students who experience difficulties in using digital technologies for research, learning, and academic requirements.
6. **Conduct broader and longitudinal studies:** Future researchers should replicate the study across multiple higher education institutions and geographic locations and consider longitudinal, mixed-methods, or predictive research designs. Future studies may also examine specific technologies, digital literacy, artificial intelligence use, cyber safety, digital well-being, and objectively measured academic performance such as grades or grade-point averages.

Declarations

Source of Funding

Not Applicable. This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Competing Interests Statement

The authors declare that they have no competing financial, professional, or personal interests that could have influenced the conduct, analysis, or reporting of this study.

Consent for Publication

The authors consent to the publication of this manuscript and its associated research findings.

Authors' Contributions

Christian Lloyd C. Reyes contributed to the conceptualization of the study, data collection, data analysis, interpretation of findings, and preparation of the manuscript. Edmar R. Daniel contributed to the conceptualization, research supervision, interpretation of findings, critical review, revision, and final approval of the manuscript.

Informed Consent

Informed consent was obtained from all participants prior to their participation in the study. Participants were informed about the purpose of the study, the voluntary nature of their participation, and the confidentiality of the information they provided.

Availability of Data and Material

The datasets generated and/or analyzed during the current study are not publicly available due to participant confidentiality and data-protection considerations but may be made available by the corresponding author upon reasonable request, subject to applicable institutional and ethical requirements.

Institutional Review Board Statement

Not Applicable.

Ethical Approval

Ethical considerations were observed throughout the conduct of the study, including voluntary participation, informed consent, confidentiality, privacy, and responsible handling of research data.

Acknowledgement

The authors acknowledge the participating institution, the criminology students who voluntarily participated in the study, and the individuals who provided assistance during the data-gathering and research process.

Declaration of Artificial Intelligence

The authors declare that artificial intelligence tools were used solely to assist with language refinement, grammar checking, and editorial improvement of the manuscript. The authors remain fully responsible for the accuracy, interpretation, originality, and final content of the manuscript.

References

- Al-Jarf, R. (2026). Collaborative learning and teaching in digital environments: A systematic review of two decades of research. *Journal of Computer Science and Technology Studies*, 8(4): 25–40. <https://doi.org/10.32996/jcsts.2026.8.4.2>.
- Almaqtari, J.W., Alramada, E., & Alsabry, A. (2026). An overview and impact analysis of AI tools in academic research, learning, and educational performance. *Sana'a University Journal of Applied Sciences and Technology*, 4(2): 1665–1681. <https://doi.org/10.59628/jast.v4i2.1921>.

- Alshammari, S.H., & Alkhwaldi, A.F. (2025). An integrated approach using social support theory and technology acceptance model to investigate the sustainable use of digital learning technologies. *Scientific Reports*, 15(1): 342. <https://doi.org/10.1038/s41598-024-83450-z>.
- Arkan, Z., & Bal, M. (2025). The relationship between school-age students' literacy skills and digital well-being: A systematic review. *BMC Psychology*, 13: 1240. <https://doi.org/10.1186/s40359-025-03573-4>.
- Banihashem, S.K., Bond, M., Bergdahl, N., Khosravi, H., & Noroozi, O. (2025). A systematic mapping review at the intersection of artificial intelligence and self-regulated learning. *International Journal of Educational Technology in Higher Education*, 22(1): 50. <https://doi.org/10.1186/s41239-025-00548-8>.
- Bongcac, M.C.O., & Culanag Jr, T.Y. (2026). Perceived usefulness of technology and self-regulated learning among criminology students in digital learning environments: Examining the mediating role of digital academic self-efficacy in enhancing academic engagement and learning performance. *Mediterranean Journal of Basic and Applied Sciences (MJBAS)*, 10(2): 284–295. <https://doi.org/10.46382/mjbas.2026.10218>.
- Chen, F. (2025). The relationship between digital literacy and college students' academic achievement: The chain mediating role of learning adaptation and online self-regulated learning. *Frontiers in Psychology*, 16: 1590649. <https://doi.org/10.3389/fpsyg.2025.1590649>.
- Cheng, Z., Zhang, Z., Xu, Q., Maeda, Y., & Gu, P. (2025). A meta-analysis addressing the relationship between self-regulated learning strategies and academic performance in online higher education. *Journal of Computing in Higher Education*, 37(1): 195–224. <https://doi.org/10.1007/s12528-023-09390-1>.
- Dang Tran, L., Nguyen Thi Kim, L., Tran Thi Thanh, V., & Trinh Khanh, V. (2026). Digital competence and academic success: Empirical evidence for information literacy interventions in Vietnamese higher education. *Education for Information*, 0(0). <https://doi.org/10.1177/01678329261466778>.
- Ergasheva, G., Khursanov, R., Bazarova, D., Altiyev, R., Tadjibaeva, A., Yusupdzhanova, G., & Madatova, Z. (2025). Integrating digital competencies into legal education: A pedagogical framework for the future. *Qubahan Academic Journal*, 5(2): 446–478. <https://doi.org/10.48161/qaj.v5n2a1709>.
- Faza, A., & Lestari, I.A. (2025). Self-regulated learning in the digital age: A systematic review of strategies, technologies, benefits, and challenges. *International Review of Research in Open and Distributed Learning*, 26(2): 23–58. <https://doi.org/10.19173/irrodl.v26i2.8119>.
- Forsström, S., Njå, M., Munthe, E., Álvarez-Galván, J.L., & Houldsworth, L. (2025). Key findings and integration strategies on the impact of digital technologies on students' learning: Results from a literature review. *OECD Education Working Papers*, (336): 1–48. <https://doi.org/10.1787/ab309c32-en>.
- Gerard, F.J., Ammerer, K., Mentzelopoulos, M., & Economou, D. (2025). Exploring students' experiences in using virtual simulation and gamification principles for authentic learning and assessment in criminal psychology. *Journal of Criminal Justice Education*, 36(4): 622–640. <https://doi.org/10.1080/10511253.2024.2324179>.

Huang, K., & Lee-Post, A. (2025). Enhancing online college students' self-regulated learning and performance through self-assessments and commitment strategies. *The Internet and Higher Education*, 67: 101033. <https://doi.org/10.1016/j.iheduc.2025.101033>.

Juarez Lopez, M.B., Gil Quevedo, W.S., Garcia Chapoñan, A.W., & Laos Fernandez, E.L. (2026). Self-regulated learning and academic success under digital inequality among Peruvian university students: The moderating role of institutional support. *Frontiers in Psychology*, 17: 1838281. <https://doi.org/10.3389/fpsyg.2026.1838281>.

Li, F., Cheng, L., Wang, X., Shen, L., Ma, Y., & Islam, A.Y.M. (2025). The causal relationship between digital literacy and students' academic achievement: A meta-analysis. *Humanities and Social Sciences Communications*, 12(1): 108. <https://doi.org/10.1057/s41599-025-04399-6>.

Malik, M.S., Maslahah, M., Maulida, A.Z., Nikmah, L., & Hashinuddin, A. (2025). Vygotsky's theory in the development of social and cognitive skills of the alpha generation. *FASHLUNA*, 6(1): 28–39. <https://doi.org/10.47625/fashluna.v6i1.968>.

Mohd Bahar, F.H., Roslan, N.S., Ping, N.P.T., Abdul Nasir, N.A., Ibrahim, M.S., Adam, S.K., & Yusoff, M.S.B. (2026). The digital well-being among learners in higher education: A scoping review. *BMC Medical Education*. <https://doi.org/10.1186/s12909-026-09370-w>.

Nazyrova, A., Miłosz, M., Bekmanova, G., Omarbekova, A., Aimicheva, G., & Kadyr, Y. (2025). The digital transformation of higher education in the context of an AI-driven future. *Sustainability*, 17(22): 9927. <https://doi.org/10.3390/su17229927>.

Noviandy, T.R., & Idroes, R. (2026). Online gaming, digital entertainment, and academic performance among students: A review. *J. of Edu Management and Learning*, 4(1): 41–47. <https://doi.org/10.60084/jeml.v4i1.434>.

O'Dea, M., Zhou, X., Teng, D., Mundy, D., & Ishaya, T. (2025). Are technology acceptance models still fit for purpose? *Journal of University Teaching and Learning Practice*, 22(8): 1–11. <https://doi.org/10.53761/1bdbms32>.

Okpako, E., Adewuyi, H., Fehintola, V., Ojuolape, M., Raji, N., Adegoke, A., & Umanhonlen, S. (2026). Digital learning fatigue and its psychological consequences among tertiary students: A systematic review. *Educational Technology Quarterly*, 2026(2): 99–128. <https://doi.org/10.55056/etq.1056>.

Pérez-Conde, M.L., Cruz, T.D.L.T., & Luis Rico, M.I. (2026). Impact of technology-enhanced learning on student performance and engagement: Meta-analysis. *Educación XX1*, 29(1): 199. <https://doi.org/10.5944/educxx1.42286>.

Petrovic, A., & Jaksic, D. (2026). Towards smart and socially integrated learning: A systematic review of LMS, social media and artificial intelligence synergies. *Electronic Journal of E-Learning*, 24(1): 75–92. <https://doi.org/10.34190/ejel.24.1.4417>.

Rashidi, N., Farangi, M.R., & Hosseini, A. (2025). Exploring technology-enhanced learning: A comparative study of online and offline interactive practices in the Iranian higher education system. *Qualitative Report*, 30(8): 4168. <https://doi.org/10.46743/2160-3715/2025.7757>.

- Rigopouli, K., Kotsifakos, D., & Psaromiligkos, Y. (2025). Vygotsky's creativity options and ideas in 21st-century technology-enhanced learning design. *Education Sciences*, 15(2): 257. <https://doi.org/10.3390/educsci15020257>.
- Shahzad, M.F., Xu, S., & Asif, M. (2025). Factors affecting generative artificial intelligence, such as ChatGPT, use in higher education: An application of technology acceptance model. *British Educational Research Journal*, 51(2): 489–513. <https://doi.org/10.1002/berj.4084>.
- Staneviciene, E., & Žekienė, G. (2025). The use of multimedia in the teaching and learning process of higher education: A systematic review. *Sustainability*, 17(19): 8859. <https://doi.org/10.3390/su17198859>.
- Svingen, E., Tsirova, E., & Khalilova, U. (2026). Developing critical thinking through the lens of interdisciplinarity: A case study of a criminological theory module. *Humanities and Social Sciences Communications*, 13(1): 211. <https://doi.org/10.1057/s41599-026-06517-4>.
- Tressyalina, T., Ghaluh, B.M., Wulandari, E., Arief, E., & Noveria, E. (2026). Enhancing students' critical thinking in criminal case solving: An AI-based pragmatic application for analyzing authentic Indonesian texts and videos. *Interactive Learning Environments*, 34(2): 543–575. <https://doi.org/10.1080/10494820.2025.2504062>.
- Ussenova, G., Issayeva, G., Urazaliyeva, R., Karimova, G., & Mukhanova, M. (2025). Examining cognitive independence in the context of digital learning: A moderation analysis of student motivation, self-regulation skills, and cognitive engagement. *Contemporary Educational Technology*, 17(4): ep618. <https://doi.org/10.30935/cedtech/17570>.
- Verdugo, C.A., & Martínez-Líbano, J. (2026). Self-regulation of learning and its implications for academic performance and well-being of university students in health sciences: A systematic review. *International Medical Education*, 5(2): 34. <https://doi.org/10.3390/ime5020034>.
- Wang, J., Tigelaar, D.E., Ye, T., & Admiraal, W. (2026). A meta-analysis of moderators of the effects of technology-enhanced adaptive learning on primary and secondary students' learning outcomes. *Journal of Computer Assisted Learning*, 42(1): e70168. <https://doi.org/10.1002/jcal.70168>.
- Zakir, S., Hoque, M.E., Susanto, P., Nisaa, V., Alam, M.K., Khatimah, H., & Mulyani, E. (2025). Digital literacy and academic performance: The mediating roles of digital informal learning, self-efficacy, and students' digital competence. *Frontiers in Education*, 10: 1590274. <https://doi.org/10.3389/educ.2025.1590274>.
- Zhang, Y., Zhang, M., Wu, L., & Li, J. (2025). Digital transition framework for higher education in AI-assisted engineering teaching: Y. Zhang et al. *Science & Education*, 34(2): 933–954. <https://doi.org/10.1007/s11191-024-00575-3>.
- Zhao, Y., Li, Y., Ma, S., Xu, Z., & Zhang, B. (2025). A meta-analysis of the correlation between self-regulated learning strategies and academic performance in online and blended learning environments. *Computers & Education*, 230: 105279. <https://doi.org/10.1016/j.compedu.2025.105279>.