



ASSESSING THE 21ST-CENTURY SKILLS OF CRIMINOLOGY STUDENTS BASED ON THEIR PERCEPTION OF TECHNOLOGY

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Abstract:

This study examined the relationship between criminology students' perceptions of technology and their development of 21st-century skills at the University of Mindanao, Davao City. The study focused on the Technology Acceptance Model (TAM) and examined how students' perceptions of technology's usefulness and ease influence essential 21st-century skills. These skills include information management, communication, collaboration, critical thinking, creativity, and problem solving. The study employed a descriptive-correlation design and included 300 randomly selected criminology students as participants. The data were collected using a validated survey questionnaire adapted from Robinson (2024). The data were analyzed using various statistical methods, including the mean, standard deviation, the Pearson correlation coefficient, and regression analysis. The results showed that criminology students possess a high level of 21st-century skills and hold positive perceptions toward technology, suggesting that technology plays a significant role in enhancing their learning and academic performance. The findings also revealed a significant relationship between students' perception of technology and the development of their 21st-century skills. Furthermore, the regression analysis confirmed that both perceived usefulness and perceived ease of use can predict students' skills development, explaining 37.6% of the variance in the model. Overall, the study concluded that encouraging positive attitudes toward technology helps students become more confident, capable, and prepared to meet

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the demands of a technology-driven profession in the future. Based on these results, the study recommended that the Criminology Department continue to integrate and enhance technology-based learning activities, such as simulations, digital case analysis, and virtual investigative exercises, to deepen the students' critical thinking and practical skills. It also encourages other criminology institutions to adopt similar technology-supported approaches for educators and students to engage in continuous digital skill development. Future researchers are advised to broaden the scope of study or explore additional variables to further understand the factors influencing technology-driven skill development among criminology students.

SDG No. 4: Quality Education

Keywords: 21st-century skills, perception of technology, criminology students

1. Introduction

In today's rapidly evolving digital world, higher education institutions are increasingly integrating technology into their learning environments to better prepare students for the demands of the professional world (Lin & Yu, 2023). However, despite the availability of digital tools and platforms, students may differ in their perceptions and use of technology in their academic journey (Getenet *et al.*, 2024). In the field of criminology, where future professionals are expected to handle technology-driven systems such as digital forensics, surveillance tools, and criminal analysis software, developing strong technology-related competencies is essential (Estrada *et al.*, 2024). However, it remains unclear whether criminology students fully recognize the usefulness and ease of technology in supporting their learning and building crucial 21st-century skills (Lee *et al.*, 2025). Without a clear understanding of this relationship between perception and skills, educational institutions may struggle to design learning environments that effectively strengthen students' readiness for modern criminal justice work (Pica *et al.*, 2024).

Technology serves as a resource, tool, and support in developing higher-order skills, including 21st-century digital literacy skills (González-Salamanca *et al.*, 2020), highlighting the importance of preparing students to take full advantage of the digital age (Kennedy & Sundberg, 2020). Despite these advancements, many students struggle with limited digital skills, inadequate access to technology, and difficulty adapting to technology-based learning environments (Hasim & Bakar, 2025). These issues are further compounded by inadequate infrastructure, limited resources, and insufficient training, which collectively hinder effective technology integration across all levels of education (Kunjiapu *et al.*, 2025).

As stated by Önür and Kozikoglu (2020), technology is considered an important component in establishing an educational setting aligned with the learning strategies of our generation and one of the 21st-century skills. Given how rapidly technology is

advancing, criminology students must be motivated to learn new concepts and stay up to date with developments in both criminology and technology (Estrada, 2024).

Digital literacy, critical thinking, and collaborative learning together form an essential set of skills that help students navigate and succeed in today's fast-changing, technology-driven world (Judijanto *et al.*, 2025). 21st-century skills involve developing interpersonal abilities that enable individuals to collaborate on knowledge, information, and values, while actively participating in society and effectively operating in a digital environment (González-Salamanca *et al.*, 2020). In addition to supporting academic success, it is important to develop 21st-century skills, as they play a key role in success in both the workforce and community (Mahmud, 2022)

The application of digital technologies supports innovation and enhances creativity, enabling individuals to acquire new knowledge, develop skills, and gain valuable experience in educational environments (Ramaila & Molwele, 2022). As stated by Munteanu (2020), the integration of technology in learning is pivotal in equipping students with the knowledge, skills, and abilities necessary to thrive in a modern, information-driven society. As technology becomes an increasingly important portion of learning, it also directly impacts students' ability to develop 21st-century skills. Furthermore, the use of technology in learning helps students develop adaptability. It prepares them for the demands of future careers by enabling them to adapt to various workplace situations (Orús *et al.*, 2020).

1.1 Research Objectives

The general objective of the study is to investigate the descriptive correlation between the perception of technology and the development of 21st-century skills among criminology students. This aims to examine criminology students' perceptions of technology in relation to their academic experience, focusing on perceived ease of use and perceived usefulness. It also attempts to measure the extent to which criminology students possess 21st-century skills, including information management, information evaluation, communication, collaboration, critical thinking, creativity, and problem-solving. Furthermore, this study aims to investigate the relationship between criminology students' perceptions of technology and their 21st-century skills, and to understand whether these perceptions affect the development of their skills. Lastly, this study aims to conduct a regression analysis to identify the extent to which technology perception predicts the development of 21st-century skills among the criminology students.

The study's null hypothesis, at a 0.05 significance level, assumes that there is no relationship between criminology students' perceptions of technology and the development of their 21st-century skills.

1.2 Framework of the Study

This study anchored in the Technology Acceptance Model (TAM) which assumes that individuals' acceptance of technology is determined by two factors as stated by Davis (1989): First, perceived usefulness is the range to which an individual thinks that utilizing

a specific method would improve their performance; Second, perceived ease of use is the degree to which a person believes that using the system would be free from effort. Since its establishment, TAM has been widely used to understand how people respond to and adopt new technology (Davis, 1989). In this study, TAM serves as the basis for examining how criminology students view technology and how these views affect their development of 21st-century competencies such as communication, cooperation, digital literacy, and critical thinking, as noted by Robinson (2024). In today's technologically advanced world, professionals are expected to use technology extensively in their work, making these abilities essential (Robinson, 2024).

The supporting theory is the Theory of Reasoned Action (TRA) by Martin Fishbein and Icek Ajzen (Fishbein & Ajzen, 1975). It clarifies whether a person's behavior with an innovation is motivated by behavioral intentions shaped by their attitude toward the behavior, the subjective norms surrounding its performance, and the individual's perception of how easy it is to perform the behavior (Ajzen & Fishbein, 1980). Users engage with and adopt technology only if they believe it is valuable to them (Davis, 1989). After adjusting for the impact of attitudes, social norms influence intentions to use the system that supports its use, as well as perceptions of how it would affect valued abilities (Venkatesh *et al.*, 2003). Perceived system usefulness and its effect on valued abilities influenced attitudes toward system use (Davis *et al.*, 1989). In this study, the attitudes of criminology students toward technology, as well as the influence of peers or educators, may determine their willingness to integrate technology into learning, thereby affecting their acquisition of essential skills (Robinson, 2024).

Additionally, Venkatesh *et al.* (2003) stated in the Unified Theory of Acceptance and Use of Technology (UTAUT) that behavioral intention drives technology use. The four primary constructs, which are performance expectancy, effort expectancy, social influence, and facilitating conditions, determine the perceived likelihood of technology adoption. The primary goal of UTAUT was to clarify the user's objectives about the usage of technical innovation and the ensuing user behavior. The model considers four constructs as direct predictors of user acceptance and usage behavior.

Furthermore, there are four important moderating factors: age, experience, gender, and the voluntariness of use. The moderating effects of age, gender, experience, and the voluntariness of use define the strength of the predictors of intention. Age moderates the effects of all factors. Gender influences the relationship between effort expectancy, performance expectancy, and social influence. Experience moderates the intensity of the linkages between social influence, enabling situations, and effort expectancy. The voluntariness of use moderates only the relationship between social influence and behavioral intention. This theory suggests that institutional support, peer encouragement, and ease of access to technological tools significantly impact students' engagement with technology (Venkatesh *et al.*, 2003). Consequently, these factors contribute to the development of competencies necessary for 21st-century professionals (Robinson, 2024).

A conceptual framework outlines the researcher's understanding of the study's variables and their relationships (Luft *et al.*, 2022). The independent variable is the perception of technology, with the following indicators: first, the perceived usefulness, as mentioned by Robinson (2024), is associated with whether the information is relevant, informative, meaningful, helpful, or significant, labeled as the perceived importance. Second, Worthington (2021) defined the perceived ease of use as the level to which an individual believes that using a particular technology would be effortless. As an individual's perceived ease of use of a given technology increases, their intentions to use the technology also increase (Worthington, 2021).

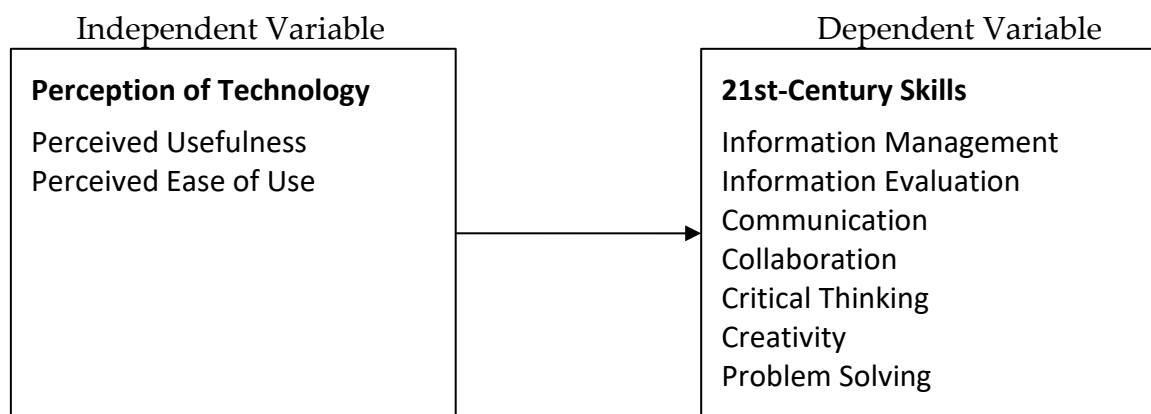


Figure 1: The Conceptual Framework of the Study

The dependent variable is the development of 21st-century skills, which encompass a broader range of abilities that individuals can incorporate into their lives to succeed in work and today's world (González-Salamanca, 2020). The following indicator is information management: the capacity to provide users with data and information to the proper degree of precision, promptness, dependability, security, and confidentiality. The capacity to offer access and communication to everyone with sufficient reach and range (Information, 2025); information evaluation is the procedure for critically examining the quality, credibility, relevance, accuracy, and reliability of information (Landøy & Repanovici, 2020); communication as explained by Thornhill-Miller *et al.* (2023), is the ability to express ideas through oral, written, and non-verbal methods; collaboration is the capacity to work together with others from different points of view but has the same goal; critical thinking is the skill to analyze and evaluate information or arguments in a disciplined and systematic manner; creativity is the capacity to produce innovative ideas and concept that produce unique outcome; problem-solving skills is to provide solutions of the identified problems and circumstances (Thornhill-Miller *et al.*, 2023).

The independent variable is the perception of technology, which evaluates how users utilize it based on its effectiveness and user-friendliness (Ubaidillah *et al.*, 2020). The indicators are: perceived usefulness, the degree to which an individual considers that

using technology would improve their output; and perceived ease of use, the extent to which an individual perceives technology as free from effort (Ortiz-López *et al.*, 2024).

1.3 Related Literatures

A study by Kalyani (2024) highlighted that educational patterns have undergone drastic changes over the decades, accompanied by technological advancements. This research highlights the primary influence of technology on education and educational outcomes, as well as the transition from traditional rote learning to the development of critical 21st-century skills (Kalyani, 2024). Thus, the learning paradigm shifts towards the 21st century, encompassing complex competencies, transformations in technology-based learning, and non-cognitive skills (Mutohhari *et al.*, 2021). Furthermore, St. Louis *et al.* (2021) suggested that new college graduates entering the workplace should possess sufficient content knowledge and be competent in 21st-century skills, such as collaboration, communication, and problem-solving. These enabling technologies can play a crucial role in creating better physical working conditions, which in turn drive the optimization of workers' performance and workplace experience (Umanah *et al.*, 2024).

Over the years, there has been a rapid growth in the educational needs of 21st-century students, accompanied by the global development and advancement of technology, encompassing hardware and software, platforms, content, and auxiliary services (Aithor, 2024b). As stated by Kalyani (2024), the idea of students being at the center stage is a key aspect of modern teaching. Students are required to engage in discussions, work in groups, or participate in activities, rather than relying solely on memorization. There are also several online textbooks and interactive websites available that enhance learning. It helps ensure that students complete activities that foster critical thinking through creativity and problem-solving exercises, enabling them to thrive in this modern, technology-enabled era.

As Cheung *et al.* (2021) state, personalization of learning is made possible by digital technologies. These programs support the implementation of individualized lesson plans and enhance classroom instruction. Both teachers and students benefit from the application of digital tools, which in turn enhances the overall learning experience. Artificial intelligence, image recognition, and the internet are examples of tools that enhance learning by providing insights into performance, learning, and behavior. Digital literacy is important in establishing innovative learning environments. Computer classrooms support the development of 21st-century skills by providing the necessary digital tools (Cheung *et al.*, 2021). Furthermore, technological advancements allow learners to access vast knowledge and experience in technology-driven classrooms. Using these tools, learners can develop essential skills such as flexibility, adaptability, creativity, critical thinking, and technology literacy (Yilmaz, 2021).

The use of digital learning has become an accepted standard over the years as an integral technology in education (Agung *et al.*, 2020). Several advantages of digital learning heavily influence this evolution compared to the traditional education system

(Gyimah, 2020). The education system transitioned from traditional in-person classrooms to fully online learning through the integration of technology (Illescas *et al.*, 2023)

Students, having grown up fully immersed in the internet and digital tools, now rely on technologies such as social media, smartphones, and cloud-based platforms as an integral part of their daily routines (Alruthaya *et al.*, 2021). As students become familiar with using technology as a learning tool, they become more confident and comfortable, and their ability to interact with others in new ways becomes a common practice (Merrick, B., 2020). The use of technology in traditional learning systems has dramatically influenced how students learn, enhancing the development of fundamental skills (Nassoura, 2020). Furthermore, the success of learning using technology is more than just availability and ease of use, relying on self-discipline, effective time management, and previous knowledge with digital platforms, all of which play an important role in enhancing students' engagement and their perception of technology's usefulness in education (Landrum, 2020)

The move towards deepening digitalization in criminology, as mentioned by Asli (2023), is likely to prove enduring, as our modern world becomes increasingly influenced by technology in both the study and practice of the discipline. Digital technology exposure among criminology students is increasingly informing researchers about crime, helping to prevent it, and forming the basis of policy-making as part of the leading change. Studies have examined how emerging technologies, including digital forensics, algorithmic criminology, and cyber studies, have transformed criminological research and education (Asli, 2023). In addition, in line with Singh (2020), integrating criminological data into interdisciplinary synergies, students must learn 21st-century skills to remain relevant in criminology. How they understand and engage with technology informs their capacity to integrate these advances into future careers in law enforcement, policy-making, and academic research, underscoring the critical need for curricula that foster both technical proficiency and critical thinking (Singh, 2020).

The increasing dependence on digital technology also exposes individuals to emerging forms of technology-facilitated victimization, emphasizing the need for criminology students to develop strong digital competencies. The study, *Stolen Lives: Stories of Victims of Identity Theft*, provides a victim-centered perspective on identity theft and illustrates the realities experienced by individuals affected by crimes involving the misuse of personal information. Such experiences underscore the importance of information management, information evaluation, critical thinking, and problem-solving in navigating technology-driven environments. For criminology students, understanding these forms of victimization further demonstrates that technological competence is not limited to using digital tools but also entails critically evaluating information, recognizing digital risks, and responding appropriately to emerging forms of crime (Duron & Cartin-Pecson, 2026)

Also, Bajen *et al.* (2026) found that modern technology improves the accuracy of forensic analysis and enhances evidence examination and case resolution in Davao City. However, they also noted challenges such as the high cost of equipment and the need for

continuous training. These results emphasize that effective use of forensic technology requires not only access to tools but also strong critical thinking, adaptability, and problem-solving skills, highlighting the importance of developing 21st-century skills among criminology students.

Gohetia *et al.* (2026) further emphasized the importance of strengthening criminology students' competencies by examining factors contributing to students' failure in the Competency Appraisal Course. Their study highlights the need to address factors that may hinder students from demonstrating the knowledge and competencies expected in the criminology program. This underscores the importance of developing essential 21st-century skills, particularly critical thinking, information management, communication, and problem-solving, as these competencies help students respond more effectively to academic demands and prepare for professional practice in criminology.

This also aligned with the Sustainable Development Goals (SDGs), particularly SDG 4: Quality Education, as it promoted the development of 21st-century skills essential for students to thrive in a rapidly changing, technology-driven world. By examining how criminology students perceived and utilized technology, the research supported efforts to enhance digital competencies, improve learning environments, and prepare future professionals for the demands of modern society. Strengthening these skills not only contributed to academic success but also supported broader educational reforms aimed at producing globally competitive, technologically capable, and socially responsible graduates.

2. Method

This section discusses research respondents, instruments and materials, and design and procedure.

2.1 Research Respondents

The study's respondents were 300 criminology students from the University of Mindanao in Davao City. This study employs a probability sampling method, specifically simple random sampling. As stated by Simkus (2023), this method provides every portion of the population with an equal opportunity to be selected. Simple random sampling is well known as one of the most straightforward and efficient methods of data collection, as it selects a sample from the overall population, allowing for a fair representation of participants (Simkus, 2023).

The study specifically involved 1st-year to 4th-year criminology students currently enrolled at the University of Mindanao's Main Campus. Meanwhile, students from other academic programs, criminology graduates or alumni, and respondents with incomplete or invalid survey responses were excluded from the analysis. These criteria ensured that the respondents accurately represented the target population and that data were collected and analyzed in alignment with the study's objectives

2.2 Materials and Instruments

The adapted survey questionnaire from a research study by Robinson (2024), entitled “Predictability of Rural Teachers’ 21st-Century Digital Skills Based on Their Perception of Technology.” The researcher adjusted the instrument to align with the respondents’ demographics and context (Kayode-Sanni, 2023). In line with Robinson (2024), the survey consists of a three-part questionnaire. The first section collects demographic information from the respondents. In the next part, using the adapted questions, the respondents measured the perceived usefulness and ease of use of technology for academic activities. In the final section, the respondents evaluate their digital competencies and the application of technology in various skill domains (i.e., collaboration, creativity, communication, and problem-solving) using the 21st-Century Skills Instrument (Robinson, 2024).

The responses were gathered from respondents who interpreted using a 5-point Likert scale. This scale was used to systematically analyze respondents’ level of agreement with the statement in the survey questionnaire. An overall mean ranging from 4.20 to 5.00 was interpreted as Very High, indicating that the respondents consistently agreed with and strongly accepted the statement. A mean range of 3.40 to 4.19 was considered High, suggesting that the respondents often agreed with the given situations or experiences. Meanwhile, a mean ranging from 2.60 to 3.39 was described as Moderate, which indicated that the respondents sometimes agreed with the statements presented. A mean range of 1.80 to 2.59 was interpreted as Low, showing that the respondents seldom agreed with the described situations. Lastly, a mean ranging from 1.00 to 1.79 was categorized as Very Low, indicating that the respondents rarely agreed with the statements provided in the survey.

2.3 Design and Procedure

This study employed a descriptive-correlational research design to examine the relationship between perceptions of technology and 21st-century skills. Descriptive-correlational research focuses on identifying variables and examining the strength of their relationships (Aprecia *et al.*, 2022). This approach enabled the researchers to monitor changes in participants’ behaviors or attitudes over time and evaluate how these shifts may impact outcomes or future trends, as outlined in “Descriptive Correlational Design in Research” (2025). Furthermore, Bhat (2021) explains that its purpose is to explore the characteristics or actions of a specific group and analyze the connections between independent and dependent variables. This study examined criminology students’ perceptions of technology and their development of 21st-century skills, and assessed the relationship between the two.

To gather the essential data for this study, researchers used a validated, modified survey questionnaire developed by a panel of experts prior to conducting the survey. After the validation process, researchers submitted a letter of approval to the Office of the Dean to formally conduct the study. After that, the researchers administered the questionnaires to 300 criminology students in person. Once the data were collected, an expert statistician

carefully reviewed, tallied, and analyzed the responses using the statistical tools identified in the study. These included measures to assess perceptions of technology and 21st-century skills, Pearson's r to measure the relationship between the variables, and regression analysis to examine the predictive influence of technology perception on students' 21st-century skills. The researchers then interpreted the results in light of the study's objectives.

3. Results and Discussion

This section presents the statistical results and interpretation of the gathered data on the perceptions of technology and the 21st-century skills of criminology students at the University of Mindanao.

2.1 The Perception of Technology of Criminology Students

Table 1 below shows the level of perception of technology. The results show that the respondents' overall perception of technology is very high, with a mean of 4.49 and a standard deviation of 0.47. Perceived usefulness has the highest mean, at 4.54, indicating that respondents strongly agree that the technology is useful. Concurrently, perceived ease of use has the lowest mean, interpreted as very high, with a score of 4.45.

Table 1: The Perception of Technology of Criminology Students

Perception of Technology	Mean	SD	Interpretation
Perceived Usefulness	4.54	0.50	Very High
Perceived Ease of Use	4.45	0.57	Very High
Overall	4.49	0.47	Very High

The results indicate that perceptions of technology are very high, highlighting its importance in improving the outcomes of their activities and accomplishing their daily tasks. Students rely on technology because it supports their personal and academic responsibilities and provides results they can use. The Technology Acceptance Model (TAM) was proposed by Davis (1989). He asserted that the user's intent to use technology significantly influences whether the individual will accept or reject it. Students' high rating means that they accept technology in their lives because it is convenient, easy to use, and user-friendly.

The findings of the study support the existing literature and theoretical evidence regarding students' adoption and use of technology. Linus *et al.* (2025) asserted that students are more likely to adopt technological platforms that enhance their academic performance by making tasks easier, clearer, and more collaborative. This aligns with the study's results, which showed that criminology students demonstrated very high levels of perceived usefulness, indicating that they view technology as an effective tool for improving learning outcomes and facilitating academic activities. Similarly, the study's finding that perceived ease of use significantly predicted students' 21st-century skills supports Fatani's (2020) claim that students integrate tools that are simple, accessible, and

user-friendly because such tools provide comfort, clarity, and satisfaction. Although the literature notes that some individuals still encounter difficulties with complex technological features, the high overall ratings for usefulness and ease of use in this study indicate that respondents generally had positive experiences with technology. Thus, the results reinforce both empirical and theoretical evidence, particularly the Technology Acceptance Model, which explains that technology adoption increases when users perceive tools as useful and easy to use.

2.2 The 21st-Century Skills of Criminology Students

As presented in Table 2, the respondents demonstrated a high level of 21st-century skills with an overall mean of 4.24 and a standard deviation of 0.54. Among the indicators, information evaluation obtained the highest mean score (4.35), followed by creativity and problem-solving (both 4.27). Meanwhile, communication, interpreted as high, received the lowest mean (4.14). These results indicate that students generally possess well-developed 21st-century competencies, particularly in analyzing and assessing information, generating creative ideas, and solving problems effectively.

Table 2: The 21st-Century Skills of Criminology Students

21st-Century Skills	Mean	SD	Interpretation
Information Management	4.21	0.79	Very High
Information Evaluation	4.35	0.73	Very High
Communication	4.14	0.70	High
Collaboration	4.16	0.78	High
Critical Thinking	4.25	0.68	Very High
Creativity	4.27	0.69	Very High
Problem Solving	4.27	0.76	Very High
Overall	4.24	0.54	Very High

The very high overall mean suggests that students strongly agree with the statements assessed in the survey. These results indicate that the measured practices or skills are widely experienced, applied, and recognized by respondents in their academic activities. One possible reason for this is that continuously evaluating tasks that require the use of the variable allows students to become familiar and confident in performing it. Their engagement with technology-based learning, research requirements, and collaborative academic tasks may also contribute to this positive outcome. Since students perceive the factor as beneficial and accessible, they tend to respond more favorably to it. Therefore, the high overall mean reflects the strong presence, relevance, and effectiveness of this aspect in supporting students' learning and development.

The study's results support the empirical literature on 21st-century skills. Oluwagbohunmi and Alonge (2023) described 21st-century skills as a combination of knowledge, skills, and character that equip students to function effectively in an evolving world. This aligns with the study's findings, which showed that criminology students demonstrated high levels of 21st-century skills, particularly in information evaluation, problem-solving, and creativity, the skills necessary for adaptability and competence.

Furthermore, Kalyani's (2024) assertion that technology use is a major factor in developing 21st-century skills is reinforced by the study's results. The strong and significant relationship between students' perception of technology and their 21st-century skills suggests that technology indeed enhances engagement, critical thinking, and problem-solving abilities, consistent with existing literature. The study's findings also align with claims that digital platforms improve communication and collaboration, as students rated their collaborative and communicative skills highly. Overall, the evidence from the study supports the theoretical and empirical claims that integrating technology is crucial to strengthening 21st-century skills among learners.

The importance of information evaluation, critical thinking, and problem-solving among criminology students is further supported by Reyes *et al.* (2025). Their exploratory factor analysis revealed multiple dimensions of cybercrime victimization, including cyber intrusion and harassment, risky online behavior, security risks in digital interactions, exposure to fraud and online harassment, personal security and impersonation risks, sharing sensitive information online, and negligence in online security. These findings demonstrate that participation in digital environments involves not only technological opportunities but also risks that require users to critically evaluate information, recognize potentially unsafe online practices, protect sensitive information, and make informed decisions. In the context of criminology education, the findings reinforce the importance of developing 21st-century competencies that enable students to navigate digital environments responsibly and recognize and respond to emerging forms of cybercrime

2.3 The Relationship Between Perception of Technology and 21st-Century Skills of Criminology Students

As presented in Table 3, the data suggest that all dimensions of respondents' perceptions of technology have a significant positive correlation with all domains of 21st-century skills ($p < 0.001$). The strongest correlation is observed between overall perception of technology and total 21st-century skills ($r = 0.613$), followed by perceived ease of use ($r = 0.563$). This result suggests that when students perceive technology as beneficial and easy to use, they are more likely to demonstrate higher levels of information management, communication, collaboration, critical thinking, creativity, and problem-solving.

Table 3: The Relationship Between Perception of Technology and 21st-Century Skills of Criminology Students

		Information Management	Information Evaluation	Communication	Collaboration	Critical Thinking	Creativity	Problem Solving	21st-Century Skills
Perceived Usefulness	r	0.429	0.408	0.387	0.259	0.427	0.431	0.379	0.527
	p	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
Perceived Ease of Use	r	0.462	0.439	0.507	0.238	0.413	0.449	0.402	0.563
	p	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
Perception of Technology	r	0.501	0.476	0.506	0.279	0.471	0.494	0.44	0.613
	p	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001

The results show that students' perception of technology significantly influences their 21st-century skills, as technology serves as both a tool for learning and an environment for applying these skills. When students perceive technology as applicable, it enhances their motivation to use digital tools for learning, promoting active engagement and independent knowledge construction. The high correlation values suggest that integrating technology into educational practices nurtures a learning atmosphere that fosters critical thinking and innovation. Since all p-values are below 0.05, the relationships are statistically significant, confirming that students' comfort and familiarity with technology lead to better mastery of complex, technology-driven tasks aligned with modern learning demands.

The results are consistent with previous studies emphasizing how digital learning enhances skill development and reshapes educational experiences. Agung *et al.* and Ansong-Gyimah (2020) highlighted that digital learning has become a standard in education due to its flexibility and ability to meet learners' evolving needs. Similarly, Mahmud (2022) noted that the development of 21st-century skills remains crucial, as these competencies not only support academic achievement but also prepare learners for success in both the workplace and the broader community (Mahmud, 2022). Merrick (2020) further observed that regular use of technology helps students become more confident, communicative, and adaptable to new learning environments. Nassoura (2020) and Landrum (2020) emphasized that success in digital learning relies not only on accessibility but also on students' perception of its usefulness and ease of use, both of which significantly enhance self-regulation, collaboration, and problem-solving.

2.4 Regression Analysis Between Perception of Technology and 21st-Century Skills of Criminology Students

Table 4 shows the regression results predicting the 21st-century skills of criminology students based on their perception of technology. The model shows that both Perceived Usefulness ($\beta = 0.324$, $p < .001$) and Perceived Ease of Use ($\beta = 0.368$, $p < .001$) are significant predictors of 21st-century skills. The overall model explains 37.6% of the variance ($R^2 = 0.376$) with an adjusted R^2 of 0.372, and an F-value of 89.5 at a p-value $< .001$, indicating that the regression model is statistically significant.

The regression results indicate that criminology students' perceptions of technology significantly affect their development of 21st-century skills. Both perceived usefulness and ease of use were significant predictors, implying that students who view technology as helpful and simple to operate are more likely to progress necessary skills such as creativity, critical thinking, communication, and collaboration. It suggests that positive perceptions of technology encourage criminology students to engage more effectively in their studies, thereby improving their ability to apply technology in solving both academic and real-life problems. The 37.6% explained variance ($R^2 = 0.376$) further indicates that students' perceptions of the technology's perceived benefit and user-friendliness strongly influence their skill development.

Table 4: Regression Analysis for 21st-Century Skills Based on Perception of Technology of Criminology Students

Predictor	Estimate	SE	t	p
Intercept	1.127	0.2387	4.72	<.001
Perceived Usefulness	0.324	0.0610	5.30	<.001
Perceived Ease of Use	0.368	0.0537	6.85	<.001
R ² = 0.376				
Adj R ² = 0.372				
F-value = 89.5				
P-value = 0.001				

The results were consistent with the Technology Acceptance Model (TAM) proposed by Davis (1989). This model suggests that technology's ability to improve and yield positive outcomes for its users drives its practical use, resulting in enhanced learning performance and skill development. Robinson (2024) noted that individuals with a positive attitude towards technology tend to excel in areas such as communication, teamwork, critical thinking, creativity, and problem-solving. Furthermore, Carstens *et al.* (2021) found that students who are comfortable and engaged with technology tend to experience the most significant learning interactions and achieve the most academic success.

3. Conclusion and Recommendation

This section summarizes the study's results and presents recommendations based on the data.

The study showed that the respondents had a very high perception of technology and strong 21st-century skills. The overall results indicated that students perceive technology as helpful, easy to use, and beneficial in both their academic studies and daily life. This result suggested that technology plays a crucial role in enhancing students' learning experiences, productivity, and communication. Among these skills, information evaluation scored the highest, followed by creativity and problem-solving. This result suggested that criminology students can critically analyze information, generate innovative ideas, and effectively tackle challenges. These findings indicate that the

respondents possessed the necessary technical knowledge and modern skills to meet the demands of a fast-paced, technology-driven world. The rise of new tools and artificial intelligence has slightly reduced the ease of use compared with other indicators. However, it still does not change the fact that the technology is easy to handle.

Moreover, the findings of this study indicate that criminology students with favorable attitudes toward technology are more engaged in the learning process. Their familiarity with digital platforms enables them to complete tasks efficiently, communicate and collaborate better, and access study resources with ease. As they continue to use technology, they become more confident and independent in managing their academic responsibility. It indicated that technology not only helped people learn but also made them more engaged and more effective. It also helped students apply what they learned in real-life situations, making learning more valuable and meaningful.

The regression analysis further confirmed that students' perception of technology predicted their development of essential 21st-century skills. When students view technology as helpful and easy to use, they are more likely to develop skills such as communication, collaboration, critical thinking, creativity, and problem-solving. The R^2 value of 0.376 indicates that 37.6% of the variation in students' 21st-century skills can be explained by their perceptions of technology, showing that positive attitudes toward digital tools significantly support their skill development. Overall, the findings suggested that encouraging confidence and familiarity with technology can help prepare students to become more capable and future-ready in their professional field.

Therefore, the Technology Acceptance Model (TAM), proposed by Davis (1989), aligns with findings indicating that individuals' perceived usefulness and ease of use significantly affect their adoption of technology, contributing to the development of 21st-century skills (Robinson, 2024). Similarly, Fishbein and Ajzen proposed that a person's behavior is strongly influenced by their attitude towards using a specific technology. Thus, these combined theories provided a rationale for the more active engagement of students in criminology who consider technology practical and easy to use in their academic practices. Thus, the study concluded that favorable attitudes towards technology considerably enhance the 21st-century skills of criminology students and validate the theoretical grounds that explained technology adoption and its critical role in the contemporary learning process.

Based on the study's results, the researchers recommended that the Criminology Department of the University of Mindanao continue to strengthen its use of technology in classroom instruction. Since students demonstrated a strong understanding of both technology and 21st-century skills, the department is encouraged to further develop technology-based learning activities, such as case analysis, online simulations, and virtual law enforcement exercises. These types of activities can deepen students' abilities in information management, evaluation, creativity, problem-solving, and critical thinking.

Moreover, since technology integration has already been implemented in the department and has yielded strong results, this indicates that technology is indeed being

effectively integrated into classroom instruction. Therefore, it is also recommended that other criminology institutions adopt similar practices by incorporating technology-based learning methods into their programs. These may include simulations and virtual laboratory activities similar to those used in the criminology department of the University of Mindanao. Before implementation, schools may assess their students' perceptions of technology and 21st-century skills to identify areas where technology integration is most needed. Through this assessment, schools can determine whether these strategies are effective and identify opportunities for improvement. If proven successful, the institution may further establish modern laboratories and advanced simulations equipped with technologies applicable to fieldwork and law enforcement training.

Additionally, faculty members are encouraged to adopt innovative, student-centered teaching approaches that use digital tools for blended learning and research-based projects. These methods can help students become more digitally literate and confident in applying technology in academic and professional settings. Teachers may also attend seminars or training sessions on technology integration to further develop effective strategies that align with students' learning needs.

Furthermore, students are encouraged to maximize their use of technology by engaging in self-directed digital learning activities, such as online research, participation in academic forums, and virtual collaboration with peers. This will not only enhance their communication and collaboration skills but also help them adapt to a technology-driven environment in criminology.

Lastly, future researchers are encouraged to conduct studies involving a broader population or other criminology institutions to compare findings and validate the results. Future studies may also include variables such as academic performance, digital literacy, or motivation to identify additional factors that influence the relationship between perceptions of technology and 21st-century skills. These efforts will help improve educational strategies that prepare criminology students to become more competent, innovative, and future-ready professionals.

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Conflict of Interest Statement

The authors declare no conflicts of interest.

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