

# Artificial Intelligence Dependence in Relation to Knowledge Retention and Critical Thinking Skills Among Criminology Students

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## ABSTRACT

The increasing integration of Artificial Intelligence (AI) in education has significantly transformed how students access information and complete academic tasks. This study determined the relationship between AI dependence and the students' knowledge retention and critical thinking skills in one of the higher education institutions in Misamis Occidental. The study employed a descriptive-correlational research design and involved 218 criminology students selected through stratified random sampling. Data were gathered using validated questionnaires measuring AI usage, knowledge retention, and critical thinking skills. In analyzing the data, the Mean, Standard Deviation and Spearman's Rank-Order Correlation Coefficient were used. The findings revealed that AI dependence among criminology students was moderate, while knowledge retention and critical thinking skills were both high. Statistical analysis showed that AI dependence influenced knowledge retention and critical thinking skills. However, it varied across dimensions, with stronger associations observed in evaluation and decision-making than in analytical reasoning. The study concludes that AI can be a valuable academic support tool; however, its effectiveness in developing higher-order thinking depends on how it is utilized. It is recommended that teachers promote responsible AI use and design learning activities that enhance critical thinking and independent learning.

Keywords: *assessment, artificial intelligence dependence, critical thinking, reasoning, retention*

## INTRODUCTION

Artificial Intelligence (AI) has rapidly transformed modern life, particularly in education, communication, and problem-solving (Sadiku et al., 2022). As AI continues to advance, its integration into schools has created new opportunities for teaching, learning, and addressing societal challenges (Holmes et al., 2022). Tools such as ChatGPT, Gemini, and Microsoft Copilot have become common among students, offering greater efficiency, creativity, and convenience in academic tasks (Dun, 2025). However, increasing dependence on AI has raised concerns about its effects on students' knowledge retention and critical thinking, which may influence academic performance (Szmyd & Mitera, 2024).

In higher education, AI makes learning faster and more accessible by providing explanations, summaries, and answers with minimal effort (Sajja et al., 2024; Baidoo-Anu & Ansah, 2023). While this improves convenience, it may also reduce students' motivation to practice essential skills such as note-taking, reading comprehension, and problem-solving (Darwin et al., 2024). Thus, maintaining a balance between technological reliance and active human effort has become a major educational concern (George et al., 2024). Studies by Kundu and Bej (2025) and Ouyang et al. (2022) found that excessive AI reliance weakens motivation, self-regulation, cognitive engagement, and deep learning, leading to poorer retention and lower academic performance. Revesai (2025) further described AI dependence as contributing to an "academic crisis" characterized by mental fatigue, superficial understanding, and declining reasoning skills.

Knowledge retention and critical thinking are essential for academic growth across disciplines (Saleh et al., 2023). For criminology students, these skills are particularly important because their field requires analytical reasoning, ethical judgment, and evidence-based decision-making (Dooley & Larrivee, 2024). Knowledge retention involves recalling and applying criminological concepts, laws, and investigative principles (Radvansky

et al., 2022; Buted, 2024). Although AI may support comprehension through summaries and reviews, studies indicate that extensive AI use can weaken long-term recall and reduce active engagement in learning (Ododo et al., 2024; Alonta et al., 2024). AI dependence has also been linked to shallow understanding, reduced independent study, and limited deep cognitive processing (Rodzi & Mohamad et al., 2024).

Recent trends show that AI has become a routine part of students' academic practices (Yu et al., 2025). Many learners regularly use generative AI platforms for searching information, summarizing content, and drafting assignments (Bouguettaya et al., 2025). Reports reveal a sharp increase in AI use, with about 92% of students using AI in some form and 88% utilizing generative AI for assessments (Freeman, 2025). This growing normalization of AI-assisted learning highlights how dependence may gradually develop from occasional support into a primary academic strategy, reinforcing concerns about reduced cognitive engagement and weakened retention.

Critical thinking involves analyzing, evaluating, and synthesizing information to form sound judgments (Raj et al., 2022). Students who rely heavily on AI may generate organized responses without fully understanding or evaluating the ideas presented (Zhai et al., 2024). Such dependence can weaken analytical reasoning and evaluative judgment, as learners may accept AI-generated outputs without critical reflection (Shah et al., 2024). Research by Aymen and Zakarya (2024) showed that students who heavily depend on AI often bypass independent reasoning, resulting in weaker analytical depth and evaluative skills. Similarly, da Silva (2024) found that AI use may encourage passive information processing, limiting reflective judgment and problem-solving. Tian et al. (2025) further noted that AI dependence may cause cognitive fatigue, especially among students with low AI literacy, thereby reducing critical thinking performance.

The cognitive effects of AI reliance call for careful and structured research. Although AI is intended to support learning, it should not replace the mental processes that strengthen reasoning and decision-making. Understanding how AI influences students' thinking can help educators design strategies that encourage responsible and balanced technology use (Pillai & Ramakrishnan, 2024). AI should enhance, not replace, human intelligence (Hemachandran et al., 2022). As AI becomes more influential in higher education and future careers (Luckin, 2025), students must continue developing creativity, problem-solving, independent reasoning, and sound judgment alongside technological proficiency (Aithal & Maiya, 2023; George et al., 2024).

This study highlights the growing concern that AI dependence may weaken students' knowledge retention and critical thinking. In the Philippine context, empirical evidence on this issue remains limited, particularly among criminology students. Existing international studies rarely focus on criminology programs, despite the field's strong demand for retention of laws and procedures and for sound investigative and judicial decision-making. Without localized evidence, educators and policymakers lack a clear basis for developing curricula and interventions that balance technological advancement with cognitive development. Addressing this gap is essential to preparing criminology students for professional roles that require independent reasoning, ethical judgment, and evidence-based decision-making.

The study aims to determine the relationship between AI dependence and the cognitive outcomes of knowledge retention and critical thinking among criminology students. Using validated Likert-scale instruments, it seeks to measure how varying levels of AI reliance influence students' ability to retain information, process criminological concepts, and engage in analytical reasoning. The study also examines whether dependence on AI-generated outputs contributes to shallow comprehension and reduced analytical depth or whether balanced AI use can support memory retention and reasoning skills. Through statistical analysis, the research aims to provide empirical evidence on how AI shapes learning behaviors and intellectual development among criminology students.

The findings are expected to benefit educators, curriculum developers, students, policymakers, and academic institutions. Educators may use the results to design teaching strategies that encourage responsible AI use while preserving critical thinking and retention. Curriculum developers can integrate AI literacy with cognitive skill-building, while students may become more aware of the risks of overreliance on AI and adopt more effective study habits. Policymakers and institutions may also use the findings to create guidelines that balance

technological advancement with cognitive development. Ultimately, the study seeks to prepare criminology students for careers that demand independent reasoning, evidence evaluation, and ethical judgment.

## Theoretical Framework

This study is anchored on the Cognitive Load Theory by John Sweller (1988) and Bloom's Revised Taxonomy by Lorin Anderson and David Krathwohl (2001), and is supported by the Technology Acceptance Model (TAM) of Fred Davis (1989).

Cognitive Load Theory explains that learning is most effective when learners manage cognitive demands efficiently. The theory identifies intrinsic load (task complexity), extraneous load (unnecessary mental demands), and germane load (mental effort for meaningful learning and knowledge construction). In this study, the theory explains how excessive dependence on AI tools may reduce students' active mental engagement and deep information processing, which are essential for knowledge retention and critical thinking. While AI can reduce unnecessary cognitive load, overreliance may also limit germane load, weakening comprehension, analytical skills, and long-term retention among criminology students (Chen et al., 2023; Sridevi et al., 2024; Zhai et al., 2024). Recent studies further suggest that excessive AI use may hinder schema construction, critical thinking, and independent learning despite its benefits in managing cognitive tasks (Bai et al., 2023; Gkintoni et al., 2025; Arslanova et al., 2024).

Bloom's Revised Taxonomy classifies cognitive skills into lower-order and higher-order thinking processes. Knowledge retention aligns with lower-order skills such as remembering and understanding, while critical thinking corresponds to higher-order skills like analyzing and evaluating. The theory is relevant to this study because it directly relates to the cognitive outcomes being examined among criminology students. AI tools may support comprehension and recall, but excessive dependence can weaken independent analysis, judgment, and problem-solving abilities (Loyens et al., 2023; Gonsalves, 2024). Studies show that students who heavily rely on AI-assisted learning often perform adequately in basic cognitive tasks but demonstrate weaker higher-order reasoning and evaluation skills (Yaacoub et al., 2025; Prambudi et al., 2024; Al Maani & Shanti, 2023).

The Technology Acceptance Model (TAM) explains how students' perceptions of usefulness and ease of use influence their acceptance and continued use of AI tools. According to the theory, perceived usefulness and perceived ease of use shape attitudes, behavioral intentions, and actual technology usage. In this study, TAM provides a framework for understanding how frequent AI use may develop into dependence among criminology students. When students perceive AI tools as convenient and beneficial for completing academic tasks, they are more likely to rely on them consistently, which may influence their study habits, independent learning, knowledge retention, and critical thinking skills (Feng & Su et al., 2021; Alyoussef, 2022). Previous studies also found that positive attitudes toward AI and ease of use contribute to habitual technology reliance and changes in cognitive learning strategies (Abuzar et al., 2025; Lin & Yu, 2023).

## Conceptual Framework

The study examines how the independent variable, Artificial Intelligence Dependence, relates to two dependent variables: Knowledge Retention and Critical Thinking Skills.

*Artificial Intelligence Dependence* refers to the extent to which students rely on AI-driven tools such as ChatGPT, Grammarly, and other digital applications to accomplish academic tasks; scholars note that excessive reliance may reduce active cognitive engagement. At the same time, moderate use can enhance learning efficiency. Conceptually, it involved both habitual use and psychological reliance on intelligent systems in learning activities across academic and everyday contexts (Naseer et al., 2025). Prior studies warn that overreliance may occur when learners accept AI outputs uncritically, leading to weaker problem-solving skills and diminished learning effectiveness (Zhai et al., 2024).

It is commonly assessed through standardized tools that evaluate how frequently students use AI, the purposes for which they use it, and the extent to which they rely on AI-generated results (Oyun-Erdene & Bulgantamir, 2025). Operationally, this study measures AI dependence using a researcher-developed questionnaire that

captures the frequency of AI use, the purpose of AI use, and perceived reliance on AI outputs, quantified on a 5-point Likert scale ranging from very low to very high. These will provide a structured way to capture students' behavioral patterns and reliance tendencies, forming the basis for discussing the three constructs that shape AI dependence in this study.

*The frequency of Artificial Intelligence (AI) usage* referred to how often students utilized AI tools for both personal and academic purposes (Ibieta et al., 2024). Frequent interaction can show how AI use is becoming more commonplace in everyday academic life, influencing cognitive processing and learning habits (Bai et al., 2023). Additionally, excessive frequency can discourage self-initiated learning since students might start depending on AI answers rather than critical inquiry (Zhao et al., 2024). The use of AI often directly affects how well students learn and retain academic material (Vieriu & Petrea, 2025).

*The purpose of using Artificial Intelligence (AI)* was to simulate students' learning and explore whether students engage with AI for academic, personal, or leisure purposes (Lin & Chen, 2024). The manner in which AI is used influences its impact on learning outcomes; academic use may enhance efficiency, while non-academic use may lead to distractions or misuse (Swargiary, 2024). When applied responsibly for research, composition, and review, AI can act as an extension of classroom learning and enhance understanding (Shah, 2023). On the contrary, relying solely on AI for convenience or entertainment may diminish students' motivation to think critically and engage deeply with their lessons (Arslanova et al., 2024). Recognizing students' reasons for utilizing AI is crucial for assessing whether dependence on it aids or obstructs educational achievement (Abubakar et al., 2024).

*Perceived Reliance on Artificial Intelligence (AI) Outputs* examines students' confidence and trust in the information produced by AI systems (Abuzar, 2025). A high level of perceived reliability might lead to an overdependence on these systems and diminish students' motivation to independently verify facts or analyze content (Zhang et al., 2024). This measure reflects both the cognitive and behavioral aspects of reliance on AI, illustrating how users may regard machine-generated outputs as infallible truths. According to Zhai et al., (2024), excessive trust in AI can impair critical thinking skills, as individuals may prioritize ease of use over precision. Consequently, assessing perceived reliance offers valuable insights into the impact of AI on students' ability to process and confirm information autonomously.

*Knowledge Retention* refers to students' ability to remember and apply lessons, facts, and concepts over time, indicating how effectively information is stored and maintained in long-term memory (Lubis & Sidabutar, 2023). Operationally, it is measured using a validated instrument that assesses students' recall accuracy, their ability to apply learned concepts, and their depth of long-term understanding, using a five-point Likert scale. Previous studies describe knowledge retention as the capacity to preserve both factual and conceptual understanding over time, emphasizing how much information learners can retrieve following initial instruction (Aluko et al., 2025), while others highlight that it represents the proportion of knowledge that remains in memory across a specific time interval, reflecting the long-term impact and effectiveness of learning (Carpenter et al., 2022). These perspectives lay the groundwork for examining the specific constructs used to analyze knowledge retention in this study.

*Recall accuracy* is the extent to which students can access learned information without external help (Xu et al., 2024). Efficiency indicates both short- and long-term memory, which can be influenced by studying habits that incorporate AI (Jiang et al., 2024). Students who depend excessively on AI-generated summaries may end up with a superficial grasp of the material, which can impair their ability to remember intricate details (Rohilla, 2025). On the other hand, students who merge AI usage with active learning strategies tend to have a stronger understanding and retention of important concepts (Aluko et al., 2025). Recall accuracy serves as a metric to assess whether reliance on AI improves or undermines students' cognitive retention (Jose et al., 2025).

*Application of Learned Concepts* encompasses the capacity to utilize knowledge gained in practical situations or academic challenges (Bahroun et al., 2023). Utilizing AI-based learning tools can enhance this skill through practice and feedback; however, it may also hinder independent thinking if students rely too much on the outputs generated by AI (Yavich, 2025). A successful application demonstrates advanced learning, in which students

can synthesize and apply knowledge without relying on AI constantly (Liu et al., 2022). This measure evaluates whether the use of AI fosters or obstructs genuine comprehension and flexibility (Akbar, 2025).

*Long-Term understanding* is the extent to which knowledge is remembered and retrieved after a significant period (Labaronne et al., 2023). Continued reliance on AI tools could diminish long-term understanding, as information is stored externally rather than processed in the mind (George et al., 2024). Nonetheless, using AI to facilitate learning through summarization and review can bolster long-term understanding by enhancing memory retention (Bai et al., 2023). This metric assesses whether students' reliance on AI contributes to lasting learning results (Thomas & Uminsky, 2022).

*Critical Thinking Skills* refer to a student's capacity to examine, interpret, and evaluate information to arrive at sound, logical judgments. Operationally, these skills are assessed using a standardized instrument that measures analytical reasoning, evaluative judgment, and problem-solving or decision-making abilities. Scholars describe critical thinking as the deliberate application of higher-order processes such as inference, evaluation, and synthesis to assess the strength of reasoning and arguments (Hubers, 2022), while others emphasize its reflective and self-directed nature, highlighting the need for logical analysis and awareness of one's own thought processes (Chukwunemerem, 2023). This multifaceted cognitive ability is essential for understanding information deeply and making well-reasoned decisions.

*Analytical reasoning* entails evaluating AI-generated content to recognize logical relationships, inconsistencies, and biases (Labajová, 2023). Students who possess strong analytical skills do not take AI outputs at face value; instead, they assess their accuracy and coherence (Akbar, 2025). Regular use of AI might promote superficial learning if students do not critically evaluate automated responses, whereas active engagement with AI encourages deeper reasoning (Obaje, 2025). Analytical reasoning plays a crucial role in determining whether AI serves as a means of critical inquiry or merely as a passive source of knowledge (Danry, 2023).

*Assessment and judgment* focus on determining the trustworthiness and significance of information generated by AI tools (Kaur et al., 2022). Students who evaluate AI responses show greater cognitive control and a sense of academic autonomy (Lin & Chen, 2024). Assessing the reliability of information generated by AI is crucial to avoid misinformation and uphold academic integrity (Nwozor, 2025). This indicator connects students' exposure to AI with the quality of their decision-making in evaluating sources (Khreisat et al., 2024).

*Problem-Solving and decision-making* are the capabilities to formulate solutions and make logical decisions by combining human reasoning with AI support (Venigandla et al., 2024). While AI tools can improve efficiency in addressing problems, over-reliance on them might diminish creativity and initiative (Karamuk, 2025). Students who strike a balance between using AI assistance and thinking independently are likely to cultivate more effective analytical methods (Owen & Arthur, 2025). This illustrates how dependence on AI affects students' ability to utilize logic and judgment in various academic contexts (Acosta-Enriquez & Ballesteros et al., 2025).

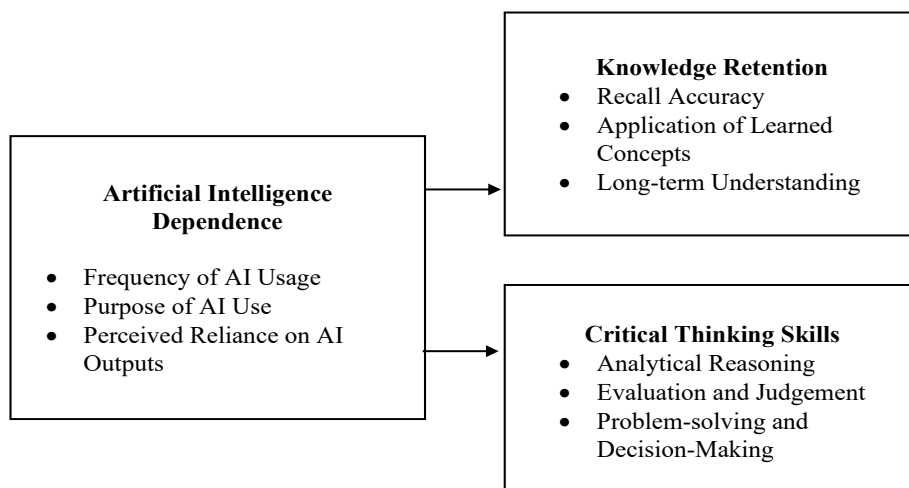


Figure 1. Schematic Diagram of the Study

## Statement of the Problem

This study determined the relationship of Artificial Intelligence (AI) dependence, knowledge retention, and critical thinking skills among criminology students. Specifically, it sought to answer the following questions:

1. What was the level of AI dependence among criminology students in terms of frequency of AI usage, purpose of AI use, and perceived reliance on AI outputs?
2. What was the level of knowledge retention of criminology concepts among the criminology students in terms of recall accuracy, application of learned concepts, and long-term understanding?
3. What was the level of critical thinking skills among the criminology students in terms of analytical reasoning, evaluation and judgement, and problem-solving and decision-making?
4. Was there a significant relationship between artificial intelligence dependence and knowledge retention among criminology students?
5. Was there a significant relationship between artificial intelligence dependence and critical thinking skills among the criminology students?

## Null Hypothesis

Ho1: There was no significant relationship between artificial intelligence dependence and knowledge retention among criminology students.

Ho2: There was no significant relationship between artificial intelligence dependence and critical thinking skills among the criminology students.

## RESEARCH METHODOLOGY

### Design

The study employed a quantitative, descriptive-correlational design to objectively measure variables and determine the strength and direction of their relationships. A descriptive-correlational design, as defined by Creswell and Creswell (2023), examined existing conditions by describing variables as they naturally occur while simultaneously exploring their associations without manipulating them. Similarly, Fraenkel and Wallen (2022) state that correlational studies are appropriate when the goal is to identify relationships among variables that cannot be controlled or experimentally assigned. This design was appropriate for the present study because it sought to measure and relate the levels of AI dependence, knowledge retention, and critical thinking skills among criminology students to determine whether significant relationships existed among these constructs in a natural academic setting.

### Setting

The study was conducted at one of the higher education institutions in Ozamiz City, Misamis Occidental, a developing urban area with a population of over 143,620, according to the latest census. The university offered a comprehensive Bachelor of Science in Criminology program, accommodating students from first year to fourth year, making it an ideal setting for exploring academic behaviors and cognitive outcomes such as AI usage, knowledge retention, and critical thinking skills. The institution provided access to modern technological resources, reliable internet connectivity, and exposure to digital learning platforms, all of which justified its relevance for examining the increasing integration of artificial intelligence tools in student learning. Additionally, the criminology students in this university come from diverse socioeconomic backgrounds and varying levels of technological fluency, offering rich contextual variability that supported meaningful analysis. This setting was appropriate because it reflected a real-world academic environment where AI tools are commonly used, making it suitable for investigating how such use influences learning and cognitive performance.

## Respondents

The respondents in the study were 218 criminology students from one of the higher education institutions in Ozamiz City, Misamis Occidental, selected through stratified random sampling. Respondents were chosen based on the following criteria: (1) officially enrolled in the criminology program during the academic year of data collection, (2) users of at least one AI tool (e.g., ChatGPT, Gemini, Grammarly, Copilot) for academic or personal purposes, and (3) students who were willing to participate voluntarily by signing the informed consent form. Stratified random sampling was used to ensure proportional representation across year levels, thereby maintaining sample diversity and enabling fair comparisons among groups. This sampling approach ensured that the respondents accurately represented the broader criminology student population, supporting the validity of the study's findings.

## Instruments

Data were collected using a researcher-made questionnaires. The questionnaire was designed to measure the three key variables: AI dependence, knowledge retention, and critical thinking skills, each using an appropriate five-point Likert scale. The Likert scale was appropriate because it measured attitudes, perceptions, and levels of agreement for continuous constructs, which aligned with the nature of the variables examined.

To establish the validity of the data-gathering protocol, the questionnaire underwent content validation through expert review. Three subject experts in research evaluated the instrument on relevance, clarity, organization, and the appropriateness of the items to the study's objectives. Their comments and suggestions were incorporated to improve the wording, sequencing, and comprehensibility of the questionnaire items. In addition, a pilot test was conducted to assess the instrument's reliability and consistency before its actual administration.

The following instruments were used in this study:

*A. Artificial Intelligence Dependence.* This instrument focused on tools related to technology use and learning behavior. It aimed to determine respondents' level of use of Artificial Intelligence (AI) in performing academic tasks. The instrument measured the extent to which students relied on AI tools for information retrieval, writing assistance, problem-solving, and other school-related activities. To ensure the instrument's reliability, a pilot test was conducted with 22 respondents (representing 10% of the total sample of 218). The analysis yielded a Cronbach's alpha of 0.864, exceeding the 0.70 threshold and indicating high reliability.

Responses	Scale	Interpretation
5 – Strongly Agree (SA)	4.20 – 5.00	Very High (VH)
4 – Agree (A)	3.40 – 4.19	High (H)
3 – Somewhat Agree (SWA)	2.60 – 3.39	Moderate (M)
2 – Disagree (D)	1.80 – 2.59	Low (L)
1 – Strongly Disagree (SD)	1.00 – 1.79	Very Low (VL)

*B. Knowledge Retention.* This instrument was used to assess the respondents' ability to retain and recall criminology-related concepts after instruction. It determined knowledge retention using items that focused on memory recall, comprehension, and the ability to connect learned ideas to practical applications. To ensure the instrument's reliability, a pilot test was conducted with 22 respondents (representing 10% of the total sample of 218). The analysis yielded a Cronbach's alpha of 0.706, which met the 0.70 threshold and indicated acceptable reliability.

Responses	Scale	Interpretation
5 – Strongly Agree (SA)	4.20 – 5.00	Very High (VH)
4 – Agree (A)	3.40 – 4.19	High (H)
3 – Somewhat Agree (SWA)	2.60 – 3.39	Moderate (M)
2 – Disagree (D)	1.80 – 2.59	Low (L)
1 – Strongly Disagree (SD)	1.00 – 1.79	Very Low (VL)

*C. Critical Thinking Skills.* This instrument measured respondents' critical thinking skills in analyzing, evaluating, and interpreting criminology-related information. The items focused on logical reasoning, evidence-based evaluation, decision-making, and reflective judgment. To ensure the instrument's reliability, a pilot test was conducted with 22 respondents (representing 10% of the total sample of 218). The analysis yielded a Cronbach's alpha of 0.935, well above the 0.70 threshold and indicating high reliability. In interpreting the level of AI dependence, knowledge retention, and critical thinking skills, the following scales were used:

Responses	Scale	Interpretation
5 – Strongly Agree (SA)	4.20 – 5.00	Very High (VH)
4 – Agree (A)	3.40 – 4.19	High (H)
3 – Somewhat Agree (SWA)	2.60 – 3.39	Moderate (M)
2 – Disagree (D)	1.80 – 2.59	Low (L)
1 – Strongly Disagree (SD)	1.00 – 1.79	Very Low (VL)

### Data Gathering Procedure

Before the actual data collection, the researcher secured approval from the Dean of the Graduate School and the Dean of the College of Criminology. Once permissions were granted, the researcher coordinated with criminology instructors to identify eligible respondents and personally administer the Google Forms survey. Participation was strictly voluntary, and before respondents signed the informed consent form, the researcher provided clear instructions and explained the study's purpose, emphasizing that respondents could withdraw at any time without consequences. To ensure confidentiality and compliance with ethical standards, all responses were collected anonymously, with no names or personally identifiable details included; instead, numerical codes represented each respondent. The completed survey data were stored in a password-protected digital folder accessible only to the researcher. Throughout the study, data were preserved securely to prevent unauthorized access, modification, or disclosure. After the analysis was completed and the final thesis was accepted, the raw data were retained only for the period required by institutional policy, then permanently deleted by clearing digital storage and removing all backup files. This disposal process will follow the Misamis University ethical guidelines and the Data Privacy Act of 2012 (RA 10173), ensuring that all information is responsibly managed and destroyed to protect participant privacy.

### Ethical Considerations

In this quantitative research, specific measures were addressed, particularly the selection and conduct of data gathering with the respondents. The researcher conformed to the ethical protocol set by the university. The paper passed through the Misamis University Ethics Committee (MUREC), during which the necessary forms were completed, including, but not limited to, the Ethical Review Assessment form, the Informed Consent form, and the Technical Review of the research proposal. The researcher ensured that all participants voluntarily participated. The researcher first ensured the respondents' voluntariness by allowing them to sign the informed consent form. Their refusal to participate did not involve any penalty or loss of benefits. Their signed consent did not waive any legal claims, rights, or remedies arising from this study.

Regarding respondents' identities, the researcher implemented measures to promote anonymity and confidentiality by not mentioning respondents' names during data collection. Instead, the researcher appropriately coded them. Throughout the study manuscript, the respondents' identities remained anonymous. Furthermore, the researcher obtained respondents' consent for the data-gathering process through an informed consent form. Any identification of respondents was stored in a password-protected digital folder accessible only to the researcher. Therefore, the data were disposed of only after the study was completed. The researcher prioritized participants' welfare throughout the study and adhered to the guidelines outlined in Republic Act No. 10173, known as the "Data Privacy Act of 2012."

### Data Analysis

The collected data were analyzed using statistical software. The following statistical tools were used:

The mean and Standard Deviation were used to determine the levels of AI dependence, knowledge retention, and critical thinking skills among criminology students.

Spearman's Rank-Order Correlation Coefficient was used to determine the relationships between AI dependence, knowledge retention, and critical thinking skills among criminology students.

## RESULTS AND DISCUSSIONS

### Level of AI Dependence Among Criminology Students

Table 1 presented the level of AI dependence among criminology students, which was found to be Moderate ( $M = 3.31$ ;  $SD = 0.83$ ). This indicates that students moderately rely on AI tools for academic tasks. AI functions mainly as a supplementary learning aid that improves efficiency, concept understanding, and task completion while still allowing students to engage in independent learning and decision-making. This finding supports Black and Tomlinson (2025) and Schmidt et al. (2025), who explained that students use AI selectively based on academic needs while balancing technology use with independent learning to avoid overdependence and maintain academic integrity. In criminology education, this moderate dependence may reflect students' awareness that investigation, ethical judgment, legal interpretation, and analytical reasoning still require human critical thinking beyond AI assistance.

The Purpose of AI Use obtained the highest mean score ( $M = 3.53$ ;  $SD = 0.81$ ), interpreted as Great Extent. This suggests that criminology students actively use AI for assignments, research, reviewing lessons, simplifying difficult topics, organizing tasks, and improving academic outputs. Sousa and Cardoso (2025) and Qian (2025) similarly noted that AI is widely used in higher education because it enhances efficiency, personalized learning, and comprehension of complex concepts. The findings imply that students recognize AI as a practical tool for managing academically demanding tasks in criminology.

Frequency of AI Usage ( $M = 3.20$ ;  $SD = 0.85$ ) and Perceived Reliance on AI Output ( $M = 3.20$ ;  $SD = 0.84$ ) were both interpreted as Moderate. This indicates that students do not use AI consistently nor rely heavily on AI-generated outputs as final answers. Instead, they evaluate, verify, and refine AI-generated information before applying it academically. These findings align with Bećirović et al. (2025), Sibug et al. (2025), Lin et al. (2025), and Freeman (2025), who emphasized that students commonly use AI for support purposes rather than as an absolute authority. The moderate scores may also reflect limitations in digital literacy, institutional integration, and intentional restraint to avoid overdependence.

The findings support the Technology Acceptance Model (TAM), which explains that technology adoption depends on perceived usefulness and ease of use. The high AI use score reflects strong perceived usefulness, while the moderate frequency and reliance scores suggest that AI integration in learning remains selective and developing. The results also support self-directed learning principles, showing that criminology students continue to regulate their own learning rather than allowing AI to replace independent reasoning. Therefore, strengthening digital literacy, ethical AI use, and guided AI integration programs may help students maximize AI benefits while preserving academic integrity, critical thinking, and professional competence.

Table 1

#### Level of AI Dependence Among Criminology Students

Constructs	M	SD	Remarks
Frequency of AI Usage	3.20	0.85	Moderate
Purpose of AI Use	3.53	0.81	Great Extent
Perceived Reliance on AI Output	3.20	0.84	Moderate
Overall Level of AI Dependence	3.31	0.83	Moderate

Note: 4.20-5.00 (Very Great Extent); 3.40-4.19 (Great Extent); 2.60-3.39 (Moderate); 1.30-2.59 (Less Extent); 1.00-1.29 (Least Extent)

## Level of Knowledge Retention among Criminology Students

Table 2 indicated the level of knowledge retention among criminology students, which was found to be High ( $M = 3.62$ ;  $SD = 0.68$ ). This indicates that students generally have a strong ability to retain, retrieve, and apply criminology-related concepts in their academic learning. The findings suggest that students can sustain and utilize learned concepts over time, an important competency in criminology education where understanding laws, procedures, theories, and investigative principles is essential. Kakar (2025) emphasized that knowledge retention improves when students connect new information to prior learning and apply concepts in meaningful activities. Similarly, Vemuri (2024) noted that retrieval practice, elaboration, and repeated application strengthen long-term retention and academic performance.

Application of Learned Concepts obtained the highest mean score ( $M = 3.81$ ;  $SD = 0.64$ ), indicating that students are highly capable of translating academic knowledge into practical understanding, classroom discussions, situational analysis, and problem-solving. Wang and Zhang (2026) and Zhao et al. (2025) similarly found that active engagement and application of knowledge strengthen higher-order learning outcomes. The high score suggests that criminology students are more confident in applying concepts than merely memorizing information, reflecting meaningful and transferable learning experiences.

Recall Accuracy also showed a High level ( $M = 3.61$ ;  $SD = 0.64$ ), indicating that students can effectively remember concepts, legal provisions, and criminological theories when needed. Doyle (2023) and Melisa et al. (2025) emphasized that the retrieval of foundational knowledge supports deeper analysis and higher-order thinking. This suggests that criminology students possess a strong cognitive foundation necessary for academic and professional preparation.

Long-Term Understanding obtained the lowest mean score ( $M = 3.45$ ;  $SD = 0.76$ ), although still interpreted as High. This suggests that maintaining deep understanding over long periods may be more challenging than immediate recall or application. Usman et al. (2025) and Vieriu and Petrea (2025) explained that sustained learning requires continuous review, practice, and reflection. The findings imply the need for strategies such as spaced repetition, cumulative assessments, and case-based learning to strengthen long-term retention.

The can be explained in the concept of Cognitive Load Theory, which states that retention improves when learning materials are meaningful and cognitively manageable. Overall, the results indicate that criminology students are active learners who effectively engage with and apply criminological knowledge, although long-term reinforcement strategies remain necessary to strengthen durable learning and professional readiness.

Table 2

*Level of Knowledge Retention among Criminology Students*

Constructs	M	SD	Remarks
Recall Accuracy	3.61	0.64	High
Application of Learned Concepts	3.81	0.64	High
Long-term Understanding	3.45	0.76	High
Overall Level of Knowledge Retention	3.62	0.68	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)*

## Level of Critical Thinking Skills among Criminology Students

Table 3 revealed the level of critical thinking skills among criminology students, which was found to be High ( $M = 3.83$ ;  $SD = 0.71$ ). This indicates that students generally demonstrate strong analytical thinking, information evaluation, and reasoned decision-making in academic contexts. The findings suggest that criminology students engage in reflective, logical, and evidence-based thinking, which is essential in criminal justice education where

evidence interpretation, legal analysis, and informed judgment are required. Siregar et al. (2025) and Aragon et al. (2025) similarly emphasized that student-centered and technology-supported learning environments strengthen analytical engagement, reflective inquiry, and evidence-based reasoning.

Analytical Reasoning obtained the highest mean score ( $M = 3.87$ ;  $SD = 0.69$ ), indicating that students are highly capable of examining situations systematically, interpreting information, and drawing logical conclusions from evidence. Salido et al. (2025) and Wang et al. (2025) explained that analytical thinking remains central in higher education because students must critically process and interpret information rather than consume it passively. This suggests that criminology students possess strong evidence-based reasoning skills important for investigative analysis and legal interpretation.

Problem-Solving and Decision-Making also showed a High level ( $M = 3.82$ ;  $SD = 0.71$ ), indicating that students can identify solutions and make informed decisions in academic and situational contexts. Shahzad et al. (2025) and Sousa and Cardoso (2025) noted that AI-supported learning environments may strengthen higher-order thinking and practical reasoning skills. The findings imply that students are developing competencies needed for investigative work, procedural judgment, and criminal justice decision-making.

Evaluation and Judgment obtained the lowest mean score ( $M = 3.81$ ;  $SD = 0.72$ ), although still interpreted as High. This suggests that while students can evaluate information and question assumptions, critically assessing credibility and ethical implications, particularly of AI-generated content, may still require improvement. Lamberti et al. (2025) and Ali (2025) emphasized that effective AI-supported learning depends on students' ability to critically evaluate information rather than accept automated responses passively. Thus, activities such as debates, case analysis, and reflective questioning may further strengthen evaluative thinking.

The findings support Bloom's Revised Taxonomy, indicating that criminology students are capable of higher-order cognitive processes such as analysis, evaluation, and problem-solving. Overall, the results show that students possess strong critical thinking skills necessary for academic success and future professional practice, although evaluation and judgment still require further reinforcement.

Table 3

*Level of Critical Thinking Skills among Criminology Students*

Constructs	M	SD	Remarks
Analytical Reasoning	3.87	0.69	High
Evaluation and Judgement	3.81	0.72	High
Problem-solving and Decision Making	3.82	0.71	High
Overall Level of Critical Thinking Skills	3.83	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)*

**Relationship Between the Students' Extent of AI Dependence and Their Knowledge Retention**

Table 4 showed the relationship between AI dependence and knowledge retention among criminology students using Spearman's rank-order correlation coefficient ( $\rho$ ). The findings revealed statistically significant relationships between AI use and all dimensions of knowledge retention, with all p-values  $< .001$ . This indicates that increased AI dependence is associated with higher levels of recall accuracy, application of learned concepts, and long-term understanding. The results suggest that AI technologies may serve as supportive learning tools that reinforce academic content, improve understanding, and sustain learning over time. Bhuttah et al. (2024) and Bhardwaj et al. (2025) similarly emphasized that technology-supported and student-centered learning approaches enhance engagement, analytical reasoning, and deeper understanding.

The purpose of AI use showed positive and significant relationships with recall accuracy ( $\rho = .391$ ), application of learned concepts ( $\rho = .470$ ), and long-term understanding ( $\rho = .369$ ). The strongest relationship was found between purposeful AI use and application of learned concepts, suggesting that students who intentionally use AI for reviewing lessons, clarifying concepts, and organizing information demonstrate stronger practical understanding. Pedro et al. (2026) and Thigpen (2025) noted that AI becomes more educationally valuable when used for personalized learning and self-directed academic support.

Perceived reliance on AI output also showed significant positive relationships with all knowledge retention indicators. This suggests that AI-generated explanations and summaries may help reinforce understanding and memory retrieval. However, Jin et al. (2025) and Wang and Zhang (2026) emphasized that AI supports learning effectively only when students engage critically and reflectively rather than depend on it uncritically.

Frequency of AI usage likewise had significant positive relationships with knowledge retention, although correlations were weaker. This indicates that frequent AI use may improve understanding and concept application, but repeated usage alone does not guarantee deeper learning unless accompanied by meaningful engagement. Guided AI-assisted learning, reflective questioning, and concept verification may therefore strengthen long-term retention.

The findings support Cognitive Load Theory, suggesting that AI can reduce unnecessary cognitive burden by organizing information and providing immediate clarification. Overall, the results imply that purposeful and responsible AI use may enhance criminology students' knowledge retention while still requiring independent learning and critical engagement.

Table 4

*Relationship Between the Students' Extent of AI Dependence and their Knowledge Retention*

Variables		Recall Accuracy	Application of Learned Concepts	Long-term Understanding
Frequency of AI Usage	$\rho$	0.290***	0.379***	0.297***
	$p$	< .001	< .001	< .001
Purpose of AI Use	$\rho$	0.391***	0.470***	0.369***
	$p$	< .001	< .001	< .001
Perceived Reliance on AI Output	$\rho$	0.399***	0.454***	0.380***
	$p$	< .001	< .001	< .001

Notes:  $H_0$ : There is no significant relationship between the extent artificial intelligence dependence and knowledge retention among criminology students

$\rho$  = Spearman's rank-order correlation coefficient \*\*\* $p < 0.01$  (Very Highly Significant); \*\* $p < 0.01$  (Highly Significant); \* $p < 0.05$  (Significant)

### Relationship Between the Students' Extent of AI Dependence

#### and Their Critical Thinking Skills

Table 5 presented the relationship between AI dependence and critical thinking skills among criminology students. The findings revealed a partially significant relationship, indicating that AI dependence is associated with some dimensions of critical thinking, particularly evaluation, judgment, problem-solving, and decision-making, but not consistently across all indicators. This suggests that AI may support higher-order thinking when learners engage with it actively and reflectively. Vendrell and Johnston (2026) and Jose et al. (2025) emphasized that critical thinking in AI-supported environments must remain self-regulated, reflective, and evaluative, as excessive reliance on AI may reduce cognitive engagement.

Purpose of AI use showed positive and significant relationships with analytical reasoning ( $\rho = .295$ ), evaluation and judgment ( $\rho = .349$ ), and problem-solving and decision-making ( $\rho = .305$ ). This indicates that students who use AI intentionally for academic purposes tend to demonstrate stronger critical thinking skills. Suazo-Galdames and Chaple-Gil (2025) and Bazouche (2025) explained that AI strengthens critical thinking when integrated into

structured learning activities involving critique, reflection, and evaluation. In criminology education, purposeful AI use may support case analysis, evaluative reasoning, and procedural interpretation.

Perceived reliance on AI output also showed significant but weaker positive relationships with critical thinking indicators. This suggests that AI outputs may serve as references or prompts for reflection rather than automatically weakening thinking skills. Zhang et al. (2025) and Rahman et al. (2025) similarly noted that AI can support critical thinking when students critically question and refine generated information instead of passively accepting it. However, excessive reliance may weaken independent reasoning and evaluative judgment.

Frequency of AI usage showed no significant relationship with analytical reasoning, although significant relationships existed with evaluation and judgment and with problem-solving and decision-making. This indicates that frequent AI use alone does not automatically improve deep analytical reasoning, which requires active interpretation and independent cognitive engagement. Thus, activities such as case analysis, investigative exercises, and structured analytical writing may better strengthen higher-order thinking.

The findings support Bloom's Revised Taxonomy, which explains that higher-order thinking develops through active cognitive engagement rather than passive exposure to information. The results suggest that AI can support critical thinking when used purposefully and reflectively, but it cannot replace independent reasoning and analytical judgment.

Table 5

*Relationship Between the Students' Extent of AI Dependence and their Critical Thinking Skills*

Variables		Analytical Reasoning	Evaluation and Judgement	Problem-solving and Decision Making
Frequency of AI Usage	$\rho$	0.129	0.154*	0.146*
	$p$	0.058	0.023	0.031
Purpose of AI Use	$\rho$	0.295***	0.349***	0.305***
	$p$	< .001	< .001	< .001
Perceived Reliance on AI Output	$\rho$	0.192***	0.157*	0.212***
	$p$	0.004	0.021	0.002

*Notes: Ho: There is no significant relationship between the extent artificial intelligence dependence and critical thinking skills among criminology students*

$\rho$  = Spearman's rank-order correlation coefficient \*\*\* $p$ <0.01 (Very Highly Significant); \*\* $p$ <0.01 (Highly Significant); \* $p$ <0.05 (Significant)

**SUMMARY, FINDINGS, CONCLUSION AND RECCOMENDATION**

**Summary**

This study aimed to determine the relationships among Artificial Intelligence (AI) dependence, knowledge retention, and critical thinking skills among criminology students at all levels. Specifically, it sought to answer the following questions: (1) What was the level of AI dependence among criminology students in terms of frequency of AI dependence, purpose of AI use, and perceived reliance on AI outputs? (2) What was the level of knowledge retention of criminology concepts among criminology students in terms of recall accuracy, application of learned concepts, and long-term understanding? (3) What were the levels of critical thinking skills among criminology students in terms of analytical reasoning, evaluation, judgment, problem-solving, and decision-making? (4) Is there a significant relationship between artificial intelligence dependence and knowledge retention among criminology students? Moreover, (5) Was there a significant relationship between artificial intelligence dependence and critical thinking skills among criminology students?

The study employed a descriptive-correlational research design to examine the relationships among AI dependence, knowledge retention, and critical thinking skills among criminology students. The respondents in the study were criminology students across all year levels who were officially enrolled during the data collection period. A researcher-made questionnaire served as the primary data-gathering tool. The data were statistically

analyzed using the mean, standard deviation, and Spearman's rank-order correlation coefficient to determine the levels of the variables and the significance of their relationships.

## FINDINGS

The following are the findings of the study:

1. Artificial intelligence dependence among criminology students was found to be at a moderate level, which indicates that students generally utilize AI tools in their academic tasks in a selective and supportive manner, suggesting that artificial intelligence has not yet become a dominant or primary source of learning but is instead used as an auxiliary academic aid.
2. Knowledge retention among criminology students was found to be at a high level, which indicates that the respondents generally demonstrate a strong capacity to retain, recall, and apply criminology-related concepts effectively in their academic activities, showing that they can understand and utilize learned information in both short-term and applied learning situations
3. Critical thinking skills among criminology students were also found to be at a high level, which indicates that the respondents generally demonstrate strong cognitive abilities in analyzing information, evaluating evidence, and making reasoned judgments and decisions in academic contexts that require higher-order thinking skills.
4. A significant relationship between AI dependence and knowledge retention among criminology students was found, as all computed p-values were less than 0.001. This leads to the rejection of the null hypothesis, indicating that increased AI dependence is significantly associated with improved recall accuracy, better application of learned concepts, and stronger long-term understanding among respondents.
5. A significant relationship was found between AI dependence and critical thinking skills among criminology students, which indicates that AI dependence is significantly associated with certain dimensions of critical thinking, such as evaluation and judgment, as well as problem-solving and decision-making, but not consistently associated with analytical reasoning across all measured indicators.

## CONCLUSION

Based on the findings of the study, the following conclusions are drawn:

1. Criminology students use AI technologies in a cautious, selective, and goal-oriented manner while still maintaining independent learning processes and academic autonomy.
2. Criminology students possess a strong capacity to retain, retrieve, and apply criminology-related knowledge; however, sustaining long-term understanding requires continuous reinforcement and deeper cognitive engagement.
3. Criminology students demonstrate strong critical thinking skills necessary for professional reasoning, judgment, and decision-making. However, evaluative thinking and reflective analysis still require further enhancement to strengthen higher-order cognitive processes.
4. AI dependence contributes positively to knowledge retention among criminology students, particularly when AI tools are used deliberately to reinforce understanding, clarify concepts, and support active learning.
5. AI dependence supports certain dimensions of critical thinking skills, particularly evaluation, judgment, and problem-solving; however, frequent AI use alone does not necessarily strengthen analytical reasoning, indicating that higher-order thinking develops more effectively through reflective, purposeful, and cognitively engaged learning practices.

## Recommendation

Based on the findings and conclusions of the study, the following recommendations are offered:

1. Criminology faculty members and program administrators may establish clearer policies and classroom guidelines on the responsible, ethical, and academically appropriate use of AI tools to encourage students to use AI as a support mechanism rather than a substitute for independent thinking and learning.
2. Course instructors may incorporate more instructional strategies that strengthen long-term knowledge retention, such as cumulative assessments, retrieval practice, simulation activities, case-based reviews, reflective exercises, and integrative learning tasks that reinforce sustained understanding of criminology concepts.
3. Criminology educators may design more learning activities that develop evaluative thinking and reflective analysis, including legal scenario analysis, evidence evaluation, debates, inquiry-based instruction, and case interpretation activities that require students to justify conclusions and critically examine multiple perspectives.
4. Educational institutions may integrate AI literacy and guided AI-assisted learning programs into criminology education to help students develop technical competence, ethical awareness, skills in evaluating sources, and reflective judgment in the use of AI technologies for academic and professional purposes.
5. Criminology educators may design instructional activities that require students to independently analyze, interpret, and evaluate information beyond AI-generated responses through investigative case analysis, legal reasoning exercises, evidence interpretation, and reflective inquiry tasks to strengthen analytical reasoning skills.
6. Future researchers may conduct similar studies using larger, more diverse samples, mixed-methods research designs, and additional variables, such as academic performance, ethical reasoning, digital literacy, cognitive dependence, and professional readiness, to further examine the role of AI in criminology education and related disciplines.

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