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THE DIGITAL CRUTCH: INVESTIGATING THE CORRELATION BETWEEN AI TOOL DEPENDENCY AND ACADEMIC SELF-EFFICACY AMONG UNIVERSITY STUDENTS

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Abstract
The rapid integration of artificial intelligence (AI) in higher education has sparked significant debate regarding its impact on student learning and autonomy. While AI offers powerful tools for academic assistance, educators and researchers increasingly worry about potential over-reliance and its effects on students' confidence in their own abilities. This quantitative study investigated the relationship between AI tool dependency and academic self-efficacy among 429 university students at Centro Escolar University, Philippines. Using a cross-sectional survey design, data were collected on AI usage frequency, specific task reliance, and perceived psychological dependency, alongside a validated three-domain academic self-efficacy scale (essay writing, mathematics, and research). Statistical analyses included Spearman rank-order correlations, independent samples t-tests, and one-way ANOVA. The results indicated that the frequency of AI tool use was not significantly correlated with academic self-efficacy ($\rho = -.017$, $p = .725$), suggesting that students' level of confidence in their academic abilities is not associated with how often they use AI tools. However, a significant "digital crutch" effect emerged among students who perceived themselves as unable to function without these tools. Students identifying as AI-dependent demonstrated significantly lower self-efficacy scores ($M = 3.631$) compared to their AI-independent peers ($M = 3.916$; $t = -3.334$, $p = .001$). Furthermore, this relationship remained consistent across diverse academic disciplines, suggesting that the psychological appraisal of one's need for AI, rather than the act of using it, is the critical factor diminishing academic confidence. These findings underscore the need for educational strategies that foster AI literacy while simultaneously reinforcing students' belief in their foundational cognitive capabilities.
Keywords: artificial intelligence, academic self-efficacy, educational technology, student dependency, higher education

Introduction

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The rapid integration of artificial intelligence (AI) tools into higher education has fundamentally altered the landscape of academic work. From generative writing assistants to complex problem-solving algorithms, students now have unprecedented access to cognitive scaffolds. However, this technological empowerment brings with it a significant tension: does the ubiquity of AI enhance student capability, or does it serve as a crutch that undermines genuine competence? Recent scholarship highlights this dichotomy, with some researchers warning that over-reliance on automated systems may lead to a reduction in cognitive agency (Favero et al., 2025). As AI tools become capable of performing increasingly complex academic tasks, there is a growing concern that students may fall into a "performance paradox," where high-quality output masks a deterioration in the underlying skills and the confidence to perform them independently (Fröhlich, 2025).

Central to this discussion is the concept of academic self-efficacy. Defined by Bandura (1997) as the belief in one's capabilities to organize and execute the courses of action required to produce given attainments, self-efficacy is a robust predictor of academic success, motivation, and resilience. In the traditional educational context, self-efficacy is built through mastery experiences—overcoming challenges through personal effort. The introduction of AI complicates this mechanism. If students attribute their success to an external algorithm rather than their own intellect, the feedback loop required to build self-efficacy may be disrupted. Consequently, students might produce high-level work without developing the corresponding internal belief in their own mastery.

Despite the urgency of this issue, empirical research has struggled to keep pace with the speed of AI adoption. While usage rates are undeniably high—current data suggests over half of students use AI tools several times a week (52.2%) or daily (34.3%)—we lack a clear understanding of how this frequency of use relates to students' psychological confidence. Does frequent use habituate dependency, or is it simply a sign of modern digital literacy? Furthermore, is the relationship between AI and self-efficacy consistent across different types of academic work, or are certain disciplines more susceptible to the "digital crutch" effect?

This study aims to bridge this gap by investigating the correlation between AI tool dependency and academic self-efficacy among university students. Specifically, it seeks to distinguish between the behavioral act of using AI and the psychological state of dependency. By examining these dynamics across various disciplines, this research provides critical insights for educators and policymakers striving to integrate AI into curricula without compromising the development of independent, confident learners. To this end, the study addresses three primary research questions:

Research Questions

RQ1: Is there a statistically significant relationship between the frequency of AI tool use and students' academic self-efficacy?

RQ2: Do students who report they "can't complete assignments without AI tools" show significantly lower confidence scores in their foundational academic skills?

RQ3: How does this relationship vary across different academic disciplines?

Literature Review

Theoretical Framework

This study is grounded in Bandura's (1997) Social Cognitive Theory, specifically the construct of self-efficacy. According to Bandura, self-efficacy is not a measure of skill, but a belief in what one can do with their skills under various conditions. It is cultivated primarily through mastery experiences, vicarious experiences, and social persuasion. In the context of AI, the attribution of success becomes critical; if a student attributes a successful essay or solution to ChatGPT rather than their own effort, the mastery experience is externalized, potentially stalling the development of self-efficacy. Complementing this is Media System Dependency Theory (Ball-Rokeach & DeFleur, 1976), which posits that the more a person depends on media to meet their needs, the more important that media becomes in their life. Jung et al. (2024) recently revisited this theory in the age of AI, suggesting a "human-AI goal interdependence" where users may lose the ability to achieve goals independently as their reliance on the system deepens.

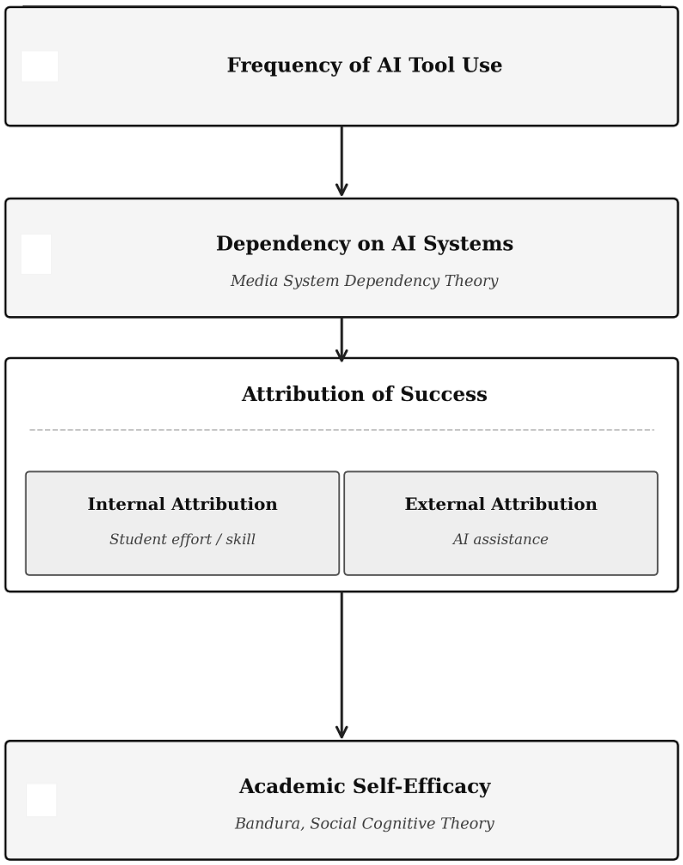

Figure 1. *Theoretical Framework*

AI Tools and Academic Performance

Current literature presents a contradictory picture of AI's impact on students. Some studies suggest a positive relationship; for instance, Yavich et al. (2025) found positive associations between AI tool use and academic

self-efficacy, arguing that these tools can serve as effective scaffolds that lower anxiety and allow students to focus on higher-order thinking. Conversely, Jia et al. (2025) identified a phenomenon of "false self-efficacy," where students utilizing GenAI exhibited the Dunning-Kruger effect—overestimating their competence because the AI masked their knowledge gaps. This aligns with findings by Singh and Gupta (2024), who warned that over-reliance could degrade metacognitive skills, leaving students unable to critically evaluate the very outputs they depend on. Dang and Nguyen (2026) further complicated this narrative by linking AI literacy to achievement, suggesting that the impact of AI depends heavily on *how* it is used, not just *if* it is used.

The Dependency Phenomenon

The concept of AI as a "crutch" is gaining theoretical traction. Favero et al. (2025) describe the risk of "cognitive atrophy," arguing that when AI takes over the "heavy lifting" of cognitive tasks, students may experience a loss of intellectual agency. This echoes Fröhlich's (2025) concern regarding "metacognitive laziness," where students bypass the struggle of learning in favor of immediate, AI-generated solutions. This dependency is not merely functional but psychological; Acosta-Enriquez et al. (2025) suggest that academic stress and performance expectations mediate this relationship, driving unsure students toward AI as a coping mechanism, which in turn reinforces a cycle of dependency and low self-confidence.

Measurement of Academic Self-Efficacy

To accurately assess these dynamics, robust measurement is essential. Recent validations of academic self-efficacy scales, such as those by Yupanqui-Lorenzo et al. (2025) and Chen et al. (2025), emphasize the multidimensional nature of academic confidence. A single global score often fails to capture the nuances of student confidence. Therefore, a domain-specific approach—assessing confidence in writing, mathematics, and research separately—is justified, as students may feel highly efficacious in one area (e.g., using AI for research) while feeling entirely dependent in another (e.g., writing).

Methodology

Research Design

This study employed a quantitative correlational research design using a cross-sectional survey. This non-experimental approach was selected to examine naturally occurring relationships between AI usage patterns and self-efficacy without manipulating the educational environment.

Participants

The sample consisted of 429 university students from Centro Escolar University, Philippines, enrolled during the Academic Year 2025-2026. Participation was voluntary, using a convenience sampling method. The demographic profile (see Table 1) indicates that the sample was predominantly composed of Medical

Technology majors (62.2%, *n*=267), followed by Dentistry/DMD (13.3%, *n*=57) and Pharmacy (12.8%, *n*=55). The year level

distribution was skewed toward upperclassmen, with 56.2% third-year students, 33.1% second-year, 8.6% fourth-year, and 1.2% first-year. The mean age of participants was 20.9 years (range: 18-25 years).

Instrumentation

Data were collected using an online questionnaire comprising four sections:

1. AI Tool Use Frequency Scale- A single-item measure assessing general frequency of AI use on a 5-point Likert scale (0=Never to 4=Daily).
2. AI Task Reliance Scale- Five items measuring the degree of reliance on AI for specific academic tasks: generating ideas, checking grammar, researching topics, solving math/science problems, and writing/editing text. Responses ranged from 0 (Never) to 4 (Always). A composite reliance score was calculated as the mean of these five items.
3. Academic Self-Efficacy Scale- Adapted from validated scales by Yupanqui-Lorenzo et al. (2025) and Chen et al. (2025), this three-item instrument measured confidence in essay writing, mathematics/calculus, and research skills. Rated on a 5-point scale (1=Very Unconfident to 5=Very Confident), the items were averaged to create a Composite SE Score ($M = 3.718$, $SD = 0.607$).
4. AI Dependency Item- A single critical item assessing psychological dependency: "Do you feel like you can't complete assignments without AI tools?" Participants responded on a 5-point agreement scale.

Data Collection and Analysis

The survey was distributed via the institutional learning management system after obtaining informed consent. The survey took approximately 10-15 minutes to complete. Data analysis was conducted using statistical software with an alpha level of .05. Spearman rank-order correlations were used to assess the relationship between ordinal frequency data and self-efficacy (RQ1). Independent samples t-tests and one-way ANOVA were utilized to compare self-efficacy scores across dependency groups (RQ2) and academic disciplines (RQ3).

Results

Descriptive Statistics

Table 1 presents the demographic profile of the respondents. The sample reflects a heavy concentration in health-allied professions, particularly Medical Technology. The overall mean Academic Self-Efficacy score was 3.718 ($SD = 0.607$), indicating a generally positive level of academic confidence among the students.

Table 1

Respondent Profile: Distribution by Year Level and Major

Group	*n*	*%*	*AI Use (Mean)*	*SE Score (Mean)*	*Dep. Group (%)*
Year Level					
1st Year	*5*	*1.2 %*	*3.40*	*3.60*	*20%*
2nd Year	*142*	*33.1 %*	*3.24*	*3.65*	*19%*
3rd Year	*241*	*56.2 %*	*3.21*	*3.74*	*20%*
4th Year	*37*	*8.6 %*	*3.03*	*3.85*	*19%*
Major / Field of Study					
Medical Technology	*267*	*62.2 %*	*3.21*	*3.72*	*20%*
Pharmacy	*55*	*12.8 %*	*3.16*	*3.72*	*15%*
Dentistry/DMD	*57*	*13.3 %*	*3.30*	*3.70*	*21%*
Information Technology	*29*	*6.8 %*	*3.21*	*3.75*	*21%*
Computer Science	*9*	*2.1 %*	*2.89*	*3.93*	*11%*

Note. N = 429. Dep. Group % indicates the percentage of students in that group identifying as AI-dependent.

As shown in Table 2, AI adoption is widespread. Over half of the participants (52.2%) reported using AI tools "Several times a week," with another 34.3% using them "Daily." Only a small minority (12.8%) use AI occasionally or rarely. Regarding specific tasks, reliance was highest for Grammar Checking ($M = 3.08$) and lowest for Solving Math/Science problems ($M = 2.00$).

Table 2
AI Tool Use Frequency & Reliance Distribution

Frequency Level	*n*	*%*	*Mean SE Score*	*SD*
Never (0)	*0*	*0.0%*	—	—
Rarely (1)	*3*	*0.7%*	*2.667*	*0.333*
Occasionally (2)	*55*	*12.8%*	*3.818*	*0.584*
Several Times/Week (3)	*224*	*52.2%*	*3.704*	*0.567*
Daily (4)	*147*	*34.3%*	*3.723*	*0.660*

Table 3 breaks down the components of the dependent variable. Students reported the highest confidence in Essay Writing ($M = 3.94$) and the lowest in Math/Calculus ($M = 3.43$).

Table 3

Academic Self-Efficacy Scores (Dependent Variable)

Confidence Item	Neutral (3)	Somewhat Conf. (4)	Very Conf. (5)	Mean (SD)
Essay Writing	21%	61%	17%	3.939 (0.642)
Math / Calculus	33%	36%	13%	3.387 (1.014)
Research Skills	26%	41%	25%	3.828 (0.916)
COMPOSITE SE Score	—	—	—	3.718 (0.607)

RQ1: Relationship Between AI Use Frequency and Self-Efficacy

To determine if frequent AI use predicts self-efficacy, a Spearman rank-order correlation was computed (see Table 4). The analysis revealed no statistically significant relationship between the raw frequency of AI tool use and students' Academic Self-Efficacy scores ($\rho = -.017$, $p = .725$). Similarly, the composite reliance score (covering specific tasks) showed no significant correlation ($\rho = .061$, $p = .209$). This suggests that merely using AI tools often does not inherently degrade or boost a student's confidence in their academic abilities.

Table 4
Correlation Matrix (Spearman's ρ)

Variables	1	2
1. AI Use Frequency	—	-.017
2. Academic Self-Efficacy	-.017	—
p-value	.725	—

Note. No significant linear correlation found between frequency and SE.

RQ2: AI Dependency and Academic Self-Efficacy

While frequency showed no effect, perceived dependency revealed a significant pattern. A one-way ANOVA (Table 5) indicated highly significant differences in self-efficacy scores based on students' agreement with the statement "I can't complete assignments without AI tools" ($F(2, 426) = 12.60$, $p < .001$). Post-hoc comparisons confirmed that the "AI-Dependent" group (Agree/Strongly Agree) had significantly lower self-efficacy scores ($M = 3.631$) compared to the "AI-Independent" group (Disagree/Strongly Disagree, $M = 3.916$), $t(229) = -3.334$, $p = .001$. The effect size was moderate (Cohen's $d = 0.49$), indicating a meaningful difference in confidence levels between those who feel psychologically bound to the tools and those who do not.

Table 5

AI Dependency Analysis: Self-Efficacy by Dependency Group

Group	n	Mean SE Score	Result
AI-Dependent (Agree+)	84	3.631	Significantly lower
Neutral	198	3.608	Baseline
AI-Independent (Disagree+)	147	3.916	Significantly higher

Note. ANOVA F = 12.60, p < .0001.

RQ3: Disciplinary Differences

Finally, the study examined if this dynamic varied by major. As presented in Table 6, a one-way ANOVA yielded no significant differences in self-efficacy scores across the different academic disciplines ($F(7, 421) = 0.238$, $p = .945$). Medical Technology, Pharmacy, Dentistry, and IT students all showed statistically similar profiles. This suggests that the relationship between dependency and self-efficacy is a general psychological phenomenon rather than one conditioned by the specific demands of a field of study.

Table 6

Discipline Analysis: SE Means by Major

Major	n	SE Mean
Computer Science/Eng.	9	3.926
Information Technology	29	3.747
Medical Technology	267	3.715
Pharmacy	55	3.715
Dentistry/DMD	57	3.702

Note. ANOVA F = 0.238, p = .945. No significant discipline effect.

Table 7

Key Findings Summary

Research Question	Test	Statistic	p	Conclusion
RQ1a: AI frequency ↔ SE?	Spearman	ρ = −.017	.725	No significant relationship
RQ1b: AI reliance ↔ SE?	Spearman	ρ = .061	.209	No significant relationship
RQ2: Dependent vs Independent?	t-test	t = −3.334	.001	YES — Significant
RQ3: Discipline moderates?	ANOVA	F = 0.238	.945	No discipline effect

Discussion

Interpretation of Major Findings

The most striking finding of this study is the divergence between behavior (frequency of use) and psychology (dependency). The lack of correlation between how often a student uses AI and their academic confidence (RQ1) challenges the simplistic narrative that AI inevitably erodes skills. This aligns with Yavich et al. (2025), who found that AI can coexist with high self-efficacy when used as a tool rather than a replacement. A student

who uses AI daily for brainstorming or grammar checking may still retain a strong sense of ownership over their work, viewing the AI as a subordinate instrument much like a calculator or a spell-checker.

However, the significant negative impact observed in the "AI-Dependent" group (RQ2) provides empirical support for the "digital crutch" metaphor. Students who believe they *cannot* function without the tool suffer from significantly lower confidence. This supports Favero et al.'s (2025) warnings about cognitive agency. When a student feels that the locus of control has shifted from their own intellect to the algorithm, their self-efficacy diminishes. This is consistent with the "false self-efficacy" described by Jia et al. (2025); these students may complete assignments, but they do not internalize the success, leading to a fragile academic self-concept.

The distinction here is likely rooted in cognitive offloading (Risko & Gilbert, 2016). When students offload the *execution* of a task but retain the *monitoring* of it, self-efficacy may remain intact. But when they offload the *responsibility* for the outcome—psychologically surrendering to the tool—dependency sets in. The fact that this pattern holds true across all disciplines (RQ3), from the technical fields of Engineering to the clinical fields of Dentistry, suggests that this is a fundamental human-computer interaction dynamic. It is not about the subject matter; it is about the user's relationship with the technology.

Implications

Theoretically, these findings refine our application of Media System Dependency Theory (Jung et al., 2024) to education. They suggest that dependency is not an inevitable outcome of usage intensity, but a specific psychological
orientation. For educators, the practical implication is clear: banning AI is likely ineffective and unnecessary, as usage frequency itself is not the enemy. Instead, interventions should focus on "metacognitive correction"—helping students distinguish between using AI for efficiency and using it to mask incompetence. Universities should develop policies that move beyond plagiarism detection to fostering "AI literacy," which includes the psychological resilience to work independently when necessary.

Limitations and Future Research

This study has limitations. The cross-sectional design prevents causal inference; we cannot strictly determine if dependency causes low self-efficacy or if low self-efficacy drives students to become dependent. The sample was drawn from a single institution with a high concentration of Medical Technology students, which may limit generalizability. Future research should employ longitudinal designs to track how these dependency beliefs evolve over a semester. Experimental studies manipulating AI access could also isolate the causal direction of the "digital crutch" effect.

Conclusion

This study provides critical empirical evidence for the "digital crutch" phenomenon in higher education. It reveals that the danger of AI lies not in the tool itself, but in the student's belief that they are powerless without it. While frequent AI use does not inherently damage academic confidence, the psychological conviction of dependency is significantly associated with lower self-efficacy. As universities navigate this technological disruption, the goal should not be to limit access, but to build agency. We must teach students to view AI as a powerful partner in their learning, while ensuring they never lose faith in their own capacity to think, create, and solve problems alone.

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