Academic Performance and Self-Concept Across Generations: Effects of Parents' Education, Gender, Year Level, and ChatGPT Use

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Abstract

This study examined the relationships among parents' educational attainment, gender, ChatGPT use, year level, academic performance (AP), and academic self-concept (ASC) among 563 undergraduates from Chinese Traditional University (10.8%), Wenzhou-Kean University (63.9%), and Kean University (25.2%). A comparative quantitative design was employed, and data were analyzed using descriptive statistics, two-way multivariate analysis of variance (MANOVA), and follow-up univariate ANOVAs. Results indicated that parents' educational attainment significantly predicted ASC but not AP. Continuing-generation students (i.e., those with at least one parent holding a college degree) reported higher academic self-concept than first-generation students (i.e., those whose parents did not complete a college degree), suggesting that parental education is associated with differences in academic self-beliefs. Gender and the Gender × Parents' Education interaction were not significant predictors of either academic outcome. ChatGPT usage frequency significantly predicted AP, with more frequent users demonstrating higher performance, but did not significantly predict ASC. Although year level showed no significant main effects on AP, a significant interaction emerged between ChatGPT usage × year level for AP: the positive association between ChatGPT use and performance was stronger among upper-year level students than freshmen. Year level was significantly associated with ASC, with seniors reporting higher self-concept than juniors. Overall, familial background was more closely linked to academic self-concept, whereas technology engagement—particularly in interaction with year classification—was associated with performance outcomes. These results underscore the multifaceted nature of student success and highlight the importance of considering both sociocultural and technological factors in higher education.

Keywords: academic performance, academic self-concept, first-generation and continuing-generation students, parents' education level, ChatGPT usage

Introduction

The rapid uptake of generative AI, particularly ChatGPT, has quickly altered how undergraduates approach learning tasks. ChatGPT has been discussed as offering a range of functionalities that may support learners' study efforts (Lera et al., 2023). Prior research suggests that specific AI affordances are associated with improvements in learning efficiency and, in some contexts, with stronger academic performance (Echiverri et al., 2025). Specifically, Echiverri et al. found that ChatGPT's real-time feedback significantly enhanced student engagement and critical thinking, while adaptive tutoring features were linked to reduced anxiety and higher academic self-efficacy. Their results also revealed a strong positive correlation between learning efficiency and academic performance, and a moderate positive relationship between academic performance and academic self-concept, suggesting that students who experience efficiency gains with ChatGPT tend to report stronger academic self-beliefs. However, existing evidence remains limited and fragmented regarding whether these benefits translate into more sustained academic outcomes or into systematic differences across student backgrounds. In particular, there is still insufficient understanding of how background characteristics such as gender, parents' education level, and year level, together with differences in ChatGPT usage frequency, relate to students' academic development in higher education (Al-kfairy, 2024; J. Wang & Fan, 2025). To address this gap, the present study focuses on two central outcomes, Academic Performance and Academic Self-Concept, and examines how they vary across student backgrounds and patterns of ChatGPT use.

Academic Performance

Academic performance, often measured by grades and GPA, reflects students' academic capabilities (Agrawal & Nehajul, 2017; Alyahyan & Düştegör, 2020). It may improve via chatbot use, especially for first-generation students (Georgia State University, 2022). While ChatGPT offers personalized learning (Firat, 2023), it also risks spreading misinformation and increasing plagiarism (Lo, 2023; Qasem, 2023).

Critical Thinking

AI supports critical thinking by enhancing literature screening, theoretical analysis, and hypothesis testing, thus improving research quality (Darwin et al., 2024). It also fosters deep reflection through personalized systems and intelligent mentors (Spector & Ma, 2019).

Engagement/Motivation

AI boosts engagement and motivation by personalizing content delivery, increasing interest and participation (Huang et al., 2023). In language learning, it enhances enjoyment and goal-setting through interactive, tailored feedback (Yuan & Liu, 2025).

Self-Efficacy

Chatbots enhance self-efficacy by offering real-time, personalized support, building confidence and autonomy (Parsakia, 2023). In programming education, ChatGPT helps learners tackle challenges more effectively, improving outcomes (R. Yilmaz & Yilmaz, 2023).

Plagiarism Awareness

While AI improves writing efficiency, it raises concerns about originality and academic integrity (Hutson, 2024). Research shows it may lead to fabrication and ethical violations, posing risks to education and science (Elali & Rachid, 2023; Khalaf, 2025).

Academic Self-Concept

Academic self-concept reflects how students perceive their abilities and potential within educational settings (Bong & Skaalvik, 2003; Kavanagh, 2020; Marsh & Martin, 2010). Evaluation and comparison are the two core aspects of academic self-concept (Meyer et al., 2023).

Parents' Level of Education

Higher parental education correlates with a more positive academic self-concept (Zhao et al., 2023). College-educated parents often instill greater confidence in their children's learning abilities through academic support and involvement (Chevalère et al., 2023; Yeung et al., 2010).

Self-Evaluation

Self-evaluation reflects perceived academic competence, shaped by past achievements (Wu et al., 2021). Success or failure experiences influence this self-belief (Preckel et al., 2013).

Peer Comparison

Adolescents form academic self-concept by comparing themselves to peers (Wouters et al., 2013). Social comparison theory suggests students assess their abilities relative to noticeable or similar peers (Jansen et al., 2022; Meyer et al., 2023).

School-Focused Environment

Effort-focused environments foster student success by valuing learning processes over innate ability (Bauer et al., 2023). Talent-focused settings may harm minority or first-generation students' self-concept, making them feel less capable (Bauer et al., 2023; Leslie et al., 2015).

Gender Differences: AP & ASC

Academic Performance

Empirical evidence regarding gender differences in academic performance is mixed. Some studies indicate that female students tend to outperform male students in overall coursework or language-related subjects, whereas male students may demonstrate advantages in mathematics or selected STEM disciplines (Jahanifar, 2022). These performance differences are often influenced by prior academic preparation, assessment formats, learning strategies, and motivational factors, rather than gender alone (L. Wang & Yu, 2023; Yu & Deng, 2022). As a result, gender is increasingly understood as one component within a broader set of interacting variables that shape academic outcomes in higher education.

Academic Self-Concept

Gender differences in academic self-concept frequently emerge at the domain-specific level. Research suggests that female students tend to report higher academic self-concept in language-related areas, while male students often report stronger self-concept in mathematics and technology-oriented fields (Cooper et al., 2018; L. Wang & Yu, 2023). Social comparison processes, classroom practices, and culturally embedded expectations may shape how students evaluate their academic abilities, contributing to observed gender patterns in self-concept (Jahanifar, 2022). These findings imply that gender-related differences in academic self-concept are context-dependent rather than uniform across educational settings.

First Generation vs Continuing Generation College Students Differences: AP&ASC

Definition of Generational Status

In this study, generational status was derived from parents' educational level (National Center for Education Statistics [NCES], 2024). First-generation college students were defined as students whose parents (or primary caregivers) had not completed a bachelor's degree (i.e., neither parent holds a four-year college degree) (NCES, 2024). Continuing-generation students were defined as those with at least one parent who had completed a bachelor's degree or higher (NCES, 2024). This binary classification was based on parental educational attainment, which is commonly used in recent empirical literature as a proxy for differential access to academic, social, and cultural resources prior to college (Blanden et al., 2022; Nunes & de Andrade, 2024).

Academic Performance

Research on academic performance consistently shows that first-generation college students, on average, face greater academic challenges than their continuing-generation peers. These challenges are reflected in lower grades, reduced academic persistence, and lower likelihood of entering highly selective academic programs (W. Wang et al., 2020). Such differences are often attributed to disparities in pre-college academic preparation, financial constraints, and limited access to educational guidance within the family (Hood et al., 2020). Importantly, evidence suggests that targeted academic support and increased access to institutional resources can mitigate, though not entirely eliminate, these performance gaps (Ko et al., 2025).

Academic Self-Concept

In terms of academic self-concept, first-generation college students frequently report lower academic confidence and greater concerns about belonging in higher education environments (Hood et al., 2020; Means & Pyne, 2021). These psychological differences may stem from socialization processes within the family as well as perceived mismatches between students' backgrounds and institutional expectations (Muñoz & Del Picò, 2020). However, not all studies identify significant differences in academic self-concept based on parents' education level, suggesting that contextual factors such as institutional support and peer environment may moderate these relationships (W. Wang et al., 2020).

ChatGPT Use Differences: AP & ASC

Academic Performance

During academic life, ChatGPT could bring students a lot of knowledge and help them accomplish their assignments, which could improve the efficiency on their study process. Studies discovered that Students who use ChatGPT have a great improvement on their academic performance (Amjad et al., 2024; Cheong & Chong, 2025; Gonzalez-Garcia et al., 2025; Yusfi & Asmara, 2023). Gonzalez-Garcia et al. (2025)'s study further pointed that students with higher GPA inclined to highly accept the usage of ChatGPT and benefited more from it. Additionally, ChatGPT users have higher motivation in learning process than students who do not use (Yusfi & Asmara, 2023). Shahzad et al. (2025)'s study investigated the ChatGPT Usage in English learning at higher education level, which also indicated students who use ChatGPT had higher GPA and motivation than those who do not use.

Academic Self-Concept

ChatGPT Usage influenced students' self-concept under the learning context. Periyasamy et al. (2025) conducted a qualitative study and investigated that ChatGPT Usage had dual-impact on college students' academic self-concept, which reflected negatively on their self-doubt about knowledge and positively on their feeling of achievement.

Almineeai et al. (2025)'s study found that ChatGPT enhanced students' confidence and motivation during the learning process. Moreover, overreliance on large language models like ChatGPT was correlated with decreased self-efficacy during learning process for students (Padiyath et al., 2024).

Year Level Differences: AP & ASC

Academic Performance

ChatGPT has been pervasively used in higher education among college students. However, there is a dearth of studies investigated the use of ChatGPT based on the academic year-level. H. Yilmaz et al. (2023) explored students' perception of ChatGPT at higher education level. Results showed that there was no significant difference between 4 year-level's students' perception and attitude of the usefulness and ease of use of ChatGPT. However, some studies discovered there were differences in use of ChatGPT among year levels. As pointed by Köhler and Hartig (2024), students toward the end of bachelor's degree tended to be more familiar with and more frequent to use ChatGPT. Moreover, Andalibi et al. (2024) study indicated junior students had a significantly higher usage of ChatGPT than freshman students. Additionally, seldom research analyzed the difference of student's academic performance under the interaction of year level and ChatGPT usage.

Academic Self-Concept

Academic self-concept is crucial for college students' academic achievement. According to Fryer (2015)'s study, academic self-concept was important for first year students in college to keep intrinsic motivation. Haktanir et al. (2021) found that first-year students who perceived college requirements as similar to those of high school maintained higher academic self-concept, suggesting that perceived academic continuity may buffer potential declines in self-concept during this adjustment phase. Beyond the transitional effect, differences across year levels have also been observed. Isiksal (2010)'s study indicated that senior students had the highest positive academic self-concept and followed with freshman, junior and sophomore. Based on this study, it was suggested that different social environment and university required courses influence second-year students negatively which reduced their academic self-concept.

Methodology

A quantitative comparative, cross-sectional design was employed to extend prior correlational findings by examining the effects of gender, parents' education level, year level, and ChatGPT usage frequency on students' academic performance and academic self-concept. Data were drawn from the same dataset reported in Echiverri et al. (2025), consisting of 563 undergraduate students. Convenience and snowball sampling techniques were used to recruit participants from Chinese traditional universities (10.8%), Wenzhou–Kean University (63.9%), and Kean University in the United States (25.2%). Data were collected through an online self-constructed questionnaire administered via Sojump (Wenjuanwang) and Qualtrics platforms. Compared with the previous descriptive-correlational study, which focused on associations between ChatGPT usage, academic performance, and academic self-concept, the present study represents an extended analysis by introducing additional predictors and examining both main and interaction effects using comparative statistical methods.

The survey employed a five-point Likert scale, and reliability analyses indicated acceptable internal consistency for the key outcome variables, with Cronbach's alpha values of .710 for Academic Performance and .828 for Academic Self-Concept. All procedures complied with ethical standards, including Institutional Review Board approval, informed consent, and assurances of anonymity and confidentiality.

Statistical analyses were conducted using SPSS version 29.0. Descriptive statistics were first computed, followed by two-way multivariate analysis of variance (MANOVA) to simultaneously examine the effects of gender, parents' education level, year level, and ChatGPT usage frequency on academic performance and academic self-concept. When significant multivariate effects were detected, follow-up univariate analyses of variance (ANOVA) were conducted to identify the contributing dependent variables. Given the multiple groups of ChatGPT usage and year level, Bonferroni-adjusted post hoc comparisons were conducted to identify specific group differences while controlling for Type I error.

Results and Discussion

Gender and Parents' Education Level Effects on Academic Performance and Academic Self-Concept

A two-way multivariate analysis of variance (MANOVA) was conducted to examine the effects of gender and parents' education level (PEL) on academic performance (AP) and academic self-concept (ASC). Preliminary analyses supported the suitability of MANOVA. Box's M was nonsignificant, p = .060, indicating homogeneity of covariance matrices. Levene's tests were nonsignificant for AP, $F(3, 521) = 0.36$, $p = .780$, and ASC, $F(3, 521) = 0.63$, $p = .596$, supporting homogeneity of variances.

Multivariate Effects

There was no significant multivariate main effect of gender, Wilks' Λ = .99, $F(2, 520) = 1.41$, $p = .244$, partial $\eta^2 = .005$, nor a significant Gender × PEL interaction, Wilks' Λ = .99, $F(2, 520) = 0.47$, $p = .629$, partial $\eta^2 = .002$. A marginal multivariate effect was observed for PEL, Wilks' Λ = .98, $F(2, 520) = 2.92$, $p = .055$, partial $\eta^2 = .011$ (See Table 1).

Table 1
Multivariate Tests of Significance for Gender, Parents' Education Level, and Interaction Effects

IVs	Wilks's Lambda (λ)	F	Hypothesis df	Error df	p	η²
Gender	.99	1.41	2	520	.244	.005
PEL	.98	2.92	2	520	.055	.011
Gender * PEL	.99	0.47	2	520	.629	.002

Note. PEL= Parents' Education Level.

Univariate Effects

Parental education level (PEL), which differentiates first-generation students (no parent with a college degree) from continuing-generation students (at least one parent with a college degree), demonstrated a significant effect on academic self-concept (ASC). Follow-up ANOVAs (see Table 2) indicated that continuing-generation students (M = 3.56, SD = .62) reported significantly higher ASC than first-generation students (M = 3.43, SD = .62), $F(1, 521) = 5.65$, $p = .018$, partial $\eta^2 = .011$. In contrast, PEL did not significantly affect academic performance (AP), $F(1, 521) = 0.40$, $p = .527$, partial $\eta^2 = .001$. Gender showed no significant main effects on AP or ASC (all ps > .05), and the interaction between PEL and gender was nonsignificant across outcomes (see Table 2).

Table 2
Univariate Tests of Between-Subject Effects for Gender and Parents' Education Level on Academic Performance and Academic Self-Concept

DVs	Sources	Df	F	*p*	*η²*
AP	Gender	1	0.28	.590	.001
	PEL	1	0.40	.527	.001
	Gender* PEL	1	0.89	.345	.002
ASC	Gender	1	1.45	.228	.003
	PEL	1	5.64	.018	.011
	Gender* PEL	1	0.34	.558	.001

Note. AP=Academic Performance; ASC=Academic Self-Concept; PEL= Parents' Education Level.

Interpretation and Implications

Although academic performance did not significantly differ across parental education groups in the present study, first-generation students reported lower academic self-concept compared to their continuing-generation peers. This finding aligns with prior research indicating that first-generation college students frequently report lower academic confidence and heightened concerns about belonging in higher education environments (Hood et al., 2020; Means & Pyne, 2021).

Such differences have been attributed to socialization processes within the family and perceived mismatches between students' backgrounds and institutional expectations (Muñoz & Del Picò, 2020). From a social capital perspective, continuing-generation students may benefit from access to implicit academic norms, expectations, and confidence-reinforcing messages embedded within family contexts, which contribute to the development of stronger academic identity. First-generation students, in contrast, may achieve comparable performance outcomes yet internalize lower perceptions of competence due to reduced exposure to these forms of academic capital.

At the same time, the absence of significant performance differences in this study contrasts with research documenting achievement gaps (W. Wang et al., 2020), and partially aligns with evidence suggesting that contextual factors—such as institutional support and peer environment—may moderate disparities in academic self-concept (W. Wang et al., 2020).

The present findings therefore suggest that while institutional mechanisms may mitigate performance gaps, disparities in academic identity may persist. Closing achievement gaps does not automatically eliminate differences in students' academic self-beliefs or sense of belonging (Bong & Skaalvik, 2003; Kavanagh, 2020; Marsh & Martin, 2010).

This study contributes to the literature by demonstrating that parity in academic performance does not necessarily eliminate disparities in academic self-concept among first-generation students. By distinguishing between achievement outcomes and academic identity, the findings extend existing research on educational equity and underscore the importance of integrating psychosocial dimensions into evaluations of student success.

ChatGPT Usage and Year Level Effects on Academic Performance and Academic Self-Concept

A two-way MANOVA was conducted to examine the effects of ChatGPT usage frequency and year level on academic performance (AP) and academic self-concept (ASC). Box's M Test showed a significant result (M = 157.923, F (57, 5594.367) = 2.554, $p < .001$), indicating that the variance-covariance matrices of the academic performance and academic self-concept across groups of ChatGPT usage and year level were heterogeneous. Levene's test of equality of error variances was significant for AP ($p <.001$) but not significant for ASC ($p = .299$). Therefore, Pillai's Trace was applied to test statistical significance, which is more robust when assumptions were violated.

Multivariate Effects

There was a significant multivariate main effect of ChatGPT usage, Pillai's Trace = .27, $F(8, 1010) = 19.66$, $p < .001$, partial $\eta^2 = .135$. In contrast, year level did not demonstrate a significant multivariate main effect, Pillai's Trace = .02, $F(8, 1010) = 1.78$, $p = .100$, partial $\eta^2 = .010$. However, the interaction between ChatGPT usage and year level was statistically significant, Pillai's Trace = .07, $F(24, 1010) = 1.72$, $p = .016$, partial $\eta^2 = .039$, indicating that the relationship between ChatGPT usage and the dependent variables varied across year level (see Table 3).

Table 3
Multivariate Tests of Significance for ChatGPT Usage, Year Level, and Interaction Effects

IVs	Pillai's Trace	F	Hypothesis df	Error df	p	η^2
CGPTU	.27	19.66	8	1010	<.001	.135
YL	.02	1.78	6	1010	.100	.010
CGPTU *YL	.07	1.72	24	1010	.016	.039

Note. CGPTU= ChatGPT Usage; YL= Year Level.

Univariate Effects

Follow-up ANOVAs revealed that ChatGPT usage had a significant effect on academic performance, $F(4, 505) = 44.57$, $p < .001$, partial $\eta^2 = .261$, indicating a large effect size (see Table 4). ChatGPT usage also had a statistically significant, though smaller, effect on academic self-concept, $F(4, 505) = 3.14$, $p = .014$, partial $\eta^2 = .024$ (see Table 4).

Table 4
Univariate Tests of Between-Subject Effects for Year Level and ChatGPT Usage on Academic Performance and Academic Self-Concept

Dependent Variable	Source	Df	F	p	η^2
AP	YL	3	0.76	.515	.005
	CGPTU	4	44.57	<.001	.261
	YL* CGPTU	12	2.41	.005	.054
ASC	YL	3	2.67	.046	.016
	CGPTU	4	3.14	.014	.024
	YL* CGPTU	12	1.36	.181	.031

Note. AP=Academic Performance; ASC=Academic Self-Concept; YL=Year Level; CGPTU=ChatGPT Usage.

Post hoc comparisons using Bonferroni adjustment indicated that students who used ChatGPT often or always demonstrated significantly higher academic performance compared to those who used it sometimes or rarely or never (see Table 5). Although ChatGPT Use significantly affected academic self-concept (see Table 4) but pairwise comparisons for academic self-concept were not statistically significant (see Table 5).

Table 5
Multiple Comparison of Differences in Academic Performance and Academic Self-Concept Based on ChatGPT Usage

Dependent Variable	(I) ChatGPT Usage	(J) ChatGPT Usage	Mean Difference (I-J)	SE	p	95% CI	
						Lower Bound	Upper Bound
AP	Never (0 days/week)	Rarely	-.65*	.10	<.001	-.94	-.37
		Sometimes	-1.04*	.09	<.001	-1.31	-.76
		Often	-1.25*	.10	<.001	-1.54	-.97
		Always	-1.39*	.10	<.001	-1.69	-1.10
	Rarely (1-2 days/week)	Never	.65*	.10	<.001	.37	.94
		Sometimes	-.38*	.07	<.001	-.58	-.18
		Often	-.60*	.07	<.001	-.81	-.38
		Always	-.74*	.07	<.001	-.96	-.51
	Sometimes (3-4days/week)	Never	1.04*	.09	<.001	.76	1.31
		Rarely	.38*	.07	<.001	.18	.58
		Often	-.21	.07	.028	-.41	-.01
		Always	-.35*	.07	<.001	-.56	-.14
	Often (5-6 days/week)	Never	1.25*	.10	<.001	.97	1.54
		Rarely	.60*	.07	<.001	.38	.81
		Sometimes	.21	.07	.028	.01	.41
		Always	-.13	.08	.888	-.36	.09
	Always (7 days/week)	Never	1.39*	.10	<.001	1.10	1.69
		Rarely	.74*	.07	<.001	.51	.96
		Sometimes	.35*	.07	<.001	.14	.56
		Often	.13	.08	.888	-.09	.36

Note. Bonferroni adjustment at p<.005 (0.05/10). CI=Confidence Interval; AP= Academic Performance; *Mean difference is significant.

Year level did not significantly influence academic performance but a modest effect was observed for academic self-concept (See Table 4). Multiple comparison tests showed that senior students (M = 3.73, SD = .72) had significantly higher score than junior student (M = 3 .38, SD =. 61) on academic self-concept (see Table 6).

Table 6
Multiple Comparison of Differences in Academic Self-Concept Based on Year Level

Dependent Variable	(I) Year Level	(J) Year Level	Mean Difference (I-J)	SE	p	95% CI	
						Lower Bound	Upper Bound
ASC	Freshman	Sophomore	.04	.07	1.000	-.14	.23
		Junior	.15	.07	.274	-.05	.36
		Senior	-.19	.09	.274	-.44	.06
	Sophomore	Freshman	-.04	.07	1.000	-.23	.14
		Junior	.11	.06	.568	-.06	.29
		Senior	-.23	.08	.038	-.46	-.00
	Junior	Freshman	-.15	.07	.274	-.36	.05
		Sophomore	-.11	.06	.568	-.29	.06
		Senior	-.35*	.09	.001	-.59	-.10
	Senior	Freshman	.19	.09	.274	-.06	.44
		Sophomore	.23	.08	.038	.00	.46
		Junior	.35*	.09	.001	.10	.59

Note. Bonferroni adjustment at $p<.008$ (0.05/6). CI=Confidence Interval; ASC= Academic Self-concept; *Mean difference is significant.

Interaction Effects: ChatGPT Use × Year Level

A significant interaction emerged between ChatGPT usage and year level for academic performance, $F(12, 505) = 2.41$, $p = .005$, partial $\eta^2 = .054$ (see Table 4), whereas no interaction was found for academic self-concept. Bonferroni-adjusted comparisons (see Appendix) indicated that the association between ChatGPT use and performance strengthened across academic cohorts.

Among freshmen, differences across usage levels were modest, with limited pairwise significance. In contrast, among sophomores, juniors, and especially seniors, students who reported never using ChatGPT performed significantly lower than peers who used it at least occasionally (all ps $\leq .002$ in upper cohorts). The magnitude of mean differences increased progressively from freshman to senior year, suggesting that the performance advantage associated with ChatGPT use becomes more pronounced in later academic stages.

These results indicate that ChatGPT use is not uniformly associated with performance but interacts with year classification, with stronger differentiation observed in upper-year students.

Interpretation and Implications

The present findings reveal distinct pathways through which ChatGPT usage and year level relate to academic performance (AP) and academic self-concept (ASC). ChatGPT use significantly predicted AP but not ASC, whereas year level predicted ASC but not AP. These patterns highlight the differentiated academic and psychosocial mechanisms underlying student development in technology-mediated higher education contexts.

Consistent with prior studies (Amjad et al., 2024; Cheong & Chong, 2025; Gonzalez-Garcia et al., 2025; Shahzad et al., 2025; Yusfi & Asmara, 2023), students who reported more frequent

ChatGPT use achieved significantly higher academic performance (see Table 4). This supports the view that generative AI functions as a learning scaffold that enhances efficiency, clarification, and task completion. The findings align with evidence suggesting that students who adopt ChatGPT strategically derive measurable academic benefits, particularly in performance-based outcomes.

However, ChatGPT usage did not significantly influence academic self-concept (ASC) (see Table 5). Although prior research reports both positive (Almineeai et al., 2025) and negative (Padiyath et al., 2024; Periyasamy et al., 2025) effects on students' academic self-perceptions, the present findings suggest that performance gains associated with AI use do not necessarily translate into stronger academic self-beliefs. This suggests that technological assistance may improve outputs without fundamentally reshaping students' academic identity or perceived competence.

Year level did not significantly predict AP (see Table 6), indicating relative stability in achievement across cohorts. While some research reports variation in ChatGPT familiarity across academic years (Andalibi et al., 2024; Köhler & Hartig, 2024), increased exposure does not appear to produce performance differentials in this sample.

Importantly, however, a significant interaction emerged between ChatGPT usage and year level for AP. The performance advantage associated with more frequent ChatGPT use was more pronounced among sophomores, juniors, and seniors than among freshmen. This suggests that the academic benefits of AI engagement may become increasingly salient as coursework grows more advanced and specialized.

In contrast, year level significantly predicted ASC. Seniors reported higher academic self-concept than juniors (see Table 6), partially aligning with Isiksal (2010), who observed stronger ASC among upper-level students. This pattern suggests that academic self-perceptions may strengthen with sustained institutional engagement. The comparatively lower ASC among juniors may reflect transitional academic pressures or increased disciplinary demands, consistent with evidence that contextual and cohort-related factors shape self-concept trajectories (Haktanir et al., 2021).

Overall, the findings indicate that ChatGPT use is associated with performance-based outcomes—particularly in interaction with year classification—whereas variation in academic self-concept is more closely linked to students' year level and background characteristics. Together, these results underscore the importance of addressing both technological engagement and psychosocial dimensions of student experience in higher education.

Limitations of the Study

Several limitations warrant consideration. First, the cross-sectional design precludes causal inference. Although significant associations were observed among ChatGPT use, parental education, year level, and academic outcomes, temporal ordering cannot be established, and alternative explanations remain possible. For instance, higher-performing students may be more inclined to use ChatGPT rather than ChatGPT use leading to improved performance.

Second, measures of ChatGPT usage and academic indicators were self-reported and may be subject to response or social desirability bias. ChatGPT use was assessed primarily in terms of frequency, without capturing qualitative differences in purpose, depth, or cognitive reliance.

Finally, although some effects were statistically significant, effect sizes were small, and the sample—drawn from three institutions with distinct international contexts—may limit generalizability. Longitudinal and multi-method research is needed to clarify developmental trajectories and underlying mechanisms.

Conclusion

The findings indicate that academic performance did not significantly differ by parental education level (PEL), yet disparities in academic self-concept (ASC) persisted between first-generation students (no parent with a college degree) and continuing-generation students (at least one parent with a college degree). These results suggest that parity in measurable achievement does not necessarily translate into equity in students' academic self-perceptions or sense of competence.

The study further demonstrates that ChatGPT usage and year level are differentially associated with student outcomes. Frequent ChatGPT use was linked to higher academic performance but was not significantly related to academic self-concept. In contrast, year level was associated with differences in academic self-concept—particularly between juniors and seniors—while academic performance remained stable across cohorts. The interaction between ChatGPT use and year level further suggests that technological engagement may differentially enhance achievement across academic cohorts.

Collectively, these findings indicate that technological engagement is associated with performance-based outcomes, whereas variation in academic self-concept is more closely linked to students' year classification and parental education background. The results underscore the importance of addressing both academic achievement and psychosocial dimensions of student experience in higher education.

Recommendations

Institutions should complement performance-focused academic support with initiatives that strengthen academic self-concept and belonging, particularly among first-generation students. Mentoring, identity-affirming practices, and enhanced access to social capital may help reduce disparities in self-perception.

Given the positive association between ChatGPT use and academic performance, institutions should promote structured and pedagogically guided integration of generative AI, coupled with reflective practices that foster competence and ownership of learning. Targeted psychosocial support during transitional stages, especially the junior year, may further sustain academic identity.

Future research should employ longitudinal designs to examine whether sustained achievement and scaffolded AI engagement contribute to long-term development of academic self-concept.

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Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

During the preparation of this manuscript, the authors used OpenAI's ChatGPT (GPT-4) to assist with language editing, clarity, and organization of the text. The tool was used solely to improve readability and did not generate original research content, conduct data analysis, or contribute to the interpretation of findings.

All content generated with AI assistance was critically reviewed, revised, and verified by the authors. The authors take full responsibility for the accuracy, integrity, and originality of the manuscript.

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Appendix

Multiple Comparisons of Academic Performance by ChatGPT Usage and Year Level

DV	Year Level	(I) CGPTU	(J) CGPTU	Mean Difference (I-J)	SE	p	95% CI	
							Lower Bound	Upper Bound
AP	Freshman	Never	Rarely	-.204	.150	1.000	-.627	.220
			Sometimes	-.635*	.163	.001	-1.095	-.175
			Often	-.566	.213	.081	-1.168	.035
			Always	-1.028	.314	.011	-1.913	-.143
		Rarely	Never	.204	.150	1.000	-.220	.627
			Sometimes	-.431	.137	.018	-.819	-.044
			Often	-.363	.194	.623	-.910	.185
			Always	-.824	.301	.064	-1.674	.025
		Sometimes	Never	.635*	.163	.001	.175	1.095
			Rarely	.431	.137	.018	.044	.819
			Often	.069	.204	1.000	-.508	.645
			Always	-.393	.308	1.000	-1.261	.476
		Often	Never	.566	.213	.081	-.035	1.168
			Rarely	.363	.194	.623	-.185	.910
			Sometimes	-.069	.204	1.000	-.645	.508
			Always	-.461	.337	1.000	-1.412	.489
		Always	Never	1.028	.314	.011	.143	1.913
			Rarely	.824	.301	.064	-.025	1.674
			Sometimes	.393	.308	1.000	-.476	1.261
			Often	.461	.337	1.000	-.489	1.412
	Sophomore	Never	Rarely	-1.217*	.193	<.001	-1.761	-.672
			Sometimes	-1.539*	.180	<.001	-2.046	-1.031
			Often	-1.752*	.185	<.001	-2.274	-1.230
			Always	-1.831*	.185	<.001	-2.352	-1.309
		Rarely	Never	1.217*	.193	<.001	.672	1.761
			Sometimes	-.322	.119	.069	-.657	.013
			Often	-.535*	.127	<.001	-.893	-.178
			Always	-.614*	.126	<.001	-.970	-.258
		Sometimes	Never	1.539*	.180	<.001	1.031	2.046
			Rarely	.322	.119	.069	-.013	.657
			Often	-.213	.105	.434	-.510	.084
			Always	-.292	.105	.055	-.587	.003
		Often	Never	1.752*	.185	<.001	1.230	2.274
			Rarely	.535*	.127	<.001	.178	.893
			Sometimes	.213	.105	.434	-.084	.510
			Always	-.079	.114	1.000	-.399	.242
		Always	Never	1.831*	.185	<.001	1.309	2.352
			Rarely	.614*	.126	<.001	.258	.970
			Sometimes	.292	.105	.055	-.003	.587
			Often	.079	.114	1.000	-.242	.399
	Junior	Never	Rarely	-.672	.238	.050	-1.344	.000
			Sometimes	-1.043*	.223	<.001	-1.671	-.415
			Often	-1.384*	.228	<.001	-2.026	-.743
			Always	-1.416*	.238	<.001	-2.088	-.744
		Rarely	Never	.672	.238	.050	.000	1.344
			Sometimes	-.371	.152	.150	-.799	.058
			Often	-.712*	.159	<.001	-1.160	-.264
			Always	-.744*	.174	<.001	-1.235	-.253
		Sometimes	Never	1.043*	.223	<.001	.415	1.671
			Rarely	.371	.152	.150	-.058	.799
			Often	-.341	.134	.114	-.720	.038
			Always	-.373	.152	.144	-.801	.055
		Often	Never	1.384*	.228	<.001	.743	2.026

		Rarely	.712*	.159	<.001	.264	1.160
		Sometimes	.341	.134	.114	-.038	.720
		Always	-.032	.159	1.000	-.480	.416
	Always	Never	1.416*	.238	<.001	.744	2.088
		Rarely	.744*	.174	<.001	.253	1.235
		Sometimes	.373	.152	.144	-.055	.801
		Often	.032	.159	1.000	-.416	.480
Senior	Never	Rarely	-1.390*	.365	.002	-2.420	-.360
		Sometimes	-1.854*	.367	<.001	-2.890	-.818
		Often	-1.937*	.370	<.001	-2.980	-.894
		Always	-2.179*	.359	<.001	-3.190	-1.167
	Rarely	Never	1.390*	.365	.002	.360	2.420
		Sometimes	-.464	.215	.310	-1.069	.141
		Often	-.547	.219	.128	-1.164	.070
		Always	-.789*	.199	<.001	-1.351	-.226
	Sometimes	Never	1.854*	.367	<.001	.818	2.890
		Rarely	.464	.215	.310	-.141	1.069
		Often	-.083	.222	1.000	-.710	.544
		Always	-.324	.203	1.000	-.898	.249
	Often	Never	1.937*	.370	<.001	.894	2.980
		Rarely	.547	.219	.128	-.070	1.164
		Sometimes	.083	.222	1.000	-.544	.710
		Always	-.242	.208	1.000	-.828	.344
	Always	Never	2.179*	.359	<.001	1.167	3.190
		Rarely	.789*	.199	<.001	.226	1.351
		Sometimes	.324	.203	1.000	-.249	.898
		Often	.242	.208	1.000	-.344	.828

Note. Bonferroni adjustment at p<.005 (0.05/10). CI = Confidence Interval; AP = Academic Performance; CGPTU = ChatGPT Usage; *Mean difference is significant.