

Examining the Relationship Between Gender, Self-Efficacy, and Students' Use of AI Based Applications for English Grammar Course

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Abstract

This study examine the relationship between gender, self-efficacy and students' use of AI-based applications in English grammar courses. Using a quantitative ex post facto design, data collected from 123 fourth-semester EFL students through a structured questionnaire measuring gender, self-efficacy, and the use of AI-based applications for grammar learning. The data were analyzed using descriptive statistics and Multiple Linear Regression. The results showed that gender did not have a significant relationship with students' use of AI-based applications ($p = 0.613$), while self-efficacy showed a positive relationship ($p = 0.007$). Simultaneously, analysis result show that gender and self-efficacy show significant relationship with students' use of AI ($p = 0.014$), explaining 6.9% of the variance in AI use. These findings highlight that psychological factors, particularly self-efficacy plays a more important role than gender in forming students' engagement with AI-supported grammar learning.

Key words: AI use, AI-based applications, English grammar learning, EFL students, Gender, Self-efficacy.

INTRODUCTION

The advancement of artificial intelligence (AI) has significantly influenced educational practices, particularly in higher education. The increasing accessibility of AI-based applications has transformed how students engage with learning materials, complete academic tasks, and develop language skills. These applications are also recognized for their role in supporting learners' grammar development and vocabulary enrichment, making them practical tools in the language learning process (Aulia and Santosa 2025; Devi, Santosa, and Kusuma 2025; Intan et al. 2022). AI tools such as grammar checkers, writing assistants, and conversational chatbots are highly used to support learners in increasing grammatical accuracy and writing quality through immediate feedback and personalized language support (Hardiantini et al. 2025; Hou 2021; Saumi et al. 2025; Song and Song 2023; Yuliandari, Ratminingsih, and Santosa 2025).

English grammar are challenging component for EFL learners, especially at the university level where students are expected to produce accurate and academically appropriate language (Farikhah 2019; Rachmawati 2022). AI-based applications such as Grammarly, QuillBot, and ChatGPT have gained prominence in grammar learning contexts due to their ability to identify errors, provide corrective feedback, and suggest revisions in real time (Alharbi 2023; Waluyo 2024; Zaim et al. 2024). Previous studies report that AI-supported learning can enhance student engagement, reduce grammatical errors, and promote learner autonomy (Huang et al. 2023; Suardewa, Kusuma, and Dewi 2024; Wina and Merta 2023).

Despite these benefits, the utilization of AI in language learning depends on students' willingness to adopt and use these technologies. Technology adoption is influenced not only by system characteristics but also by individual factors, including demographic and psychological variables. Gender has frequently discussed as a factor influencing learners' attitudes toward and use of educational technology. Some research suggests that gender differences may affect students'

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confidence, perceived usefulness, and attitudes toward technology use (Pazilah, Hashim, and Yunus 2019). In AI-assisted learning contexts, some studies indicate that male students demonstrate higher confidence and more positive perceptions of AI technologies than female students (Al-Samarraie et al. 2024).

However, findings related to gender differences in AI use remain inconsistent. While several studies identify significant gender-based differences in AI usage and attitudes, report no meaningful differences between male and female students, particularly in educational settings where technology use is common (John Mark R. Asio and Sardina 2025; Iddrisu, Iddrisu, and Aminu 2025). These inconsistencies indicate that gender alone may not sufficiently explain students' adoption of AI-based applications and that additional psychological factors should be considered.

One key psychological factor is self-efficacy that defined as someone beliefs in their ability to successfully accomplish specific tasks (Bandura 1977). In educational contexts, self-efficacy has been associated with higher motivation, stronger engagement, and improved academic performance (Hayat et al. 2020; Schunk and Pajares 2022). Students with higher self-efficacy tend to persist when facing difficulties and engage more actively with learning resources. In AI-assisted learning environments, self-efficacy plays an important role in shaping students' willingness to explore AI tools, interpret automated feedback, and use AI applications effectively (Mah and Groß 2024). Previous studies have shown that higher levels of AI-related self-efficacy are associated with stronger intentions to adopt AI technologies and more frequent use of AI tools in language learning (Kittredge et al. 2025; Seo et al. 2024).

Although prior research has examined gender and self-efficacy in relation to technology and AI utilization, several gaps remain. First, many studies focus on general writing or learning skills rather than grammar-specific contexts, where accuracy and feedback are central (Alharbi 2023; Jaya and Susyla 2024). Second, gender and self-efficacy are often examined independently, with limited attention to their combined relationship on students' adoption of AI-based applications (Estrada-Araoz et al. 2025; Zhang et al. 2023). Third, inconsistent findings regarding gender differences in AI use highlight the need for further empirical investigation within specific instructional contexts, such as university-level EFL grammar courses (Iddrisu et al. 2025; Otis et al. 2025).

To address these gaps, this study investigates the relationship between gender, self-efficacy and students' use of AI-based applications in English grammar courses. This study focuses on fourth-semester EFL students and examines whether there is a significant relationship between gender and students' use of AI-based applications for English grammar, whether there is a significant relationship between self-efficacy and students' use of AI-based applications, and whether gender and self-efficacy are significantly related to students' use of AI-based applications in English grammar courses.

The following research questions guided this study: (1) Is there a significant relationship between gender and students' use of AI-based applications in English grammar courses?, (2) Is there a significant relationship between self-efficacy and students' use of AI-based applications in English grammar courses?, and (3) Is there a significant combined relationship of gender and self-efficacy with students' use of AI-based applications in English grammar courses? .

METHODOLOGY

1. Research Design

This study applied a quantitative research design. Specifically, the study was guided by the Technology Acceptance Model (TAM) and social cognitive theory, particularly the construct of self-efficacy theory (Bandura 1977; Davis 1989). These theories provide a conceptual basis for examining how individual characteristics related to students' adoption of AI-based applications in learning contexts.

An ex post facto design was selected because the study did not involve experimental manipulation but aimed to examine the extent to gender and self-efficacy predict students' use

of AI-based applications in English grammar courses. In line with TAM, students' use of AI-based applications was treated as an outcome of individual perceptions and beliefs, while self-efficacy was conceptualized as a key psychological factor related with technology use. Multiple linear regression analysis was employed to examine the individual and combined relationship of gender and self-efficacy on AI use, in line with the research questions of the study.

2. Research Setting and Participants

The study was conducted at a university-level English education program where English grammar is taught as a one of the mandatory course. The participants were fourth-semester students enrolled in English grammar courses during the data collection period. Fourth-semester students were selected because they had sufficient academic experience and exposure to both formal grammar instruction and AI-based applications used to support grammar learning.

Participants were selected with a random sampling. A total of 123 students participated in the study, consisting of 33 male students and 90 female students. All participants had prior experience using AI-based applications, such as grammar checkers or AI writing tools, for academic purposes. Gender was treated as a categorical variable, while self-efficacy and AI application use were treated as continuous variables, consistent with the assumptions of multiple linear regression analysis.

3. Data Collection

The data were obtained using a structured questionnaire designed based on the theoretical framework of this study. The questionnaire consisted of three sections. The first section gathered demographic information, including gender. The second section measured students' self-efficacy related to learning using 15 valid questionnaire items and students' use of AI-based applications for grammar course, drawing on Bandura (1977) and the General Self-Efficacy (GSE) Scale developed by Schwarzer & Jerusalem (1995). The third section measured students' use of AI-based applications in English grammar learning using 15 questionnaire items, reflecting behavioral aspects of technology use as described in TAM (Davis 1989).

All questionnaire items were measured using a four-point Likert scale ranging from strongly disagree to strongly agree. Before collecting data, the instrument was reviewed by two experts to establish content validity and subsequently tested for empirical validity and reliability. The questionnaire was administered after students had sufficient experience using AI-based applications in their grammar courses to ensure that responses reflected actual usage rather than hypothetical perceptions.

4. Data Analysis

The data were analyzed through the Statistical Package for the Social Sciences (SPSS) version 27. Before statistical analysis, data screening was conducted to ensure completeness and accuracy, and only valid responses were included in the dataset. Gender was coded as a dummy variable, while self-efficacy and students' use of AI-based applications were treated as continuous variables.

Descriptive statistical analysis was applied to summarize the distribution of every variable, including measures of central tendency and dispersion. Instrument reliability was analyzed using Cronbach's alpha to make sure the internal consistency of the self-efficacy and AI adoption scales, with all values exceeding the acceptable threshold of 0.70. Prior conducting Multiple Linear Regression analysis, classical assumption tests were applied, including tests of normality, multicollinearity and homoscedasticity, to confirm the relevance of

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the data for regression analysis. After all assumptions were satisfied, Multiple Linear Regression analysis was conducted to examine the relationship of gender, self-efficacy with students' use of AI-based applications in English grammar courses.

RESULT AND DISCUSSION

1. RESULT

The result of this study is presented in a logical sequence based on the research questions and the statistical analyses conducted. Descriptive statistics are first intended to provide an overview of the data, followed by the results of the Multiple Linear Regression analysis analyzing the relationship of gender and self-efficacy on students' adoption of AI-based applications in English grammar courses.

Descriptive Statistics of the Study Variables

The descriptive statistics of this study reveals key variables of the study, including gender distribution, self-efficacy, and the use of AI-based application in English grammar learning. The analysis was based in total 123 responses, consisting of 33 males, (26.8%) and 90 females (73.2%), indicating that female constituted the majority of the sample.

Table 1. Descriptive statistics of gender and AI use

Descriptive Statistics

AI use

Gender	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
Male	33	25	33	58	44.30	6.277	39.405
Female	90	26	34	60	43.91	4.546	20.666
Total	123	27	33	60	44.02	5.044	25.442

Regarding students' use of AI-based application, the results show a moderate level of use in grammar learning, with an overall mean score of 44.02 (SD = 5.04) and a range of 33 to 60. Male recorded a slightly higher mean score (M = 44.30, SD = 6.28) compared to female (M = 43.91, SD = 4.55). The minimal difference between these mean values indicates that AI-based application use was largely similar across gender groups.

Table 2. Descriptive statistics of gender and Self-efficacy

Descriptive Statistics

Self_Efficacy

Gender	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
Male	33	19	39	58	49.12	5.260	27.672
Female	90	18	35	53	43.97	3.817	14.572
Total	123	23	35	58	45.35	4.811	23.147

Overall, the respondents demonstrated relatively positive levels of self-efficacy, with a mean score of 45.35 (SD = 4.81) and values ranging from 35 to 58. Male reported a higher average self-efficacy score (M = 49.12, SD = 5.26) than female (M = 43.97, SD = 3.82). Although male showed greater mean scores, female exhibited less variability, suggesting more consistent self-efficacy levels within this group.

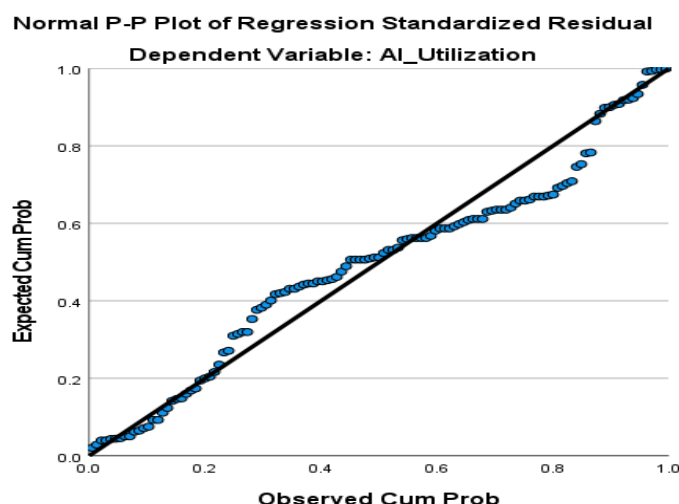


Figure 1. Normal P-P Plot of Standardized Residual

Assumption Testing for Multiple Linear Regression

The normality assumption of the multiple linear regression analysis model was examined using a Normal P–P Plot of regression standardized residuals, as revealed in Figure 1. The plot shows that the data points are distributed closely along the diagonal reference line, with no extreme deviations observed. This pattern suggests that the regression residuals are approximately normally distributed. Therefore, the normality assumption required for multiple linear regression analysis.

Table 3. Multicollinearity test result

Model	Unstandardized Coefficients		Standardized Coefficients		t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta				Tolerance	VIF
(Constant)	27.870	5.975			4.664	.000		
Gender (X1)	1.206	1.136	.106		1.061	.291	.773	1.294
Self-Efficacy (X2)	.310	.105	.296		2.951	.004	.773	1.294

a. Dependent Variable: AI use (Y)

To check multicollinearity among the independent variables, Tolerance and Variance Inflation Factor (VIF) values were examined. The outcomes of the multicollinearity test are shown in Table 3.

The analysis shows that both independent variables, gender (X1) and self-efficacy (X2), obtained a tolerance value of 0.773 and VIF value of 1.294. These values meet the commonly accepted criteria for multicollinearity assessment, tolerance above 0.10 and VIF below 10 suggest no multicollinearity.

Therefore, the outcomes suggest that no multicollinearity problem exists among the variables, and each predictor contributes independently to the regression model. This shows that the multiple linear regression analysis can be applied reliably.

Table 4. Heteroskedasticity test result

Model	Coefficients ^a					Collinearity Statistics	
	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Tolerance	VIF
	B	Std. Error	Beta				
(Constant)	12.137	3.943		3.078	.003		
Gender (X1)	-2.608	.750	-.344	-3.478	.001	.773	1.294
Self Efficacy (X2)	-.091	.069	-.130	-1.312	.192	.773	1.294

a. Dependent Variable: Abs_RES

The heteroskedasticity assumption was applied the Glejser test by regressing the absolute residual values (Abs_RES) on the independent variables. The outcomes of the test are shown in Table 3.

The findings show that gender (X1) is statistically significant result on the absolute residuals (Sig. = 0.001, $p < 0.05$), suggesting the presence of heteroskedasticity related to this variable. In contrast, self-efficacy (X2) does not significantly affect the absolute residuals (Sig. = 0.192, $p > 0.05$), indicating that this predictor does not contribute to heteroskedasticity.

The results suggest that the assumption of homoscedasticity is partially violated, as heteroskedasticity is detected for one independent variable.

Relationship between Gender, Self-Efficacy and Students' Use of AI-Based Applications

This section analyzes the partial relationship of gender and self-efficacy on student's use of AI using multiple linear regression analysis. The significance of each independent variable was assessed through t-test, and the outcomes are presented in Table 3.

The results presented that gender does not have a statistically significant relationship with AI use. As indicated in Table 3, the gender variable produced a t-value of 1.061 with a significance level of $p = 0.291$, which exceeds the 0.05 threshold. This finding suggests that differences in AI use between male and female students are not statistically significant when self-efficacy is controlled.

In contrast, self-efficacy has a statistically significant positive relationship on AI use. The regression analysis reveals that self-efficacy yielded a t-value of 2.951 with a significance level of $p = 0.004$ ($p < 0.05$). The positive regression coefficient ($B = 0.310$) shows that greater levels of self-efficacy are associated with greater use of AI-based applications in English grammar learning.

Overall, these findings indicate that gender does not independently predict AI use, whereas self-efficacy as a significant predictor.

Simultaneous Relationship Between Gender and Self-Efficacy and Students' Use of AI-Based Applications.

Table 5. ANOVA results of multiple linear regression

Model	ANOVA ^a				
	Sum of Squares	df	Mean Square	F	Sig.
Regression	213.422	2	106.711	4.430	.014 ^b
Residual	2890.546	120	24.088		
Total	3103.967	122			

a. Dependent Variable: AI use (Y)

b. Predictors: (Constant), Self Efficacy (X2), Gender (X1)

This section examined the simultaneous relationship of gender and self-efficacy on student's use of AI using multiple linear regression analysis. The overall significance of the regression model was assessed through the F-test, and the results are presented in Table 4.

The ANOVA results show that the regression model is statistically significant, with an F value of 4.430 and a significance level of $p = 0.014$ ($p < 0.05$). This indicates that gender and self-efficacy, when considered together, significantly predict AI use among students. The regression model explains a meaningful proportion of variance in AI use compared to a model with no predictors.

Accordingly, the findings provide empirical support for RQ 3, confirming that the independent variables have a significant relationship on students' use of AI-based applications in English grammar courses.

2. DISCUSSION

This study examined the relationship between gender, self-efficacy, and fourth-semester students' use of AI-based applications in English grammar courses. The discussion is based on the results of the multiple linear regression analysis and addresses each research question.

The findings indicated that gender did not have a significant relationship with fourth-semester students' use of AI-based applications. Although male students obtained slightly higher mean scores in both self-efficacy and AI use than female students, the difference was not statistically significant. This finding suggests that both male and female students demonstrated comparable levels of AI use in English grammar learning. One possible explanation is that AI-based applications have become widely accessible to students regardless of gender, providing equal opportunities to integrate AI into learning activities. As a result, gender may no longer be a determining factor in students' use of AI-based applications. This finding supports the studies by Asio and Sardina (2025) and Iddrisu et al. (2025), which reported that gender was not significantly associated with students' use or acceptance of AI technologies in educational settings.

In contrast, self-efficacy showed a significant positive relationship with fourth-semester students' use of AI-based applications. Students with higher confidence in their learning abilities tended to report higher levels of AI use in English grammar learning. This finding is consistent with (Bandura 1977) Social Cognitive Theory, which emphasizes that individuals with stronger self-efficacy are more likely to engage in challenging tasks, adopt effective learning strategies, and persist when encountering difficulties. In the context of AI-supported learning, students with higher self-efficacy are more confident in exploring AI-based applications and integrating them into their grammar learning activities. This result is also supported by previous studies which reported that self-efficacy is positively associated with students' acceptance and use of AI technologies (Mah and Groß 2024; Sun et al. 2023; Wang et al. 2023). These studies suggest that students who believe in their capabilities are more

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willing to utilize AI tools as learning support because they perceive themselves as capable of using technology effectively to accomplish academic tasks.

The simultaneous analysis further revealed that the overall regression model was statistically significant, indicating that gender and self-efficacy together were significantly related to fourth-semester students' use of AI-based applications. Although gender did not demonstrate a significant relationship individually, self-efficacy contributed significantly to the overall model, resulting in a statistically significant regression model. However, the model explained only 6.9% of the variance in students' AI use, indicating that gender and self-efficacy account for only a small proportion of students' use of AI-based applications. This finding suggests that students' AI use is a multifaceted phenomenon that may also be associated with other factors, such as digital literacy, age, learning motivation, previous experience with AI technologies, and institutional support. Therefore, future studies should investigate these additional variables to obtain a more comprehensive understanding of the factors related to students' use of AI-based applications.

The findings of this study also provide practical implications for English language education. Since self-efficacy showed a stronger relationship with students' AI use than gender, lecturers should focus on developing students' confidence in using AI-based applications rather than emphasizing gender differences. Universities may also support the effective integration of AI into grammar courses by providing training, clear ethical guidelines, and learning activities that encourage students to use AI responsibly and confidently. Such efforts may help students maximize the educational benefits of AI-based applications while promoting more effective English grammar learning.

CONCLUSION

This study examined the relationship between gender, self-efficacy, and fourth-semester students' use of AI-based applications in English grammar learning. The findings indicate that self-efficacy is more strongly related to students' use of AI-based applications than gender, highlighting the importance of students' confidence in supporting the integration of AI into English grammar learning. Although the overall regression model was significant, the relatively low proportion of explained variance suggests that other factors may also be associated with students' use of AI-based applications.

This study contributes to the research on AI in language education by providing empirical evidence on the relationship between gender, self-efficacy, and students' use of AI-based applications in English grammar learning. The findings also provide practical insights for lecturers and universities to strengthen students' self-efficacy and promote the effective and responsible use of AI in grammar instruction. Future studies are recommended to investigate additional factors and involve more diverse samples to provide a more comprehensive understanding of students' use of AI-based applications in language learning.

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