Journal of English Language and Education
ISSN 2597- 6850 (Online), 2502-4132 (Print)
Journal Homepage: https://jele.or.id/index.php/jele/index

OPEN ACCESS Article

Do Gender and Academic Anxiety Associate with AI Utilization in English Grammar Courses?

https://doi.org/10.31004/jele.v11i3.2126

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A B S T R A C T

The growing use of artificial intelligence (AI) in English grammar learning brought attention to the role of internal factors in students' use of technology. While similar studies focused on demographic and affective factors, the importance of the routine academic setting is yet to be explored. This study examines the relationship between gender and academic anxiety on students' AI utilization in English Grammar Courses. A quantitative design was used in an ex post facto study with 123 fourth-semester students of the English Education department of a public university in North Bali. Data were collected by a survey of questionnaires about academic anxiety and AI utilization, and were analyzed using multiple linear regression. The results indicate that gender and academic anxiety do not significantly associate with AI utilization ($p > 0.05$), with a low R^2 value (0.001), suggesting that AI functions as a standardized and institutionalized learning activity across diverse student profiles. These results underscore the significance of context and instructional design in AI-assisted language learning.

Keywords: *Gender, Academic anxiety, AI utilization, English Grammar*

Article History:
Received 30th January 2026
Accepted 26th May 2026
Published 28th May 2026

INTRODUCTION

Artificial intelligence (AI) technologies have gradually transformed learning practices across higher education, particularly in English language learning (Novita, 2023; Rani & Wahyuni, 2025). AI-based applications are not only as learning tools but are increasingly embedded in students' daily academic practices, offering real-time feedback and helping students' learning progress (Du & Daniel, 2024; Lalira et al., 2024). Grammar learning, which traditionally relies on repeated practice, explicit feedback, and careful monitoring of accuracy, appears particularly compatible with AI-supported systems that can deliver immediate responses and individualized assistance (Awalin & Iftanti, 2023; Hooda et al., 2022). As a result, students now frequently engage with AI-based applications such as ChatGPT, Grammarly, QuillBot, and ProWritingAid when completing grammar-related tasks (Damayanti & Santosa, 2024; Kusuma et al., 2024). However, the increasing integration of AI into academic routines doesn't imply that all students engage with tools to the same extent.

Although AI-based applications are widely available, this does not necessarily lead to consistent patterns of use among students (Lalira et al., 2024). Students vary in their AI utilization, confidence in using these tools, and effectiveness in integrating it into their learning (Razak et al., 2017; Zhai et al., 2024). These differences seem to suggest that the utilization of AI in language learning cannot be understood through technological capability alone, but must be examined with reference to students' individual factors that influence students' AI utilization, namely gender (Fazal et al., 2024; Kim & Kim, 2022; Csizér & Albert, 2024) and academic anxiety (Li & Thien, 2025; Wen et al., 2024). This reflects the Technology Acceptance Model (TAM), which explains that technology utilization is influenced by perceived usefulness and perceived ease of use, while students' readiness to adopt technology

also contributes to their engagement with AI-based applications (Davis, 1989; Kumar & Krishnan, 2020; Parasuraman, 2000).

Individual characteristics have been gradually emphasised as influential factors for the adoption of digital tools. Students do not engage with technology as neutral users, but rather find technological affordances in their own experiences, beliefs, and affective responses (Kumar & Krishnan, 2020; Acosta-Enriquez et al., 2025). Among these characteristics, gender and affective variables have received independent and sustained scholarly attention due to their potential influence on determining attitudes toward technology use and learning behavior more generally. However, empirical findings concerned with the application of AI are inconsistent regarding learning contexts (Shomotova et al., 2025). Consequently, a study of specific individual characteristics, and more precisely gender and affective factors, will be crucial in order to understand the differential patterns of AI utilization, in particular in English grammar learning.

Gender has often been discussed as a factor that has been associated with differences in technology-related confidence, attitudes, and behavioral tendencies. Several studies report how gender has a meaningful association with the utilization of AI, and male students tend to show higher confidence and a higher propensity to experiment with new digital tools, including AI-based applications, especially in an academic setting (Fazal et al., 2024; Shomotova et al., 2025). Such tendencies have been construed to, among other things led to higher levels of AI utilization among male learners. Nevertheless, other studies have found that where access, digital literacy, and learning conditions are similar, gender-based variation decreases or becomes statistically insignificant (Jomaa et al., 2024). These contradictory findings generate set of critical questions about the potential of gender as a decisive predictor of AI utilization or moderated by contextual and psychological factors (Cislaghi & Heise, 2020).

Moreover, these findings suggest that gender on its own may not be enough of a factor in understanding the use of AI by students and that there are additional psychological factors that may influence AI utilization. In addition, academic anxiety has been well known as a key affective factor in foreign language learning (Horwitz et al., 1986; Hooda & Saini., 2017). Anxiety in educational settings often arises in the form of fear of negative evaluation and test anxiety, as well as performance-related anxiety, can undermine the ability to concentrate and have confidence as a student (Horwitz et al., 1986; Tran, 2012; Sazali et al., 2024; Fishstrom et al., 2022). In cases where learning grammar is in focus and the accuracy and correctness of the grammar are given great importance, such anxiety might be salient. Within this light, academic anxiety is discussed as a potentially influential factor that could either facilitate or impede the use of AI utilization in grammar learning.

For certain students, AI-based applications may potentially act as a compensatory tool, minimizing the uncertainty and the risk of committing grammatical mistakes, thus easing the academic pressure (Putra et al., 2024; Santosa et al., 2023). On the other hand, other studies indicates that anxiety is related to technology, which includes student fear of system malfunction and fear of technical issues, might prevent the students on a regular basis to use AI tools (Li & Thien, 2025; Yi & Chan, 2013). At the same time, evidence also shows that moderate or situational anxiety does not necessarily prohibit the AI utilization because student engagement with AI may vary in response to contextual demands, such as examination pressure and task complexity (Santosa, 2025). These opposite results indicate that the role of academic anxiety in using AI is context-dependent, which requires further research.

Although gender and academic anxiety have been examined independently in relation to technology use and language learning, limited research has investigated how these two variables interact in shaping students' utilization of AI utilization, particularly in English grammar courses at the university level. This context is important because grammar is a fundamental component of language competence and serves as the foundation for accurate speaking and writing (Ana & Ratminingsih, 2012; Dewi et al., 2020). However, compared with speaking and writing, grammar learning has received relatively less attention in previous AI-assisted language learning studies. This limited focus makes the English Grammar Course a

meaningful context for examining how gender and academic anxiety relate to students' AI utilization. Moreover, many existing studies conceptualize AI primarily as an instructional tool influencing learning outcomes, such as grammar mastery and writing performance, often using qualitative or mixed-methods approaches (Damayanti & Santosa, 2024; Dewi et al., 2020; Jaya & Susyla, 2024). Consequently, quantitative research that positions AI utilization as a dependent variable influenced by student characteristics remains limited. Despite growing studies in gender and academic anxiety as separate predictors of AI use, previous studies remain limited regarding their combined influence on students' AI utilization applications in in English Grammar Courses.

Addressing these gaps, the present study investigates the association between gender and academic anxiety on fourth-semester students'AI utilization in an English Grammar Course. By conceptualizing AI utilization as the outcome variable and employing regression-based analysis, this study aims to clarify contradictory findings in previous study and to contribute empirical evidence on how individual differences shape AI-assisted grammar learning in an English as a foreign language context.

Literature Review

Artificial intelligence in educational contexts refers to computational systems designed to perform tasks that typically require human intelligence, including pattern recognition, adaptive feedback, and automated language analysis (Rukiati et al., 2023; Suntharalingam, 2024). AI utilization refers to the extent to which AI-based technologies are used to support task completion and decision making in order to enhance productivity and value creation (Grebe et al., 2023; Leddy & McCreanor, 2024).

Through several features such as fast data analysis, language processing, and real-time feedback, artificial intelligence has been widely used for various industries, including English language learning to help students with their linguistic task both textual comprehension and immediate spoken interaction (Kristiawan et al., 2024; Pratiwi et al., 2024; Wang, 2024). AI-based applications are used for grammar-related tasks such as error detection, sentence revision and improvement of language production and spoken and written language (Dewi et al., 2020; Normawati, 2023). These tools analyse the input that the learner provides to the platform and generate feedback intended to guide the learner to more accurate and appropriate language usage. Grammar learning has long been recognized as an area for long-standing practice and timely feedback (Paramarta, 2022). However, traditional classroom instruction is frequently limited by a shortage of available instructional time to deliver feedback as well as having large class sizes, which may limit the ability of teachers to provide individualized feedback. Accordingly, AI-based applications have been suggested as supplementary resources extending the learning opportunities beyond the classroom by providing continuous and automated feedback (Dewi et al., 2020).

Gender is widely conceptualised as a socially constructed variable, which influences the attitudes, confidence and tendency of behaviour of individuals in educational and technological variables (Tannenbaum et al., 2016; Cislaghi & Heise, 2020).Gender is constructed by norms, culture and social expectations about the identities and traits of males and females. Gender is established by biological factors and also created through social interaction and cultural assumptions on how people are meant to behave within society (Zahroh, 2016; Noerviany, 2023). In studies of technology use, gender differences have often been attributed to gender differences in confidence, interest, and prior experience, which may affect the willingness of the learner to adopt emerging digital tools. Previous research on language learning situations has largely yielded inconclusive outcomes when examining the gender and technology use. While some research suggests that a greater technology uptake exists in male students, some studies suggest that these disparities reduce when both conditions of learning and digital competence are similar (Csizzer & Albert, 2024; Jomaa et al., 2024).

In addition, academic anxiety is one factor that can affect AI utilization in English language learning. Academic anxiety is commonly defined as a situation-specific emotional response characterized by tension, apprehension, and concern related to academic

performance (Hooda & Saini, 2017; Horwitz et al., 1986). In foreign language learning, anxiety has been associated with fear of negative evaluation, test anxiety, and communication apprehension, all of which may interfere with cognitive processing and learning engagement (Horwitz et al., 1986). Communication apprehension involves learners' anxiety toward speaking and listening activities, which often result reluctance to participate in language use. Test anxiety reflected excessive concern related to language assessments, including fear of failure in oral and written tasks. Moreover, fear of negative evaluation relates to apprehension about negative judgments of students and language competence. When experienced persistently, these forms of anxiety may diminish learning motivation and foster negative self-perceptions among students (Putra et al., 2024). In AI-supported learning, anxiety may operate in complex ways. AI-based applications may reduce anxiety by providing private, non-judgmental feedback that allows learners to practice without fear of public error (Santosa et al., 2023). Students with higher academic anxiety tend to rely more on external academic support, including AI-based applications, particularly when facing accuracy tasks such as grammar exercises (Zhou, 2024). On the other hand, anxiety related to technology use and uncertainty about AI reliability may inhibit students' willingness to rely on automated systems (Li & Thien, 2025). These contrasting perspectives highlight the need for empirical investigation into how academic anxiety shapes students' utilization of AI-based applications in grammar course contexts.

In AI-supported learning, anxiety could work in multifaceted ways. AI-based applications have potential for reducing anxiety, by providing private, not judgmental feedback for learners to practice without the fear of making mistakes in front of others (Santosa et al., 2023). Students who feel greater levels of academic anxiety have a greater tendency to seek more support from external sources of academic assistance, including AI-based applications, especially when faced with accuracy-oriented tasks, such as grammar exercises (Zhou, 2024). On the contrary, technology-related anxiety and doubts about the reliability of AI systems may affect the willingness of students to rely on automated systems (Li & Thien, 2025). These contradictory views highlight the need for empirical research on the effects of academic anxiety on the use of AI-based applications in the context of grammar courses.

Grammar is a system of rules that helps the learner to create clear and meaningful sentences by using the right structure of the sentence along with tenses, word order, and word formation (Ana & Ratminingsih, 2012; Paramarta, 2022). In English courses, grammatical competence is the key to being able to speak and write successfully (Dewi et al., 2020; Normawati, 2023). Nevertheless, students have often experienced problems because of insufficient practice, first language interference, and incorrect use of tense and word order (Dewi et al., 2020; Ratminingsih et al., 2022). To overcome these challenges, grammar learning has adopted the deductive and inductive approaches and the use of technologies in supporting learning, which are proven to improve the students' mastery of grammar in a more interactive learning environment (Ana & Ratminingsih, 2012; Dewi et al., 2020).

METHOD

This study employed a quantitative approach with an ex post facto design to investigate the association of gender and academic anxiety on students' AI utilization in an English Grammar Course. The research technique was conducted at a public university in North Bali, Indonesia. The participants consisted of 123 fourth-semester students enrolled in the English Language Education Program, selected through proportional random sampling based on the gender composition of the population to ensure representative participation. A survey method was applied, with data collected through two questionnaires, namely the Academic Anxiety Questionnaire, using a Likert scale adapted from the Foreign Language Classroom Anxiety (FLCAS) from Horwitz et al. (1986); and the AI Utilization Questionnaire, which includes dimensions of perceived usefulness (PU) and perceived ease of use (PEOU) from Davis (1989) and user readiness (UR) from Parasuraman (2000). Both instruments employed a 4-point Likert scale ranging from strongly disagree to strongly agree. The

questionnaires also include a section for respondents to indicate their gender (male or female). Before data collection, the instruments were evaluated through expert judgment and empirical validity testing. The empirical validity test indicated that 26 items of the Academic Anxiety Questionnaire and all 15 items of the AI Utilization Questionnaire fulfilled the required validity criteria. Furthermore, the Academic Anxiety Questionnaire demonstrated excellent reliability with a Cronbach's alpha of 0.934, while the AI Utilization Questionnaire obtained a Cronbach's alpha of 0.912, indicating high internal consistency.

The collected data were analyzed using descriptive statistics and multiple linear regression to identify both individual and simultaneous association of the independent variables on AI utilization. Descriptive statistics included the calculation of mean scores and standard deviations to describe students' levels of academic anxiety and AI utilization. To facilitate interpretation, the scores were categorized into low, moderate, and high levels using the Equal Interval Method proposed by Pimentel (2019), in which the total theoretical score range was divided into three equal categories. Before conducting the regression analysis, prerequisite assumption tests, including normality, multicollinearity, and linearity tests, were carried out to ensure that the data met the assumptions required for multiple linear regression analysis.

Table 1. Research Method Overview

Aspect	Description
Research Design	Quantitative, ex post facto design
Research Setting	Public university in North Bali, Indonesia
Participant	Fourth-semester EFL students selected through proportional random sampling
Data Collection	Survey
Instrument	Academic Anxiety Questionnaire (adapted from FLCAS) and AI Utilization Questionnaire (PU, PEOU, UR)
Data Analysis	Descriptive statistics and Multiple Linear Regression with prerequisite assumption tests

The study was conducted through several stages. Initially, relevant theoretical frameworks and empirical literature were reviewed in order to establish the research framework and operational variables. Subsequently, measurement instruments were drawn from scales that have been tested and refined to fit the context of the particular study. After the instruments had fulfilled the content and empirical validity criteria, the questionnaires were distributed to the selected participants. Following the data analysis, descriptive statistics were first conducted to examine the distribution of the data, followed by prerequisite assumption tests for regression analysis. Finally, the data were analyzed to examine the effects of gender and academic anxiety on students'AI utilization, and the findings were interpreted in relation to previous studies.

FINDINGS AND DISCUSSION

The study involved 123 fourth-semester students from an English Language Education program at a public university in North Bali, consisting of 33 male students (26.82%) and 90 female students (73.17%) as presented in Table 2. The descriptive statistics indicate that students experienced a moderate level of academic anxiety (M = 64.91). Similarly, students also demonstrated a moderate level of AI utilization in English Grammar Course (M = 44.26).

In addition, female students reported higher academic anxiety (M = 69.21) than male students (M = 53.18). However, both groups demonstrated relatively similar levels of AI utilization. Male students obtained a mean AI utilization score of 44.30 , while female students obtained a mean score of 44.24. These findings indicate that differences in academic anxiety between male and female students were not accompanied by substantial differences in AI utilization.

Table 2. Descriptive Statistics of Gender, Academic Anxiety, and AI Utilization

Variable	Category	Mean	Frequency & Percentage
Gender	Male	-	33 (26.82%)
	Female	-	90 (73.17%)
Academic Anxiety	Overall	64.91	-
	Male	53.18	-
	Female	69.21	-
AI utilization	Overall	44.26	-
	Male	44.30	-
	Female	44.24	-

Note. Academic anxiety scores were categorized as low (26.00–52.00), moderate (52.01–78.00), and high (78.01–104.00). AI utilization scores were categorized as low (15.00–30.00), moderate (30.01–45.00), and high (45.01–60.00).

Before conducting the multiple linear regression analysis, prerequisite assumption tests were carried out to ensure that the data met the statistical assumptions required for regression analysis.

Table 3. Results of Prerequisite Assumption Tests

Test	Indicator	Result	Criteria	Conclusion
Normality	Kolmogorov–Smirnov Sig.	0.00	Visual inspection acceptable	Normal
Linearity	Deviation from Linearity	0.092	> 0.05	Linear
Multicollinearity	Tolerance	0.887	> 0.10	No multicollinearity
	VIF	1.127	< 10.00	No multicollinearity
Heteroscedasticity	Glejser Sig. (Academic Anxiety)	0.477	> 0.05	No heteroscedasticity

Table 3 shows that the data fulfilled the assumptions required for multiple linear regression analysis. Although the Kolmogorov–Smirnov test produced a significant result, the normal probability plot indicated that the residuals were approximately normally distributed. The linearity test showed a deviation from linearity significance value of 0.092, indicating a linear relationship between academic anxiety and AI utilization. The multicollinearity test also demonstrated acceptable tolerance and VIF values, suggesting that no multicollinearity problem existed among the independent variables. In addition, the Glejser test indicated no heteroscedasticity issue for the academic anxiety variable. Therefore, the data were considered suitable for further regression analysis.

In addition, multiple linear regression analysis was conducted to test the association of gender and academic anxiety on students' AI utilization in an English Grammar Course. The results presented in Table 3 indicate that neither gender nor academic anxiety significantly predicted students' AI utilization. Gender showed a regression coefficient of $\beta = -0.149$, with $t = -0.165$ and $p = 0.869$, indicating no statistically significant difference in AI utilization between male and female students. Similarly, academic anxiety was not found to significantly influence AI utilization, as reflected by $\beta = 0.013$, $t = 0.298$, and $p = 0.766$. This result indicates that variations in students' academic anxiety levels were not accompanied by substantial differences in their AI utilization.

Table 4. Summary of Hypothesis Testing Results

Hypothesis	Predictor(s)	Statistical Value	p-value
H1	Gender → AI Utilization	$\beta = -0.149$, $t = -0.165$	0.869
H2	Academic Anxiety → AI Utilization	$\beta = 0.013$, $t = 0.298$	0.766
H3	Gender & Anxiety → AI Utilization	$F = 0.047$	0.954
Model Summary	Explanatory Power	$R^2 = 0.001$, Adjusted $R^2 = -0.016$	-

Furthermore, the simultaneous regression analysis demonstrated that gender and academic anxiety did not significantly associate with students' AI utilization when examined together. The regression model produced $F = 0.047$ with $p = 0.954$, indicating that the overall model was not statistically significant. In addition, the regression model demonstrated very limited explanatory power, with $R^2 = 0.001$ and Adjusted $R^2 = -0.016$, suggesting that gender and academic anxiety explained only a minimal proportion of the variance in students' AI utilization.

Disscusion

This study seeks to investigate whether gender and academic anxiety are associated with students' AI utilization in the English Grammar Course. The results consistently reveal that neither of the variables has a significant influence on the use of AI, which indicates a change in the function of AI in the current context of English grammar learning.

First, the absence of a significant gender association suggests that AI utilization in English Grammar Courses is no longer differentiated by gender. Although male students demonstrated slightly greater variation in AI utilization, the nearly identical mean scores between male and female students suggest that AI functions as a shared academic tool rather than a technology associated with gender identity. This finding contrasts with previous studies that reported gender differences in AI utilization in language learning contexts (Fazal, 2024; Shomotova et al., 2024), but supports the findings of (Jomaa et al., 2024), which showed that gender differences tend to diminish when students experience similar academic demands and equal access to technology. This finding can also be interpreted through (Davis, 1989) Technology Acceptance Model (TAM), particularly the concept of perceived usefulness, which explains that students tend to adopt technology when it is perceived as beneficial for improving academic performance. Within the English Language Education program at Undiksha, AI appears to be viewed by both male and female students as a practical and necessary tool for supporting grammar learning. As a result, the functional value of AI becomes more dominant than demographic differences. This finding indicates the normalization of AI in higher education, where students use AI primarily because it supports academic tasks and has become integrated into daily learning practices.

Similarly, academic anxiety was not significantly associated with students' AI utilization. Although students reported moderate levels of academic anxiety, these emotional conditions did not appear to affect their AI utilization. Previous studies suggested that anxiety may inhibit AI utilization, particularly when students experience technological uncertainty or fear of failure (Li & Thien, 2025; Wen, 2024). However, the findings of this study indicate a different pattern. This result aligns with (Horwitz et al., 1986), who explain that academic anxiety is often associated with evaluative situations such as fear of negative evaluation and performance pressure. In the present context, AI was mainly used as a self-directed learning support tool rather than as part of a direct formal assessment. Consequently, students may have perceived AI as a low-risk learning environment that allowed them to check grammar accuracy independently without immediate social evaluation. This interpretation is also consistent with (Santosa, 2025), who emphasized that anxiety is highly situational and depends on the learning environment rather than the technology itself. In addition, the findings reinforce (Davis, 1989) TAM framework, suggesting that the perceived usefulness of AI may outweigh affective barriers. Students continued using AI because it was considered functionally helpful for completing grammar-related tasks, even when they experienced moderate anxiety. Thus, academic anxiety in this study did not function as a strong predictor of AI utilization.

Furthermore, neither gender nor academic anxiety had a significant association with students' AI utilization, suggesting that AI utilization is influenced more by contextual and pedagogical factors than by demographic or emotional differences. Male and female students exhibited nearly identical levels of AI utilization, while variations in anxiety levels did not correlate with significant differences in AI utilization behavior. These findings suggest that AI utilization in the English Language Education program at Undiksha has become part of a

shared academic culture in which students collectively rely on AI to support grammar learning. The integration of AI into daily learning activities may have reduced the influence of individual differences because students interact with AI under relatively similar learning conditions and academic expectations. The very low explanatory power of the regression model further reinforces that factors beyond gender and anxiety likely play a more significant role in shaping AI utilization. Factors such as instructional design, accessibility of AI tools, and students' perceptions of usefulness may have stronger associations with AI utilization than demographic or affective variables. Therefore, these findings imply that AI utilization in grammar learning is primarily associated with functional academic needs and learning practices rather than with students' gender or anxiety levels.

These findings imply that lecturers and curriculum developers may focus more on designing meaningful and ethical AI-integrated learning activities rather than differentiating instructional strategies based on gender or students' anxiety levels. Since AI utilization appears to be driven more strongly by learning demands and perceived usefulness, the integration of AI in grammar learning should emphasize pedagogical relevance, accessibility, and responsible academic utilization.

CONCLUSIONS

This study concludes that gender and academic anxiety did not significantly associate with students' AI utilization in the English Grammar Course, either individually or in combination. Male and female students exhibited relatively similar patterns of AI utilization, while differences in academic anxiety levels were not associated with significant differences in students' AI utilization. These findings suggest that AI has become a relatively normalized academic learning tool in the English Language Education program at Undiksha, where students tend to use AI primarily for its functional value in supporting grammar learning, rather than due to demographic or emotional factors. These findings also imply that instructors should focus more on designing learning activities that are meaningfully integrated with AI and on strengthening students' AI literacy and ethical awareness, rather than tailoring instruction based on gender or anxiety levels. However, this study is limited to a single academic setting with relatively similar learning conditions and access to AI tools, while other potentially influential variables were not included in the model. Therefore, future research is recommended to investigate broader contextual and pedagogical factors related to AI utilization across various educational settings and more diverse research approaches.

ACKNOWLEDGEMENTS

The authors would like to express their sincere gratitude to the Faculty of Language and Arts and the English Language Education Program of the host university for allowing and providing institutional support that made the data collection process possible. The authors also express their appreciation to the students who willingly participated in this study for their time and cooperation. In addition, the authors acknowledge the academic supervisor for valuable direction and constructive feedback throughout the preparation and polishing of this manuscript.

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