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AI-assisted L2 learning attitudes and willingness to communicate: the mediating role of language anxiety

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ABSTRACT

This study investigated the mediating role of skill-based foreign language anxiety (FLA) in the relationship between attitudes toward AI-assisted second language (L2) learning and willingness to communicate (WTC) among Egyptian English as a foreign language (EFL) student teachers. Using a cross-sectional correlational design, 853 participants from Al-Azhar University completed the AI-assisted L2 learning attitude scale (AL2AS), the skill-based foreign language learning anxiety scale, and the WTC scale. Mediation analysis using the PROCESS macro with 5,000 bootstrap samples revealed that AI-assisted learning attitudes positively predicted WTC (β=.288) and negatively predicted skill-based FLA (β=-.206), while skill-based FLA negatively predicted WTC (β=-.202). The indirect effect through skill-based FLA was significant (β=.042, 95% confidence interval (CI) [.020, .068]), indicating partial mediation accounting for 14.3% of the total effect. This study focuses on student teachers in the Egyptian EFL context, distinguishing anxiety patterns across language competencies using a skill-based anxiety measure. It reveals that positive attitudes towards artificial intelligence (AI) enhance communicative readiness by reducing anxiety. Although the cross-sectional design limits causal inference, the findings advocate integrating AI tools into teacher education to create supportive environments that promote communicative competence, addressing a gap in research in this area.

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1. INTRODUCTION

In the contemporary globalized landscape, communication competence in foreign language learning has emerged as a critical educational priority shaped by three interconnected phenomena. English has solidified its position as the primary lingua franca for international communication, business, and digital interaction, making English proficiency essential for global participation across diverse linguistic and cultural contexts [1], [2]. Concurrently, modern language education now emphasizes not merely linguistic accuracy but skilled communication, intercultural awareness, and adaptability—competencies vital for navigating multicultural environments and solving problems in an interconnected world [3]. Moreover, second language (L2) acquisition has gained recognition for its cognitive, social, and economic benefits, enhancing employability and social integration while preparing future educators and professionals for cross-border

collaboration and global citizenship [4], [5]. Teacher education programs increasingly focus on preparing instructors to teach English as an international language, embracing communicative effectiveness and 21st-century skills development [6], [7].

Willingness to communicate (WTC) in a L2 is a learner's psychological readiness to initiate discourse with specific interlocutors under particular temporal and contextual conditions. As a fundamental construct in L2 acquisition, WTC serves as a robust predictor of communicative behavior, significantly determining the frequency and quality of learners' target language engagement, thereby directly influencing the development of communicative competence and overall linguistic proficiency [8]–[10]. Empirical evidence consistently establishes positive correlations between WTC and critical variables including language proficiency, as well as affective factors such as self-confidence and intrinsic motivation [11], [12]. Within the context of teacher education, WTC assumes paramount significance, as student teachers must not only cultivate their own linguistic competencies but also exemplify effective communication strategies that their future learners will emulate [13]–[15]. Consequently, their demonstrated WTC fundamentally shapes pedagogical climate and exerts substantial influence on learners' communicative engagement and confidence.

Among the multifaceted challenges confronting L2 learners, skill-based foreign language anxiety (FLA) is the most pervasive psychological barrier, significantly impeding WTC, particularly in oral contexts [16], [17]. Skill-based FLA manifests as general apprehension, fear of negative evaluation, and heightened nervousness during speaking activities [18], [19]. This affective construct consistently demonstrates detrimental effects on learners' communication confidence and self-perceived competence, often resulting in avoidance behaviors and diminished oral performance [20], [21]. The cognitive interference induced by anxiety impairs real-time language processing, leading to increased disfluencies and hesitancy [22], [23]. Consequently, skill-based FLA creates a self-perpetuating cycle in which heightened anxiety reduces speaking opportunities, thereby limiting proficiency development and reinforcing learners' reluctance to engage in authentic L2 communication [24].

The integration of technology into foreign language teaching has undergone substantial transformation over the past six decades, fundamentally reshaping pedagogical practices and learner experiences. Computer-assisted language learning (CALL) emerged in the 1960s with mainframe-based drill-and-practice programs, subsequently evolving through phases of restricted, open, and integrated approaches that emphasized increasingly interactive and communicative methodologies [25], [26]. Contemporary digital innovations have expanded beyond traditional CALL frameworks to encompass mobile-assisted language learning, computer-mediated communication, and artificial intelligence (AI)-driven platforms, providing learners with unprecedented access to authentic materials, diverse multimedia resources, and personalized learning experiences [27]. This technological evolution has catalyzed a paradigm shift from teacher-centered, grammar-focused instruction toward digitally enhanced, learner-centered environments that promote autonomy, cultural competence, and practical language use [28]–[30]. Consequently, technology has transitioned from a supplementary instructional aid to an integral component of contemporary language education ecosystems.

The transformative potential of AI in L2 learning environments has emerged through the development of sophisticated tools that fundamentally reshape pedagogical approaches and learner experiences. AI-powered technologies, including chatbots, adaptive learning platforms, and intelligent tutoring systems, leverage natural language processing and machine learning algorithms to deliver highly personalized instruction tailored to individual proficiency levels and learning trajectories [31]–[33]. These innovations provide immediate, contextualized feedback that enables real-time error correction and accelerates skill development [34], [35]. Critically, AI-mediated learning environments establish low-pressure, non-judgmental practice spaces that significantly reduce communication anxiety while enhancing learner confidence and WTC [36]–[38]. This confluence of personalization, immediacy, and psychological safety positions AI as a potentially transformative force in contemporary L2 pedagogy.

Learner attitudes toward AI-assisted tools fundamentally shape technology acceptance and engagement in language learning contexts. The technology acceptance model (TAM) demonstrates that perceived usefulness and ease of use significantly influence learners' attitudes, which subsequently predict their intention to adopt and persist with AI-enhanced language learning tools [39], [40]. Positive attitudes toward AI applications correlate strongly with heightened motivation, sustained engagement, and enhanced self-efficacy among language learners [41]–[44]. Conversely, negative perceptions and technology-related anxiety impede effective utilization and diminish learning outcomes [45]. Understanding these attitudinal factors proves essential for maximizing AI integration effectiveness in language education, as learners' psychological dispositions toward technology directly mediate their willingness to engage with AI-powered learning environments and sustain long-term learning behaviors.

The theoretical relationship among AI-assisted learning attitudes, skill-based FLA, and WTC is characterized by complex mediating pathways that warrant scholarly examination. Research demonstrates

that positive attitudes toward AI-enhanced language instruction significantly influence learners' self-efficacy and emotional responses, which subsequently affect their communicative behaviors [46], [47]. Skill-based FLA, recognized as a robust negative predictor of WTC, functions as a critical mediator in this relationship [11], [48], [49]. Mediation occurs when AI literacy and favorable attitudes toward AI tools reduce anxiety levels and enhance self-efficacy, thereby indirectly increasing learners' WTC [37], [50]. AI-integrated technologies create supportive, low-pressure learning environments that address affective barriers by providing personalized feedback and anonymity, thereby mitigating anxiety and fostering communicative confidence [51]. Consequently, understanding these mediated relationships is essential for optimizing AI implementation in foreign language pedagogy.

Despite the growing body of research on AI in L2 education, significant gaps persist in understanding the complex relationships between AI attitudes, anxiety, and WTC. Empirical studies examining the mediating mechanisms linking AI attitudes to WTC remain limited, with most research relying on cross-sectional designs that constrain causal inference [46], [52]. More critically, student teachers represent an underexplored population, as existing literature predominantly focuses on in-service teachers or general learner populations [53], [54]. Furthermore, theoretical and practical frameworks for leveraging AI integration to address affective barriers in teacher preparation programs remain underdeveloped [55]–[57]. This gap is particularly concerning given that pre-service teachers' emotional readiness and communicative confidence are fundamental to their professional development and future pedagogical effectiveness. The present study addresses this gap by examining skill-based anxiety as a mediating mechanism linking AI attitudes to WTC specifically among Egyptian English as a foreign language (EFL) student teacher—a population and context previously unexplored in AI-assisted language learning research.

Given the critical importance of WTC for student teachers' professional development and the emerging role of AI in language education, this study aimed to investigate the relationships among AI-assisted L2 learning attitudes, skill-based FLA, and WTC among Egyptian EFL student teachers. Specifically, the study examined whether skill-based FLA serves as a mediating mechanism through which attitudes toward AI-assisted learning influence communicative readiness. Understanding these relationships is essential for optimizing AI integration in teacher preparation programs and addressing affective barriers that impede communicative competence. Accordingly, this study addressed the following research questions:

- What are the relationships among AI-assisted L2 learning attitudes, skill-based FLA, and WTC among EFL student teachers?
- Does skill-based FLA mediate the relationship between AI-assisted L2 learning attitudes and WTC?

2. METHOD

2.1. Research design

This study employed a cross-sectional correlational design to examine the relationships among AI-assisted L2 learning attitudes, skill-based FLA, and WTC among Egyptian EFL student teachers. A mediation model was tested to determine whether skill-based FLA mediates the relationship between AI-assisted learning attitudes and WTC. Data were collected electronically via Google Forms during the second semester of the 2024/2025 academic year.

2.2. Participants

A convenience sampling method was employed to recruit participants from accessible student populations at Al-Azhar University. Participants were selected based on their availability and willingness to participate in the study during the data collection period. This non-probability sampling approach was chosen due to practical constraints and the exploratory nature of the research. The sample size was determined based on recommendations for structural equation modeling and mediation analysis. Following guidelines by Kline [58] suggesting a minimum of 200 participants for structural equation modeling (SEM) analyses, and considering the number of observed variables and expected effect sizes, a target sample of at least 700 participants was established. The final samples exceeded this threshold, with 742 participants in the psychometric validation sample and 853 in the main analysis sample, providing adequate statistical power for the planned analyses.

Participants were included in the study if they met the following criteria: i) current enrollment as student teachers in English or French language education programs at Al-Azhar University; ii) age between 18 and 25 years; iii) self-reported experience using at least one AI-assisted language learning tool (e.g., ChatGPT, Duolingo, Grammarly, or other AI-powered applications); and iv) voluntary provision of informed consent to participate in the study. Exclusion criteria included: i) incomplete survey responses with more than 10% missing data across all instruments; ii) evidence of patterned or careless responding identified through attention check items embedded within the questionnaires; iii) participants who reported no prior

exposure to any AI-assisted language learning technologies; and iv) participants who withdrew consent during the data collection process.

The psychometric validation sample consisted of 742 participants who completed all study instruments, while the main sample for hypothesis testing comprised 853 participants. Participants' ages ranged from 18 to 23 years, with a mean age of 19.62 (SD=1.28) for the psychometric sample and 20.32 (SD=1.52) for the main sample. In the main sample, the majority were enrolled in English language education programs (71.3%, n=608), with 28.7% (n=245) majoring in French. Academic year distribution was relatively balanced across first year (12.9%, n=110), second year (25.8%, n=220), third year (37.7%, n=322), and fourth year (23.6%, n=201). Both language proficiency and AI proficiency levels were self-reported using a three-category classification system (beginner, intermediate, and advanced). For language proficiency, participants assessed their overall competence in their target language, with most rating themselves at intermediate level (71.7%, n=612), followed by advanced (17.4%, n=148) and beginner (10.9%, n=93). For AI proficiency, participants evaluated their familiarity and competence with AI-assisted language learning tools, with the majority reporting intermediate proficiency (66.2%, n=565), followed by beginner (23.6%, n=201) and advanced (10.2%, n=87). Table 1 presents complete demographic characteristics of both samples.

Table 1. Demographic characteristics of study participants

Variable	Category	Psychometric Sample (N=742)			Main Sample (N=853)		
		F	%	Cum. %	F	%	Cum. %
Gender	Male	315	42.5	42.5	474	55.6	55.6
	Female	427	57.5	100.0	379	44.4	100.0
Academic year	First year	274	36.9	36.9	110	12.9	12.9
	Second year	63	8.5	45.4	220	25.8	38.7
	Third year	161	21.7	67.1	322	37.7	76.4
	Fourth year	244	32.9	100.0	201	23.6	100.0
Major	French	174	23.7	23.7	245	28.7	28.7
	English	566	76.3	100.0	608	71.3	100.0
Language proficiency level	Beginner	92	12.4	12.4	93	10.9	10.9
	Intermediate	513	69.1	81.5	612	71.7	82.6
	Advanced	137	18.5	100.0	148	17.4	100.0
AI proficiency level	Beginner	245	33.0	33.0	201	23.6	23.6
	Intermediate	443	59.7	92.7	565	66.2	89.8
	Advanced	54	7.3	100.0	87	10.2	100.0

Note. F=frequency; %=percentage; Cum. %=cumulative percentage

2.3. Instruments

The AI-assisted L2 learning attitude scale (AL2AS), developed and validated by Wu *et al.* [59], was used to measure participants' attitudes toward using AI tools in second-language learning. The scale comprises 12 items distributed across two dimensions: The cognitive component, which measures students' beliefs and perceptions of AI's usefulness in language learning, and the behavioral component, which assesses students' intentions and readiness to use AI tools for language learning. Participants responded using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Confirmatory factor analysis (CFA) was conducted to verify the factorial structure of the Arabic version of the scale. The results indicated acceptable model fit indices: $\chi^2(53)=224.091$, $p<.001$, degrees of freedom ratio (χ^2/df)=4.228, goodness of fit index (GFI)=.950, adjusted goodness of fit index (AGFI)=.926, normed fit index (NFI)=.932, comparative fit index (CFI)=.947, Tucker-Lewis index (TLI)=.934, and root mean square error of approximation (RMSEA)=.066 (90% CI: .057–.075). Reliability analysis revealed adequate estimates for the cognitive component (ω=.770, α=.767), the behavioral component (ω=.855, α=.856), and the total scale (ω=.884, α=.884).

The skill-based FLA scale, developed by Öztürk *et al.* [60] was employed to assess participants' anxiety levels across the four language skills. Unlike general FLA measures that assess overall language learning apprehension, skill-based FLA examines anxiety across the four distinct language competencies: writing, reading, speaking, and listening. The scale consists of 46 items measuring four dimensions: writing anxiety (9 items), reading anxiety (11 items), speaking anxiety (12 items), and listening anxiety (14 items). Responses were recorded on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). CFA results demonstrated acceptable model fit: $\chi^2(978)=2963.980$, $p<.001$, $\chi^2/df=3.031$, GFI=.839, NFI=.862, CFI=.903, TLI=.897, and RMSEA=.052. The subscales demonstrated excellent reliability estimates: writing anxiety (ω=.882, α=.881), reading anxiety (ω=.906, α=.905), speaking anxiety (ω=.930, α=.926), listening anxiety (ω=.929, α=.929), and the total scale (ω=.969, α=.969).

The willingness to communicate scale (WTCS), developed by Dewaele [50], was used to assess participants' readiness to engage in foreign-language communication across various situations. The scale comprises 6 items with responses recorded on a 5-point scale ranging from 1 (almost never willing) to

5 (almost always willing). Total scores were computed by summing all item responses. CFA yielded excellent model fit indices: $\chi^2(7)=5.700$, p=.575, $\chi^2/df=0.814$, GFI=.997, AGFI=.992, NFI=.998, CFI=.999, TLI=.998, and RMSEA=.034. The scale demonstrated strong reliability (ω=.897, α=.898).

2.4. Translation procedures

All instruments were originally developed in English and were translated into Arabic, the native language of participants, following established translation procedures. The translation process involved four expert translators who performed forward and backward translation to ensure conceptual equivalence and linguistic accuracy. The Arabic versions were administered to participants to enhance comprehension and response validity.

2.5. Data analysis

Data were analyzed using SPSS-27 and AMOS-26. CFA was conducted to examine the factorial validity of each instrument, while reliability was assessed using Cronbach's alpha (α) and McDonald's omega (ω) coefficients. Pearson correlation coefficients were computed to examine bivariate relationships among study variables. Common method bias was assessed using Harman's single-factor test to evaluate whether a substantial portion of variance could be attributed to a single latent factor. Mediation analysis was conducted using the PROCESS macro (Model 4) with 5,000 bootstrap samples and 95% confidence intervals (CI) to test whether skill-based FLA mediates the relationship between AI-assisted L2 learning attitudes and WTC.

3. RESULTS

3.1. Preliminary analyses

Prior to testing the hypothesized mediation model, Pearson correlation coefficients were computed to examine the bivariate relationships among study variables. Common method variance was assessed using Harman's single-factor test, which indicated that the first unrotated factor accounted for 37.574% of the total variance, below the 50% threshold, suggesting that common method bias was not a significant concern. Table 2 presents the complete correlation matrix for all study variables.

The results revealed that AI-assisted L2 learning attitudes were significantly and positively correlated with WTC (r=.288, p<.01) and negatively correlated with skill-based FLA (r=-.206, p<.01). Skill-based FLA was significantly and negatively correlated with WTC (r=-.253, p<.01), with speaking anxiety showing the strongest relationship (r=-.256, p<.01). These significant correlations among the three main variables satisfied the preconditions for conducting mediation analysis.

Table 2. Correlation coefficients among AI-Assisted L2 learning attitudes, skill-based FLA, and WTC

Variable	1	2	3	4	5	6	7	8	9
1. Cognitive component	1								
2. Behavioral component	.725**	1							
3. AL2AS total	.923**	.934**	1						
4. Writing anxiety	-.169**	-.170**	-.183**	1					
5. Reading anxiety	-.169**	-.177**	-.187**	.828**	1				
6. Speaking anxiety	-.164**	-.166**	-.178**	.747**	.804**	1			
7. Listening anxiety	-.209**	-.182**	-.210**	.757**	.811**	.846**	1		
8. Skill-based FLA total	-.194**	-.189**	-.206**	.890**	.929**	.928**	.937**	1	
9. WTC	.259**	.276**	.288**	-.183**	-.237**	-.256**	-.244**	-.253**	1

Note. **p<.01 (two-tailed).

3.2. Mediation analysis

The PROCESS macro (Model 4) with 5,000 bootstrap samples was employed to test whether skill-based FLA mediates the relationship between AI-assisted L2 learning attitudes and WTC. The total effect model revealed that AI-assisted L2 learning attitudes explained 8.30% of the variance in WTC (R^2=.083), which increased to 12.20% (R^2=.122) when the mediator was included. Table 3 presents the regression coefficients for all paths in the mediation model, Figure 1 illustrates the mediation model with standardized path coefficients, and Table 4 summarizes the total, direct, and indirect effects.

The results indicated that AI-assisted L2 learning attitudes significantly predicted lower skill-based FLA (β=-.206, p<.001), which in turn predicted reduced WTC (β=-.202, p<.001). The bootstrap analysis confirmed that the indirect effect was statistically significant (β=.042, 95% CI [0.020, 0.068]), as the CI did not include zero. The direct effect remained significant (β=.247, p<.001), indicating partial mediation: skill-based FLA accounted for 14.3% of the total effect, while the direct pathway accounted for 85.7%.

Table 3. Unstandardized and standardized regression coefficients for the mediation model predicting WTC

Outcome	Predictor	β	B	SE	t	p	95% CI
Skill-based FLA	AL2AS	-.206	-1.078	.175	-6.148	<.001	[-1.422, -.734]
WTC	AL2AS	.247	.198	.026	7.507	<.001	[.146, .250]
WTC	Skill-based FLA	-.202	-.031	.005	-6.140	<.001	[-.041, -.021]

Note. β=standardized coefficient; B=unstandardized coefficient; SE=standard error; CI=confidence interval

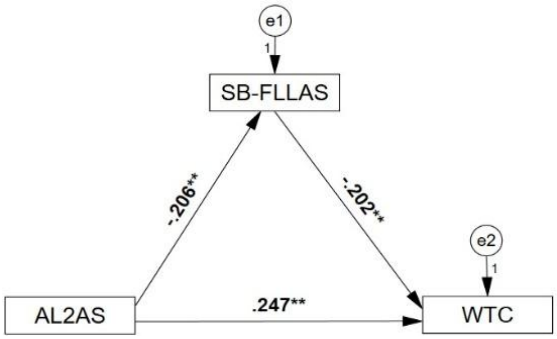

Figure 1. Mediation model with standardized path coefficients

Table 4. Total, direct, and indirect effects of AL2AS on WTC through skill-based FLA

Effect Type	B	β	SE	95% Bootstrap CI	% of total
Total effect	.232	.288	.026	[.180, 0.283]	100
Direct effect	.198	.247	.026	[.146, 0.250]	85.7
Indirect effect	.033	.042	.012	[.020, 0.068]	14.3

Note. β=standardized coefficient; B=unstandardized coefficient; SE=standard error; CI=confidence interval

4. DISCUSSION

The findings reveal a significant partial mediation model in which skill-based FLA partially mediates the relationships between AI-assisted L2 learning attitudes and WTC among Egyptian EFL student teachers. The direct effect of AI attitudes on WTC (β=.247) remained substantial, accounting for 85.7% of the total effect, while the indirect pathway through anxiety contributed 14.3%. This suggests that positive attitudes toward AI-assisted learning primarily enhance communicative readiness through direct psychological mechanisms, though anxiety reduction represents a meaningful secondary pathway. The negative association between AI attitudes and skill-based FLA (β=-.206) indicates that favorable perceptions of AI tools correspond with diminished linguistic apprehension. These results demonstrate that AI-assisted learning environments may foster psychological conditions conducive to enhanced communicative engagement among student teachers.

The present findings corroborate existing empirical research on AI-assisted language learning and affective variables. Consistent with previous studies [36], [37], AI-mediated learning environments in this study corresponded with reduced communication anxiety. The significant negative correlation between skill-based FLA and WTC (r=-.253) replicates the previous findings [16], [17] across different cultural contexts. The positive relationship between AI attitudes and WTC extends the works [41], [42] to the teacher education population. The mediation pathway observed aligns with empirical findings [46], [47], which documented similar affective mechanisms in AI-enhanced learning contexts.

The present findings provide empirical support for multiple established theoretical frameworks. First, the results align with the TAM [61], which posits that attitudes toward technology predict behavioral intentions and usage. The significant direct pathway from AI attitudes to WTC (β=.247) extends TAM by demonstrating that positive technological attitudes influence actual communicative behaviors rather than merely adoption intentions. Second, the mediating role of skill-based FLA (β=.042) supports MacIntyre *et al.* [62] WTC model, which conceptualizes WTC as influenced by affective variables including anxiety. This demonstrates that anxiety operates as a proximal factor bridging cognitive orientations (AI attitudes) with communicative behavior. Third, the anxiety-reduction mechanism aligns with Krashen affective filter hypothesis [63], which posits that negative emotional states impede language production. The negative association between AI attitudes and anxiety (β=-.206) suggests that AI-mediated environments lower the affective filter by creating psychologically safe practice spaces. Finally, the pathway through which AI attitudes reduce anxiety and enhance WTC aligns with Bandura [64] self-efficacy theory, suggesting that AI tools may strengthen learners' perceived competence in foreign-language communication. Collectively,

these theoretical alignments demonstrate that AI integration operates through well-established psychological mechanisms while extending existing frameworks to technology-mediated contexts.

These findings carry substantial implications for teacher education programs and language pedagogy. First, integrating AI-assisted tools into pre-service teacher curricula may enhance student teachers' WTC by fostering positive technological attitudes and reducing anxiety. Second, teacher educators should prioritize cultivating favorable dispositions toward AI technologies, as these attitudes directly and indirectly promote communicative readiness. Third, the mediating role of anxiety suggests that AI implementation should emphasize features providing psychological safety, including personalized feedback and non-judgmental practice environments. Fourth, addressing skill-based FLA remains essential, as it continues to impede communicative engagement even when AI attitudes are favorable. These implications underscore the importance of holistic approaches that simultaneously target technological attitudes and affective barriers in preparing communicatively competent future educators.

Several limitations warrant consideration when interpreting these findings. The cross-sectional design precludes causal inferences regarding the directionality of relationships among variables; longitudinal or experimental designs would strengthen claims about causality. The reliance on self-report instruments introduces potential response biases, as participants may provide socially desirable responses regarding their attitudes and anxiety levels. Psychometric validation of the skill-based foreign language learning anxiety scale revealed that several fit indices fell below conventional standards, with GFI=.839, AGFI=.822, NFI=.862, and TLI=.897, all below the recommended threshold of 0.90 for acceptable model fit. While CFI=.903 and RMSEA=.052 met acceptability criteria, the suboptimal fit indices suggest potential measurement concerns that may affect the precision of anxiety assessments and warrant cautious interpretation of findings involving this construct. The sample was drawn exclusively from Al-Azhar University in Egypt, limiting generalizability to other cultural, institutional, or linguistic contexts. Additionally, the study did not differentiate among specific AI tools or applications, treating AI-assisted learning as a unified construct. Finally, the explained variance in WTC (12.2%) indicates that substantial portions of communicative willingness remain attributable to unmeasured variables requiring further investigation.

Future research should address the identified limitations through methodological and conceptual expansions. Longitudinal designs tracking changes in attitudes, anxiety, and WTC over time would enable stronger causal inferences regarding these relationships. Experimental studies manipulating AI exposure conditions could establish causal mechanisms underlying the observed associations. Researchers should examine specific AI tools and features to identify which technological characteristics most effectively reduce anxiety and enhance communicative willingness. Cross-cultural investigations comparing student teachers across diverse linguistic and educational contexts would enhance generalizability. Additionally, qualitative approaches exploring learners' lived experiences with AI-assisted learning could illuminate psychological processes underlying quantitative findings. Future studies should also investigate additional mediators, including self-efficacy, motivation, and technological literacy, to develop more comprehensive explanatory models.

5. CONCLUSION

This study provides empirical evidence that FLA partially mediates the relationship between AI-assisted L2 learning attitudes and WTC among Egyptian EFL student teachers. The findings demonstrate that positive attitudes toward AI technologies enhance communicative readiness both directly and indirectly through anxiety reduction, underscoring the psychological benefits of AI integration in language teacher education. However, limitations include the cross-sectional design precluding causal inferences, reliance on self-report instruments introducing potential response biases, limited generalizability due to single-institution sampling, and treating AI as a unified construct without examining specific tools. Future research should employ longitudinal or experimental designs, investigate specific AI applications, conduct cross-cultural studies, and explore additional mediators including self-efficacy and motivation. Teacher education programs should strategically leverage AI-assisted tools to cultivate psychologically supportive learning environments that prepare future educators for confident, effective professional communication.

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AUTHOR CONTRIBUTIONS STATEMENT

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C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

INFORMED CONSENT

Informed consent was obtained from all participants after explaining the study's purpose, procedures, risks, and benefits, following ethical guidelines and institutional approval.

ETHICAL APPROVAL

The study protocol was approved by the Research Ethics Committee of the Faculty of Education, Al-Azhar University, Egypt (Ref. No. EDU-REC-2024-0583).

DATA AVAILABILITY

The data are available from the corresponding author, [MAN], upon reasonable request.

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