Language Testing in Asia

RESEARCH Open Access

Uncovering the impacts of technology literacies and acceptance on emotion regulation, resilience, willingness to communicate, and enjoyment in Intelligent Computer-Assisted Language Assessment (ICALA): an experimental study

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Abstract

Acquiring technological literacy and acceptance has a significant influence on academic emotion regulation (AER), academic resilience (AR), willingness to communicate (WTC), and academic enjoyment (AE), which are crucial for the success of university students. However, this area has not been adequately explored in research, particularly in the context of Intelligent Computer-Assisted Language Assessment (ICALA). This study aimed to bridge the existing information gap by examining the impact of technology literacies and acceptance on the AER, AR, WTC, and AE levels among Uzbek university students enrolled in virtual English as a foreign language (EFL) programs with online evaluation. Quasi-experimental research was carried out with 67 university students pursuing a degree in Applied linguistics to assess the potential underlying connections. Throughout the semester, students in the experimental group were provided with instructional feedback to foster technology literacies and acceptance through a private group on Telegram. This feedback assisted them in acquiring pertinent information to improve the application of technology in language learning and assessment. Based on the results, students in EG fared better than their counterparts in the control group in terms of AER, AR, WTC, and AE in ICALA. The data indicates that in the ICALA setting, EFL learners experience unpleasant emotions, a lack of resilience, unenjoyment, and an unwillingness to communicate due to a lack of knowledge in the application of technology. The implications of the study are examined in further detail.

Keywords: Technology literacies and acceptance, Academic emotion regulation, Academic resilience, Willingness to communicate, Academic enjoyment, Intelligent computer-assisted language assessment, EFL learners

Introduction

Technology literacies are essential in the context of artificial intelligence (AI)-integrated language instruction and assessment. Acquiring this information enables users to properly evaluate evaluation results and make well-informed decisions (Popenici & Kerr, 2017). Having a high level of skill in using AI-driven assessment platforms, such as adaptive testing systems or automated essay scoring tools, enables students to showcase their knowledge more quickly and helps instructors give exams more effectively (Namaziandost & Rezai, 2024; Zhang & Aslan, 2021). As AI systems play a larger role in activities such as providing feedback or grading replies, users with technology literacies can review the quality and dependability of the outputs created by these AI systems (Gröhbiel et al., 2020). It is essential to comprehend the ethical consequences of AI in assessment, including concerns about privacy, prejudice, and fairness, to guarantee these technologies' proper and equitable utilization (Liu & Ma, 2024).

The effective incorporation of AI in educational assessment relies on technical literacy and the acceptance and preparedness of stakeholders, such as students, instructors, and administrators. Insufficient familiarity or confidence in utilizing AI-powered assessment systems might harm students' performance and engagement. To improve students' acceptance and desire to engage with AI technology, address their concerns, offer training, and cultivate a favorable view of AI (Eshet-Alkalai, 2004; Vieira & Cabral, 2020). Teachers have a crucial role in implementing AI-integrated assessment. Their willingness to adopt and integrate these technologies and their capacity to comprehend and analyze the outcomes are necessary for successful adoption (Popenici & Kerr, 2017; Redecker & Johannessen, 2013). To successfully integrate AI into assessment, it is essential to have institutional support, which includes providing the necessary facilities, offering opportunities for professional growth, and establishing apparent standards and processes for the ethical and responsible use of these technologies (Kuddus, 2022; Zhang & Aslan, 2021).

AER serves as a dynamic progress indicator that provides guidance akin to a road map, aiding learners in regulating their emotional intensity and concentration. AER involves the interconnection of physical, behavioral, and cognitive processes (Gross, 2015). AER, as described by Gross and John (2003), is an evolving system that observes and impacts the emotions of individuals over time. AER is linked to positive constructs for teachers and learners, including self-efficacy, critical thinking and immunity, and L2 tenacity (Burić et al., 2016). Academic investigations into AER have demonstrated that demographic attributes of students significantly influence the extent to which they engage in AER and their level of satisfaction with it (Namaziandost et al., 2023; Peistaraite & Clark, 2020).

Academic investigations into AER (Pekrun & Linnenbrink-Garcia, 2012; Pekrun et al., 2014) have demonstrated that language learners are more vulnerable to anxiety, fear, tension, and lack of motivation; therefore, AER is more significant in these contexts (Tan et al., 2021). Then, students who use efficient emotion control techniques might reframe the assessment environment, seeing it as a chance for personal development rather than a burden. Adopting this change in viewpoint may bolster their self-assurance and drive, leading to improved achievement and a more pleasurable evaluation encounter. Moreover, Alazemi et al. (2023) proved that AER contributes to

academic achievement and progress. According to the findings, students' capacity to maintain a balanced emotional state was correlated with increased intellectual development. Research has demonstrated that implementing AER significantly enhances student engagement and collaboration between teachers and students (Richards, 2022).

The process model of emotion regulation (Gross, 1998) offers a theoretical framework for comprehending learners' strategies to control their emotions throughout evaluations. This paradigm delineates techniques, such as situation selection, modification, and cognitive appraisal, that might be especially advantageous in language evaluations (Heydarnejad et al., 2022; Namaziandost et al., 2022). By imparting these techniques to EFL learners, instructors may cultivate a more favorable learning atmosphere, enabling them to confidently tackle tests with less apprehension (Namaziandost et al., 2024). Furthermore, social support's significance in controlling emotions should not be disregarded. The social constructivist theory proposed by Vygotsky (1978) places significant emphasis on the role of social interactions in learning. Under the ICALA framework, peer cooperation is crucial in providing emotional support by allowing learners to exchange their experiences and coping mechanisms.

A further construct that is the focal point of this research is academic resilience (AR). The multidimensionality of AR is proposed by Campbell Sills et al. (2006), who argue that various factors significantly influence its formation and development. These encompass unique abilities such as imaginative problem-solving, distinguishing character traits, temperaments, and personalities (Campbell Sills et al., 2006). AR assists learners in overcoming the depression and anxiety that can result from learning a second language (Alazemi et al., 2023). Moreover, Kim and Kim (2016), in a similar line of investigation, determined that AR is a living, breathing construct that shapes positive adaptability in the face of challenges. Furthermore, Çakmak et al. (2023) provided evidence that AR, motivation, and test-taking skills are among the characteristics that determine language success.

Following the theoretical framework put out by MacIntyre et al. (1998), studies on L2 WTC have investigated the factors that influence L2 learners' WTC in L2, including, but not limited to, interlocutors and classroom settings, as well as students' characteristics, levels of self-confidence, motivation, and attitude (Cao & Philip, 2006; Hashimoto, 2002). Several facets of second language acquisition, such as autonomy in learning, risk-taking, proficiency, and reduced anxiety, have been positively associated with second language WTC in these studies (Peng et al., 2010). WTC refers to people's tendency and incentive to communicate actively using the language they are learning. This phenomenon's diverse and complex character makes it an essential element for educators, researchers, and practitioners who want to improve language learning experiences and promote the development of effective communication skills in second language learners. Understanding WTC's intricacies is crucial to grasp its significance in second language learning fully. By examining the many aspects of WTC, scholars may gain significant knowledge about the elements that impact people's WTC and the possible consequences of their language acquisition advancement. Moreover, it is essential to acknowledge the correlation between WTC and academic achievement to develop efficient language learning techniques and treatments (Qu, 2023).

WTC was originally developed to account for people's inclination to communicate in their native language (L1) and was believed to be a consistent characteristic across many situations (MacIntyre et al., 1998). Nevertheless, when it comes to second language (L2) communication, the WTC is affected by linguistic, social, and psychological aspects that may not be directly associated with the individual's first language (L1) (MacIntyre, 2007). Investigations grounded in situational analysis and contextual frameworks, frequently employing qualitative or mixed research methodologies, have demonstrated the dynamic nature of WTC. These studies have revealed that WTC can vary between different lessons and within a single instructional activity.

Such fluctuations are influenced by a multitude of factors, including but not limited to the topic being discussed, the characteristics of the teacher and peers involved, the perceived interest and significance of the task, the level of cooperation and familiarity with the interlocutors, the mastery of relevant vocabulary, the opportunity to express one's ideas, cultural influences, levels of excitement and responsibility, the sense of security, the ability to recall vocabulary, and the experience of anxiety. The comprehensive exploration of these diverse situational factors contributes to our understanding of the nuanced dynamics of WTC and underscores the intricate interplay between contextual variables and individuals' communicative behaviors (Al-Murtadha, 2019; Khajavy et al., 2016; Liu & Jackson, 2008).

If learners perceive ICALA tools as intuitive and advantageous, they are more likely to utilize them, increasing their inclination to communicate. A study by Teo (2018) provides evidence that students who detect language assessment tools as beneficial are more inclined to participate actively in communication, enhancing the overall learning experience. In ICALA, where interactive and adaptive tests often need students to articulate their ideas and cooperate with their classmates, this readiness to communicate is crucial. When learners feel competent in using technology and perceive it as enhancing their learning experience, their intrinsic motivation increases, leading to greater enjoyment.

Enjoyment is seen as a fundamental element of intrinsic motivation, wherein students are motivated to study for the natural gratification and sense of accomplishment it offers rather than for external incentives or pressures (Ryan & Deci, 2000). AE in the educational environment pertains to the favorable emotional state that students encounter while engaging in the process of acquiring knowledge. It includes emotions of fascination, satisfaction, and contentment that result from participating in intellectual tasks and activities (Pekrun, 2006; Dewaele et al., 2016). The experience of pleasure in education is strongly associated with the idea of flow, which refers to total engagement and heightened concentration in an activity (Csikszentmihalyi, 1990). Flow is a condition in which students are deeply involved in a learning process, lose track of time, and find the activity intrinsically delightful. Pleasure and optimal engagement are associated with improved learning outcomes, increased persistence, and the production of deep, long-lasting knowledge (Namaziandost et al., 2023).

Integrating AI into language evaluation can potentially improve students' enjoyment and engagement. Language evaluation technologies that utilize AI can offer instant feedback, customized learning experiences, and adaptive challenges that respond to individual learning preferences (Xiao et al., 2024). This can result in a more pleasurable and engaging evaluation experience, which could favor student motivation and achievement.

Through AI, instructors may provide assessment experiences tailored to individual students, adaptable to their needs, and enhance their learning and academic success.

Significance and objective of this research

A well-functioning education system can greatly impact individuals by teaching them to think critically, solve problems more effectively, and gain a broader perspective and prophetic perspective on the world around them. The educational system is heavily responsible for ensuring that all students and teachers achieve all academic and behavioral goals, including developing critical thinking and reflective skills, to the best of their ability. Students can certainly develop these skills through active participation in classroom instruction and practice, but there is a lack of research and training in educational pedagogy that focuses on finding effective toolkits for EFL classrooms.

Although AER, AR, WTC, and AE have shown efficacy in facilitating students' language acquisition, no study has explored the interrelationships among these five approaches, according to the researchers' current understanding. This study aimed to examine the preference level among EFL learners for AER, AR, WTC, and AE in ICALA. The findings of this study might have advantageous implications for both students and instructors, including theoretical and practical contexts. Considering these views, the following subjects for investigation are proposed:

RQ1: Does acquiring technology literacies and acceptance foster AER in ICALA?
RQ2: Does acquiring technology literacies and acceptance foster AR in ICALA?
RQ3: Does acquiring technology literacies and acceptance foster WTC in ICALA?
RQ4: Does acquiring technology literacies and acceptance foster AE in ICALA?

Materials and method

The study encompassed a collective of 67 students who were enrolled in language institutions in Uzbekistan. Thirty-four students were assigned to the Experimental Group (EG), and 33 were assigned to the Control Group (CG). The participants were evaluated on four dependent variables: AER, AR, WTC, and AE in ICALA. The study's independent variable is Technology Literacy and Acceptance. A multivariate analysis of variance (MANOVA) was performed to examine the data. This statistical methodology allowed the researchers to analyze the impact of the independent variable (Technology Literacy and Acceptance) on the dependent variables (AER, AR, WTC, and AE in ICALA). Before doing the MANOVA, the researchers verified the necessary assumptions for this study. These factors encompass the regularity of the dependent variables and the uniformity of variance. The assessment of normality was conducted using the Shapiro–Wilk test, while the homogeneity of variance was evaluated using Levene's test. In addition, the researchers used statistical measures, such as partial eta squared, to determine the extent of the observed impacts.

The researchers established a special Telegram group for instructional purposes to enhance the participants' understanding and acceptance of technology. The selection of Telegram as the platform was based on its robust security measures, including encrypted communication, as well as its user-friendly interface and compatibility with several devices. This channel functioned as a designated area for the EG participants to

actively participate in the teaching material and communicate with the researchers and other participants. Only the EG participants and the study team had restricted access to the channel. Through this channel, the researchers delivered a well-organized educational program on technology literacy and acceptability. The program consisted of engaging courses, instructional videos, and practical activities designed to improve participants' comprehension and proficiency in diverse technologies. The EG participants were encouraged to interact actively with the topic by posing inquiries, exchanging their experiences, and cooperating with their peers inside the group. The researchers were accessible to offer immediate assistance, respond to queries, and promote discussions to guarantee a significant learning experience. This focused intervention served as a crucial element of the study, enabling the researchers to evaluate the influence of enhanced technological abilities and attitudes on the dependent variables, including emotion control, resilience, desire to speak, and enjoyment in ICALA.

Instruments

The Oxford Quick Placement Test (OQPT) assessed the students' English competency. Students who obtained scores ranging from 0.7 to 0.9 on this exam, with potential values ranging from 0.1 to 0.9, are considered to possess English language abilities at an upper intermediate level. The OQPT underwent a Cronbach's alpha reliability test, yielding good results indicating a reliability of 0.842.

The learners' AER was evaluated using the Academic Emotion Regulation Questionnaire (AERQ) developed by the authors referenced (Burić et al., 2016). The AERQ consists of 37 questions rated on a five-point Likert scale, ranging from 1 (indicating "strongly disagree") to 5 (indicating "strongly agree"). The AERQ encompasses eight facets, each shown with an example: Situation Selection consists of 4 items, such as intentionally missing a class when experiencing extreme anxiety about a test. Developing Competencies involves five items, such as modifying materials in a stressful situation. Redirection Attention includes six items, such as redirecting attention to something that brings happiness when feeling nervous. Reappraisal consists of 5 items, such as convincing oneself of other opportunities when anxious about test results. Suppression involves five items, such as hiding anxiety about test results. Respiration consists of 3 items, such as using deep breathing techniques to reduce anxiety. Venting includes 5 items, such as throwing objects around the room in a stressful situation. Lastly, Social Support consists of 4 items: talking with close friends when feeling miserable. The internal consistency of the AERQ was deemed satisfactory in this investigation, with values ranging from 0.768 to 0.892.

The participants' resilience was assessed using the Academic Resilience Scale (ASR) created by Kim and Kim (2016), employing a Likert scale ranging from 1 (indicating a strong disagreement) to 5 (indicating a strong agreement). The ASR questionnaire has 26 items divided into six subsections: perceived happiness, empathy, sociability, perseverance, self-regulation, and self-control. The reliability coefficient of this scale was computed to be 0.789, as indicated by the findings.

The other instrument used by the author was the WTC Questionnaire (WTCQ), which was designed and validated in the Iranian setting by MacIntyre et al. (2001) and then revalidated by Valadi et al. (2015). The WTCQ measured four aspects of English

WTC in twenty items: social support (e.g., "I would like to go abroad and learn more about foreign countries and cultures."), language learning orientations (e.g., "learning English will be useful in getting a good job."), WTC outside the class (e.g., "I like talking to a friend while waiting in line."), and WTC inside the class (e.g., "I like speaking in a group"). Each component was assessed using a five-point Likert scale, ranging from strongly disagree (1) to strongly agree (5). They made no substantial changes to the tool except for minor phrasing and style modifications. The current study produced a Cronbach's alpha value of 0.758, suggesting good reliability.

The enjoyment of the participants, as the last construct in this research, was investigated using the Foreign Language Enjoyment Scale (FLES), which Dewaele and MacIntyre (2016) designed and verified. FLES has 21 statements on a 5-point Likert scale (strongly disagree to strongly agree), such as "There is a positive environment in my FL class." According to Cronbach's alpha assessment ($\alpha = 0.845$), the FLES dependability in this investigation was deemed adequate.

Results

One-way MANOVA was utilized to compare the pretest and posttest scores of the EG and CG learners with respect to the dependent variables. Before the administration of MANOVA, its assumptions (including normality, sample size, outliers, linearity, homogeneity of regression) were checked. Tables 1 and 2 compare the EG and CG learners on the ER, resilience, WTC, and enjoyment.

The pretest mean scores of the EG and CG for ER, resilience, WTC, and enjoyment are shown in Table 1. There were minimal differences between the mean scores of the two groups on all variables. To make sure whether the differences were of statistical significance or not, the researcher had to refer to the MANOVA (Table 2):

The Wilk's Lambda's associated *Sig.* value was found to be 0.62, larger than the significance level (i.e., $0.62 > 0.05$). This shows that the two groups of EG and CG were not significantly different on their pretest regarding the four dependent variables. What follows are the results of a similar data analysis procedure performed for

Table 1 Descriptive statistic results comparing EG and CG on ER, resilience, WTC, and enjoyment scores of the pretest

	Groups	Mean	Std. deviation	*N*
ER pre	EG	78.64	23.45	34
	CG	64.87	54.20	33
	Total	71.86	41.80	67
WTC pre	EG	65.17	46.25	34
	CG	71.66	19.74	33
	Total	68.37	35.62	67
Resilience pre	EG	75.85	44.04	34
	CG	80.24	26.07	33
	Total	78.01	36.11	67
Enjoyment Pre	EG	72.17	66.76	34
	CG	77.75	18.15	33
	Total	74.92	48.95	67

Table 2 MANOVA results comparing EG and CG on ER, resilience, WTC, and enjoyment scores of the pretest

	Value	*F*	Hypothesis df	Error df	Sig	Partial eta squared
Pillai's trace	.041	.656	4.00	62.00	.62	.04
Wilks' lambda	.959	.656	4.00	62.00	.62	.04
Hotelling's trace	.042	.656	4.00	62.00	.62	.04
Roy's largest root	.042	.656	4.00	62.00	.62	.04

the posttest scores of the EG and CG. Any possible changes on the posttest could be attributed to the treatment provided for the EG (that is, technology literacies and acceptance).

The posttest mean scores of the EG and CG for AER, AR, WTC, and AE, as shown in Table 3, differed. However, to find out whether these differences were statistically significant or not, the researcher needed to consult the MANOVA results in Table 4 below:

The Wilk's Lambda's associated *Sig.* value was 0.00, lower than the significance level ($0.00 < 0.05$). Thus, the two groups of EG and CG were significantly different on their posttest regarding the four dependent variables. Now, to see which of the four dependent variables caused the difference between the two groups, Table 5 should be looked at:

As Table 5 shows, the *Sig.* value corresponding to all four variables was less than the Bonferroni-adjusted significance level, and all other *p*-values were smaller than the

Table 3 Descriptive statistic results comparing EG and CG on AER, AR, WTC, and AE scores of the posttest

	Groups	Mean	Std. deviation	*N*
ER post	EG	116.67	22.21	34
	CG	67.84	54.35	33
	Total	92.62	47.79	67
WTC post	EG	104.32	17.76	34
	CG	81.57	35.27	33
	Total	93.11	29.87	67
AR post	EG	83.73	10.66	34
	CG	72.39	18.83	33
	Total	78.14	16.17	67
AE post	EG	90.35	10.13	34
	CG	78.51	22.34	33
	Total	84.52	18.140	67

Table 4 MANOVA results comparing EG and CG on AER, AR, WTC, and AE scores of the posttest

	Value	*F*	Hypothesis df	Error df	*Sig*	Partial eta squared
Pillai's trace	.373	9.20	4.00	62.00	.00	.37
Wilk's Lambda	.627	9.20	4.00	62.00	.00	.37
Hotelling's trace	.594	9.20	4.00	62.00	.00	.37
Roy's largest root	.594	9.20	4.00	62.00	.00	.37

Table 5 Test of between-subject effects of speaking

Dependent variable	Type III sum of squares	df	Mean square	*F*	Sig	Partial eta squared
AER post	39925.98	1	39,925.98	23.41	.00	.26
AR post	8665.54	1	8665.54	11.21	.00	.14
WTC post	2154.01	1	2154.01	9.26	.00	.12
AE post	2346.70	1	2346.70	7.87	.00	.10

significance level. Thus, the conclusion could be that all four variables (i.e., AER, AR, WTC, and AE) brought about the difference between the writing posttest scores of the EG and CG learners.

Discussion

In light of the expanding corpus of literature on ICALA, this study set out to contribute to that literature by providing more empirical data pertaining to the progress in AER, AR, WTC, and AE. Specifically, this research intended to uncover the impacts of technology literacies and acceptance on AER, AR, WTC, and AE in ICALA through an experimental study among Uzbek university students. Concerning the first research inquiry (Does acquiring technology literacies and acceptance foster AER in ICALA?), it was determined that technology literacies and acceptance among EFL learners are detrimental to the state of AER in ICALA. In simpler words, technology literacies benefit EFL students since they may cultivate a feeling of mastery and self-assurance while utilizing AI-driven evaluation systems. By understanding the fundamental concepts of these systems, students are more prepared to navigate the assessment process, analyze the outcomes, and assert their rights if they see any inaccuracies or biases in the AI. The presence of agency and comprehension might alleviate sensations of fear, annoyance, or powerlessness that may otherwise emerge from using unfamiliar or obscure technology (Vieira & Cabral, 2020).

Similarly, instructors with technological literacies may effectively assess the quality and dependability of AI-generated feedback or grading, empowering them to make well-informed judgments on interpreting and using these outputs. Consequently, this can promote more assurance and reliance in the AI-incorporated evaluation procedure, thereby diminishing the emotional strain of unquestioningly embracing the system's results. Provided that students and instructors possess knowledge, authority, and support in utilizing AI-integrated assessment, they are more inclined to experience favorable emotions such as confidence, engagement, and a sense of fairness. Consequently, this contributes to enhanced educational outcomes and more effective assessment techniques.

As Eshet-Alkalai (2004), as well as Vieira and Cabral (2020), highlighted, the acceptance of new technologies is assisted by a number of factors, including the provision of intensive training, the resolution of worries, and the demonstration of the benefits of these technologies. It is possible to successfully eliminate unpleasant emotional responses, such as resistance, concern, or fear, that may otherwise develop as a result of the arrival of innovative and unfamiliar technology by creating an environment that

is characterized by acceptance and trust (Roberts et al., 2021). Furthermore, when all of the stakeholders involved, including students, teachers, and administrators, create a positive attitude and embrace AI-integrated assessment, it can build an environment that is more encouraging and cooperative (Kohnke et al., 2023).

To obtain information on the second research question (Does acquiring technology literacies and acceptance foster resilience in ICALA?), the findings show that EFL learners in EG achieved a more reasonable state in AR than their peers in CG. This means that acquiring technological literacies gives individuals the essential knowledge and abilities to navigate and interact properly with AI-integrated assessment. This entails comprehending these systems' functioning, capacities and constraints, and potential origins of partiality or inaccuracy. By understanding this information, users are more capable of recognizing and resolving potential problems rather than feeling overwhelmed or discouraged by unforeseen difficulties.

Technology literacies may strengthen their resilience by providing students with the ability to evaluate assessment results, advocate for their own needs, and adapt their learning strategies as needed. With a comprehensive grasp of the core concepts behind AI-driven assessment, students are less likely to blame their poor performance only on the technology. On the contrary, they are more inclined to identify areas where they may enhance their skills or seek guidance from faculty members (Vieira & Cabral, 2020). Such resilience in the face of difficulties may lead to increased engagement, confidence in one's capabilities, and enhanced academic performance (Kelly et al., 2023).

Comparably, teachers with comprehensive knowledge and skills in technology can thoroughly assess the quality and reliability of feedback or grading supplied by artificial intelligence (O'Dea, X. (C.), & O'Dea, M, 2023). They may then make informed decisions on how to boost student learning by using these outputs. This resilience empowers teachers to adapt their instructional and assessment techniques rather than relying only on the outcomes of the AI system. To improve their approach to ICALA, teachers may develop strategies to supplement or offer background to the AI-generated content by understanding the capabilities and limitations of these technologies, therefore fostering a more resilient and effective methodology (Liu & Ma, 2024; Popenici & Kerr, 2017). Thus, cultivating technical literacy is crucial for promoting resilience in ICALA.

Furthermore, it is important to encourage acceptance among every individual involved in educational settings. When students, teachers, and administrators experience a sense of ease, self-assurance, and encouragement regarding the utilization of AI in assessment, they are more inclined to persevere in the presence of difficulties and perceive these technologies as instruments that improve, rather than impede the assessment and learning process (Eshet-Alkalai, 2004; Vieira & Cabral, 2020). This eventually results in assessment methods that are more effective and fairer and that promote student learning and development.

With regard to the state of WTC among the EFL learners after the treatment, the outcomes evidenced that acquiring technological literacies enables EFL learners in EG to get a comprehensive comprehension of the functioning, capabilities, and limits of AI-powered evaluation systems, as well as the possible sources of bias or inaccuracy. This understanding can assist in mitigating fears and dispelling misconceptions that would otherwise impede communication in language classes. Technology literacies can

enhance students' confidence and mastery using AI-integrated assessment systems. When students grasp the fundamental concepts of these systems, they are more inclined to feel at ease inquiring, requesting elucidation, or offering criticism (Rezai, 2023; Zhang & Aslan, 2021). This heightened inclination to communicate can result in more fruitful exchanges with educators and AI systems, enabling improved comprehension of evaluation outcomes and more efficient approaches to learning (Kelly et al., 2023).

The outcomes also indicated that students actively and effectively participate in the evaluation process by acquiring a more profound comprehension of ICALA technologies. That is, gaining proficiency in technical skills empowered EG, giving them a stronger sense of authority and influence over the evaluation process. It can be inferred that EFL learners who enhance their proficiency in utilizing technology tools see heightened levels of engagement and pleasure in their language learning endeavors. These phenomena may be elucidated Within the self-determination theory, which posits that intrinsic motivation relies on sentiments of competence, autonomy, and relatedness (Deci & Ryan, 2000). Equating learners with the requisite technology abilities fosters a feeling of competence, therefore bolstering their confidence and augmenting their general delight in language assessment activities.

This link is further clarified by the Technology Acceptance Model (TAM), which highlights the significance of perceived ease of use and perceived utility in adopting technology (Davis, 1989). Within the framework of ICALA, learners' adoption of intelligent assessment measures is enhanced when they perceive these tools to be intuitive and advantageous for their language acquisition. Accepting this phenomenon cultivates a favorable emotional reaction, improving the overall pleasure derived from the learning process. As students use adaptive assessment technologies that customize questions according to their competence levels, they are more inclined to experience engagement and motivation as the evaluations become more relevant and individualized (Kuddus, 2022).

Students may be more inclined to engage with the functionalities and evaluations offered by AI-driven systems, while teachers may utilize their expertise to individualize the assessment process and offer more customized assistance (Liu & Wang, 2024). Teachers serve as facilitators who may significantly enhance the learning process by instructing students in their use of technology. Their support may clarify intricate technological instruments and provide an environment that promotes learners' comfort in exploring and engaging with these resources independently. Educators can supplement technology instruments' acceptance and pleasure through instruction, demonstrating positive attitudes, and cultivating collaborative settings. The use of this comprehensive strategy not only facilitates the development of learners' technological literacy but also enhances their entire language assessment experience. Consequently, this can result in improved learning results, enhanced student–teacher connections, and a more favorable overall evaluation process.

Conclusion and suggestions for future research

To summarize, the objective of this research was to shed light on how AER, AR, WTC, and AE are all enhanced by increasing their technological literacies in the realm of ICALA. The ability to regulate emotions throughout learning a new language has been

established to be of utmost importance. This is because it maintains students' engagement and dedication for longer lengths of time despite their difficulties. It would seem that this field is still in its early stages, and it might benefit from more empirical research to shed light on a route that improves students' academic performance and guarantees that instruction is carried out effectively.

The discoveries of this research have significant ramifications for language educators and educational administrators. First and foremost, the study emphasizes the need to cultivate technological literacy skills among those learning a new language. Given the increasing prevalence of ICALA platforms for language learning and assessment, students must possess the essential skills and knowledge to use these technological tools proficiently. By integrating technology literacy training into language curricula, educators can enhance students' confidence and ease in using ICALA, thus promoting improved ER, AR, WTC, and AE during the assessment process.

Furthermore, the study's focus on the significance of technological acceptability is especially pertinent for educators. The primary focus of language teachers should be to provide a favorable learning environment for adopting and incorporating ICALA platforms. This may include equipping both students and teachers with thorough training and assistance while cultivating a favorable disposition toward using technology in language evaluation. By mitigating any obstacles to the use of technology, educators may guarantee a smooth and efficient deployment of ICALA systems, resulting in enhanced learning results and a more captivating evaluation experience for students.

Training programs that are both in-service and pre-service have the potential to give education professionals and academics access to pertinent information. The following individuals—policymakers, curriculum designers, content producers, test developers, and language teachers—should consider the benefits of adopting psychological qualities, reducing the possibility of anxiety experienced during language assessment. It is highly recommended that assignments be designed to assist students in adapting effective and efficient self-help constructions in addition to academic topics. Beginning with the first stages of language acquisition, it is important to cultivate self-monitoring and self-awareness by practicing both. Consequently, pupils will have a higher chance of attaining academic success, assessment will be more focused on the needs of the students, and society as a whole will benefit.

Furthermore, the knowledge acquired from this research may guide the creation of complete student assistance systems. Language programs should contemplate integrating specialized technical support and problem-solving services, including peer-to-peer mentoring programs, to assist students in navigating the ICALA environment. These support techniques may mitigate tension and anxiety in conversation classes and oral assessments, enabling students to assume a more proactive and self-assured role in their language assessment participation. Last but not least, the study's focus on the interrelated aspects of technological literacy, acceptance, emotion control, resilience, desire to communicate, and pleasure may guide the development of comprehensive language learning and evaluation systems. Educators should contemplate embracing a thorough strategy that promotes the growth of linguistic competence and the socio-emotional and technical skills essential for achieving success in assessments based on the ICALA framework. This may include integrating mindfulness,

stress management, and digital literacy instruction into language courses and establishing collaborative and project-based learning possibilities.

Consistent with previous research, the present study has some constraints, which are as follows: (1) The study did not take into account the sociocultural backgrounds and demographics of the learners. Subsequent research might investigate these concerns and examine how variations in sociocultural settings and demography may impact the relationship between AER, AR, WTC, and AE. (2) Including learners from other departments and institutions would facilitate the generalization of the results. It is feasible that this examination will be conducted in other instructional contexts, including both institutions and private language institutions, throughout future research. (3) This investigation was completed using quantitative analytic approaches. Utilizing mixed-method approaches enables a more comprehensive examination and presents avenues for further investigation in the future. (4) future researchers may focus on exploring the links between AER, AR, WTC, and AE concerning other learner-associated traits, such as optimism, self-assurance, and mental well-being.

Abbreviations

ICALA	Intelligent Computer-Assisted Language Assessment
AER	Academic Emotion Regulation
AR	Academic resilience
WTC	Willingness to communicate
AE	Academic enjoyment
EFL	English as a foreign language
EG	Experimental group
CG	Control group
AERQ	Academic Emotion Regulation Questionnaire
ASR	Academic Resilience Scale
WTCQ	WTC Questionnaire
FLES	Foreign Language Enjoyment Scale
MANOVA	Multivariate analysis of variance
OQPT	Oxford Quick Placement Test

Acknowledgements
Not applicable

Authors' contributions
BSA, DA, OK, and FAR made substantial contributions to conception and design. Data was collected by LD and NAS. Data analysis and interpretation was done by ZFS, OK, and BSA. DA and FAR conducted the intervention and participated in drafting the manuscript. LD, ZFS, and NAS, and DA revised the manuscript critically for important intellectual content and finally approved the manuscript.

Funding
This study did not receive any funding.

Availability of data and materials
The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declarations

Ethical approval and consent to participate
The study involving human participants did not require ethical review and approval, as it complied with local legislation and university requirements of Uzbekistan. Written informed consent was obtained from all participants prior to their participation in the study.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

Received: 24 June 2024 Accepted: 17 September 2024
Published online: 26 September 2024

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