



Unmasking the impacts of self-evaluation in AI-supported writing instruction on EFL learners' emotion regulation, self-competence, motivation, and writing achievement

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ABSTRACT

This study explores the impact of embedding self-evaluation within AI-supported writing instruction on learners' cognitive emotion regulation, self-competence, motivation, and writing achievement. Conducted at a high school in Iran, the research utilized a quantitative quasi-experimental pretest-posttest design involving two intact pre-intermediate writing classes randomly assigned to an experimental group and a control group. The experimental group received instruction that combined AI tools with structured self-evaluation activities, whereas the control group followed a traditional teaching approach without AI integration or self-evaluation. Data were collected using the Cognitive Emotion Regulation Questionnaire, the Self-Competence Scale, the Academic Motivation Scale, and standardized writing assessments. Statistical analyses, including Chi-square tests and t-tests, indicated that the experimental group significantly outperformed the control group across all measured variables, demonstrating improvements in cognitive emotion regulation, self-competence, motivation, and writing achievement. These results underscore the value of integrating self-evaluation practices alongside AI tools to enhance learner outcomes in EFL writing contexts.

1. Introduction

Teaching constitutes a reciprocal exchange rather than a mere one-dimensional process. It transcends the simple act of providing information in a unidirectional manner; instead, active participation of learners in all classroom endeavors and their own self-evaluation is imperative. Proficient language learners have cultivated self-assessment strategies in themselves and engage in dynamic evaluations of their own performance (Tavousi & Pour Sales, 2018). According to GuoJie (2021), self-evaluation represents a cohesive personality framework that assists learners in forging their distinctive and individual pathways toward achievement. The fundamental tenet of this self-assessment is to empower students to observe, practice, monitor, evaluate, and amend their own actions (Zhuoyuan, 2021). Moreover, it is apparent that self-evaluation enhances students' L2 resilience, regulates foreign language anxiety, fosters autonomy, and strengthens social connections (Heydarnejad, Ismail, et al., 2022; Wongdaeng, 2022). Most significantly, self-assessment cultivates a profound sense of individuality and an intrinsic recognition of personal value (see Aldosari et al., 2023).

Emotions represent one of the essential psychophysiological processes that facilitate individuals in adapting to their environment and

accomplishing their objectives (Eisenberg, 2000). The swiftly occurring social transformations and the advancement of digital technology, as observed in recent years, present individuals with an unparalleled array and diversity of stimuli. Individuals typically modulate their responses through a comprehensive array of regulation strategies (Gross & Thompson, 2014). Emotion regulation is defined as the processes by which individuals influence the emotions they experience, the timing of such emotions, and the manner in which they experience and express them (Gross, 1998). Regulation may be implemented at any phase of the emotional process, either prior to or subsequent to the manifestation of the emotional response. This encompasses anticipatory strategies as well as strategies pertaining to the emotional response itself. In accordance with Gross's model, five groups of emotion regulation strategies are identified: situation selection, situation modification, attentional deployment, cognitive change, and response modulation (Gross, 2012).

Self-competence involves the belief of individuals in competently executing a task or achieving a self-goal, and thus relates to motivation and academic success. It encompasses one's belief in their capabilities in carrying out specific actions, which is influenced by past experiences, social comparison, and others' feedback (Bandura, 1997). In this context of cognitive emotion regulation, self-competence can effectively

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influence the student's way of managing one's emotions in response to challenges in writing tasks. For instance, students who perceive themselves as highly self-competent are more likely to use adaptive emotion regulation strategies, such as positive reappraisal and planning, which will enhance motivation and then promote better achievement outcomes (see Garnefski & Kraaij, 2006). Conversely, individuals with lower self-competence may resort to maladaptive strategies like rumination or self-blame, which can hinder their performance and motivation (see Aldao et al., 2010).

Motivation constitutes a pivotal element that significantly influences the efficacy of L2 acquisition. This element has been recognized as an essential precursor that furnishes the primary impetus to embark upon L2 learning and, subsequently, the necessary driving force required to uphold the long-term objectives associated with language acquisition (Dörnyei, 1998; Dörnyei & Ryan, 2015; Dörnyei & Ushioda, 2021). Within the context of such an extensive and laborious endeavor, motivation has been identified as a determinant of the degree to which learners are actively involved in L2 acquisition (Noels et al., 2019; Alamer, 2022a), their persistence and resilience in the pursuit of language mastery (Kim et al., 2017; Alamer, 2021), and, most critically, their success in L2 acquisition (Alamer, 2022b; Elahi Shirvan & Alamer, 2024).

Academic writing occupies a crucial position in the linguistic development of learners of the English language, thereby necessitating a high degree of proficiency in various domains, including writing structure, coherence, grammar, and vocabulary (Campbell, 2019). Mastery of writing skills equips learners to communicate their ideas effectively, convey their thoughts with clarity, and attain academic distinction across an array of professional fields (Yoon, 2011). Nevertheless, the endeavor of monitoring and delivering constructive feedback on student writing presents challenges related to the expenditure of time, effort, and inherent subjectivity (Lim & Phua, 2019; Yu & Lee, 2014). Furthermore, learners of the English language frequently encounter motivational constraints owing to limitations in time, which obstructs their capacity to dedicate adequate time and effort toward the enhancement of their writing skills (Lee, 2017).

The incorporation of technology within English language educational environments is broadly acknowledged as a method to surmount various challenges encountered in the language acquisition processes (Knox, 2020; Roll & Wylie, 2016), particularly in writing assignments where temporal limitations frequently emerge (Kessler, 2020; Rahimi & Fathi, 2022; Stapleton & Radia, 2010; Wang, 2022). With the pervasive accessibility of technology and digital platforms, learners are now afforded the opportunity to practice their linguistic competencies, especially in writing, at any given moment and from diverse locations (Yan, 2023). This encompasses the utilization of sophisticated artificial intelligence (AI)-driven computer and mobile applications, which provide interactive and tailored resources for refining writing skills, in addition to fostering increased motivation (Jiang, 2022; Meunier et al., 2022; Yan, 2023).

The diverse effects of AI tools on language learning are further demonstrated by recent research. Rezai et al. (2024) found that ChatGPT use is favorably correlated with the well-being of EFL learners, mediated by improved emotion control techniques. Additionally, Qu and Wu (2024) examined ChatGPT and highlighted that hedonic motivation significantly influences students' adoption and continued engagement with AI-enhanced English learning platforms. These results jointly underscore the significance of AI in enhancing language outcomes and bolstering learners' emotional and motivational aspects. Similar to this, Wang and Reynolds (2024) investigate how Chinese English learners use big language models, like ChatGPT, to enhance their vocabulary acquisition, emphasizing the cognitive and motivational elements that affect this interaction. In their study, Heydarnejad et al. (2024) emphasize the dual function of flow in AI-assisted language learning. They argue that flow not only enhances learners' cognitive engagement but also promotes positive affective states that are conducive to

improved mental health and enhanced problem-solving abilities.

Despite the recognized importance of self-evaluation, cognitive emotion regulation, self-competence, and motivation in fostering academic achievement, particularly in L2 writing, there remains a significant gap in understanding how these interrelated factors operate within AI-integrated instructional contexts. Traditional teaching methods often fail to address the emotional and motivational needs of learners, particularly when it comes to developing essential writing skills. Moreover, while AI-driven tools promise to enhance student engagement and provide feedback, the extent to which they support students' self-assessment capabilities and influence cognitive emotion regulation remains underexplored.

This study seeks to map the intricate dynamic between these variables, examining how self-evaluation acts as a central mechanism in enhancing EFL writing performance in AI-enhanced environments. Specifically, the innovations of this study include the integration of self-evaluation strategies within AI-based writing instruction, the investigation of cognitive emotion regulation as a mediating factor, and the exploration of motivational and self-competence outcomes tied to AI-supported learning. By focusing on these dimensions, the study aims to fill a critical research gap by providing empirical evidence on the psychological and pedagogical impacts of AI tools in EFL writing classrooms.

Thus, the following research questions are raised.

1. What is the effect of self-evaluation in AI-integrated writing instruction on EFL learners' emotion regulation?
2. To what extent does self-evaluation act as a key in enhancing EFL learners' self-competence in AI-integrated writing instruction?
3. Does self-evaluation in AI-integrated writing instruction affect EFL learners' motivation?
4. Does self-evaluation in AI-integrated writing instruction facilitate writing achievement among L2 learners?

The findings of this study hold significant implications for educators, learners, and technology developers by clarifying the interplay between self-evaluation, cognitive emotion regulation, self-competence, motivation, and achievement in AI-integrated writing instruction. By illuminating how self-evaluation fosters emotional resilience, self-competence, motivation, and academic success, the research aims to guide the design of pedagogical strategies that empower learners to take ownership of their writing processes. Additionally, this study underscores the potential of AI tools to bridge existing gaps in EFL writing instruction by aligning technological advancements with psychological and motivational frameworks, thereby contributing to the broader discourse on enhancing the efficacy of language education in a digitally mediated world.

2. Literature review

2.1. Self-evaluation

Self-evaluation is characterized as a higher-order attribute encompassing constructs such as self-efficacy, self-awareness, emotional stability, and locus of control, among others (Judge et al., 1997). Fundamentally, it refers to the process of introspection or appraisal of an individual's behaviors, attitudes, or performance (Bachman & Palmer, 2010). Therefore, it is essential to teach students how to effectively assess their own development. Andrade (2019) similarly defines self-evaluation as a form of assessment that emphasizes competencies such as metacognitive knowledge, oversight, and self-regulated learning. Through active participation in self-evaluation exercises, students develop critical thinking skills and the ability to make informed decisions. Additionally, these exercises help students build the capacity to navigate academic challenges more effectively (Heydarnejad, Ismail, et al., 2022a).

Both external and internal factors influence the process of self-evaluation. Key external factors include academic grades and instructor feedback, while significant internal factors involve self-awareness and goal-setting, both of which deeply affect self-evaluation (Bourke & Mentis, 2013). The term “assessment” encompasses a broad range of methods used to evaluate and draw conclusions about students’ academic progress (Bachman, 2015). Among these methods, self-evaluation stands out as the active involvement of learners in assessing their own performance, distinct from teacher or peer evaluations. Importantly, self-evaluation impacts not only cognitive skills but also learners’ emotional well-being, as students’ evaluative practices influence their confidence, motivation, and stress levels (Punpromthada et al., 2022).

Engaging in self-evaluation activities enhances students’ critical thinking abilities and supports judicious decision-making. These activities also foster greater proficiency in overcoming educational challenges (Al-Mamoory & Abathar Witwit, 2021). Research indicates that various factors contribute to cultivating a culture of self-evaluation among students. Notably, metacognitive strategies (Wei, 2020), critical thinking skills (Zhang, 2021), self-efficacy (Zheng et al., 2022), and emotional regulation (Heydarnejad, Ismail, et al., 2022) all promote greater student engagement in self-assessment. Supporting this perspective, Jahara et al. (2022) found that students’ coping styles positively influenced both their self-assessment capabilities and their ability to manage stress. Furthermore, Ismail and Heydarnejad (2023) demonstrated that self-evaluation and evaluation apprehension can predict personal best goals and self-efficacy beliefs in EFL learners.

In summary, self-evaluation is a multifaceted construct that plays an essential role in enhancing learners’ cognitive, emotional, and motivational dimensions, thereby fostering improved academic achievement and learner autonomy.

2.2. AI-integrated instruction

AI may be characterized as a system that integrates sophisticated programs designed to work in conjunction with humans to execute a variety of tasks (Aldosari, 2020). Within the realm of education, AI possesses the capability to make informed decisions that parallel human cognitive processes (Akerkar, 2014). Scholars in applied linguistics have acknowledged the immense potential of AI within the contexts of language acquisition and pedagogy, with the objective of refining instructional methodologies for educators and facilitating the language acquisition process for learners (e.g., Sun et al., 2021; Xia et al., 2022 among others). Online platforms that incorporate AI technologies can be utilized to produce the requisite linguistic input and output, thereby assisting language learners in their linguistic development. These AI-driven tools, which are accessible via both computer and mobile devices, particularly bolster the advancement of writing competencies. A notable AI-enabled resource is ChatGPT, an AI-assisted chatbot developed by OpenAI (Barrot, 2023). ChatGPT is adeptly applicable across a spectrum of language learning courses to augment learners’ writing capabilities (Barrot, 2023). Armed with an extensive repository of knowledge, ChatGPT generates lexicon and syntactically accurate structures to facilitate the production of coherent and cohesive written discourse. This tool is capable of understanding human inquiries and delivering pertinent responses. Furthermore, ChatGPT aids language learners in overcoming writing obstacles pertaining to organization, coherence, grammar, and vocabulary. It provides alternative recommendations to correct ungrammatical constructions and enhance overall writing proficiency.

It is crucial to note that AI tools, such as ChatGPT, can facilitate learners’ capacity to engage in self-evaluation by providing immediate, personalized, and scaffolded responses that encourage reflection on their own writing, in addition to providing corrective feedback. LLMs empower learners to engage in metacognitive processes by encouraging them to evaluate the lucidity of their arguments, identify patterns of

errors, and consider alternative phrasings. This fosters a more self-regulated and active learning approach (Andrade, 2019; Wei, 2020). By aligning with self-evaluation practices, learners are able to critically evaluate their performance, establish improvement objectives, and cultivate a higher level of self-awareness and autonomy in their writing development (Zheng et al., 2022). Consequently, AI-driven feedback serves as a formative guide and a catalyst for learner reflection, thereby bridging the divide between external input and internal self-assessment mechanisms that are crucial for academic development (Heydarnejad, Ismail, et al., 2022; Punpromthada et al., 2022).

A multitude of scholarly investigations have examined the beneficial influence of AI-assisted language learning instruments on the linguistic acquisition competencies of English language learners (e.g., Fitria, 2023; Liu, 2021; Suryana et al., 2020). As an illustration, Seufert et al. (2021) explored the ramifications of integrating instructor and peer feedback with feedback from intelligent tutoring systems on the academic writing capabilities of EFL students. The feedback rendered by the intelligent tutoring system, incorporated within an AI-assisted language learning framework, exerted a considerable influence on the enhancement of students’ academic writing proficiencies. Hwang et al. (2023) executed an experimental study employing a control group to investigate the impact of an AI-driven writing feedback instrument on the writing performance of undergraduate EFL students. The findings indicated that the experimental cohort, which utilized the AI-assisted tool, surpassed the control group in terms of writing assignments. The personalization attribute of the AI tool was instrumental in aiding learners in the revision and editing processes of their writing submissions.

Similarly, Fitria (2021) executed an inquiry that examined the efficacy of Grammarly as an AI-assisted language learning instrument in enhancing the writing proficiency of EFL learners. The learners were provided with corrective feedback within the AI-empowered environment to revise and ameliorate their written compositions. The outcomes indicated a substantial contribution of the AI-assisted language learning instrument to the enhancement of learners’ writing capabilities. In a similar vein, Chang et al. (2021) utilized a quasi-experimental research framework to investigate the influence of an AI-supported writing feedback tool on the writing performance of EFL learners. The experimental cohort employed Grammarly for the editing and revision of their written compositions, whereas the control cohort did not possess access to Grammarly. The findings illustrated that the experimental cohort surpassed the control cohort in writing competencies, thereby underscoring the significant role of this AI-powered language learning instrument in cultivating EFL learners’ writing performance.

In general, AI-integrated instruction exhibits promising potential for enhancing writing skills by offering personalized, timely, and adaptive feedback. Additionally, it fosters self-evaluation by fostering meta-cognitive awareness and learner autonomy, which are essential for sustained academic development. This dual function not only addresses linguistic competence but also fosters cognitive and emotional growth through self-regulatory processes, a vital aspect for learners navigating complex writing tasks in technology-enhanced educational contexts (Andrade, 2019; Punpromthada et al., 2022; Heydarnejad et al., 2024).

2.3. Emotion regulation

Emotion regulation has gained increasing prominence in second language (L2) education, influenced by the growing emphasis on positive psychology and the expanding effort to identify factors that affect both L2 learners and educators (Wang et al., 2021). According to Gross (1998), emotions arise from patterns of attention and corresponding reactions, with individuals first responding to challenges, then interpreting the situation, and finally generating an emotional response. Emotions can play a constructive role by enhancing decision-making and promoting learning. However, in certain contexts, they may also have adverse effects, leading to maladaptive cognitive or behavioral biases. Notably, the need for emotion regulation often stems from the

presence of negative or harmful emotions (Gross, 2015).

Since its conceptualization, emotion regulation has been defined in various ways. Gross (1998) describes it as the process through which individuals manage which emotions they experience, when they experience them, and how they express or act on them. Thompson et al. (2008) extend this definition to include both internal and external processes that are used to monitor and adjust emotional responses in the pursuit of personal goals. Cole et al. (1994) emphasize its role in allowing individuals to respond to life situations with a flexible and socially appropriate range of emotions. More recently, Bielak and Mystkowska-Wiertelak (2022) classified emotion regulation into two key types: downregulation, which involves reducing the intensity of negative emotions, and upregulation, which involves enhancing positive emotions.

In educational settings—particularly in the emotionally charged context of language learning—educators often engage in both forms of regulation. For instance, Li and Lv (2022) suggest that teachers may use downregulation strategies to mitigate negative emotions such as stress, which could otherwise impair students' motivation, engagement, and academic success. Conversely, upregulation techniques, as advocated by Gong et al. (2013), can be employed to enhance teaching efficacy and promote a positive learning environment. Sutton (2004) similarly emphasizes the role of emotional regulation in fostering a supportive teacher-student relationship and modeling emotional balance.

Gross (2015) further distinguishes between intrinsic and extrinsic emotion regulation. Intrinsic regulation refers to managing one's own emotional states, often seen in adult learners and teachers. In contrast, extrinsic regulation involves managing another person's emotional responses—an idea explored extensively in parent-child dynamics. Barthel et al. (2018) argue that external emotional support is often more effective than self-regulation, as it requires less cognitive effort from the learner. In language classrooms, which are often emotionally sensitive environments, teachers play a vital role in supporting learners emotionally through such external strategies (Gkonou & Miller, 2019; Li & Lv, 2022).

To assess emotion regulation in this study, the Cognitive Emotion Regulation Questionnaire (CERQ; Garnefski & Kraaij, 2007) was employed. This 36-item instrument uses a 5-point Likert scale (1 = almost never to 5 = almost always) and measures nine cognitive strategies: self-blame, acceptance, rumination, positive refocusing, refocus on planning, positive reappraisal, putting into perspective, catastrophizing, and blaming others. The CERQ is widely recognized for its ability to distinguish between adaptive and maladaptive patterns of emotion regulation.

In sum, emotion regulation is a critical factor in educational contexts, especially within L2 learning, where learners frequently face emotionally demanding situations. Supporting students in managing their emotional experiences not only enhances their academic engagement but also contributes to their overall emotional well-being. These findings highlight the potential benefits of integrating self-evaluation practices with AI tools in instructional settings to enhance learner outcomes in EFL writing courses, where emotional support, motivation, and self-perception intersect to shape academic success.

2.4. Self-competence

A wide range of methodologies, often grounded in distinct theoretical frameworks, have been used to assess students' self-perceived academic competence. Educational researchers have invited students to reflect on various dimensions of their academic beliefs—such as their confidence in applying self-regulatory strategies (self-efficacy for self-regulated learning; Zimmerman & Martinez-Pons, 1990), their expectations of performance (performance expectancies; Meece et al., 1990; Malpass et al., 1999), their understanding of reading materials (perceptions of competence; Harter, 1982), and their proficiency in specific subject areas (domain-specific self-concept; Marsh et al., 1991; Meece

et al., 1990). Pajares (1997) argues that the multitude of self-competence constructs—each rooted in different motivational theories (e.g., social cognitive theory, Bandura, 1997; expectancy-value theory, Eccles & Wigfield, 2002)—has led to ambiguity regarding their respective roles in student motivation and learning. He further suggests that varying forms of competence assessment may serve distinct purposes, thus shaping motivation and learning in different ways.

In this study, self-competence was measured using the Self-Competence Scale (Tafarodi & Swann Jr, 2001), a 16-item instrument rated on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). The scale includes two subscales: Self-Liking, which reflects general self-worth, and Self-Competence, which assesses perceived efficacy. While this instrument effectively distinguishes between affective and competence-related self-perceptions, its brevity may limit its ability to capture domain-specific academic nuances.

Consequently, a clear understanding of students' self-competence is essential for designing instructional strategies that foster academic achievement and motivation. These findings highlight the potential benefits of integrating self-evaluation practices with AI tools in instructional settings to enhance learner outcomes in EFL writing courses, where both motivation and self-perception play a critical role in student success.

2.5. Motivation

Motivation, in an operational sense, refers to a learner's inclination toward specific motivating factors that not only initiate but also sustain academic behaviors directed toward achieving particular learning goals. As a complex and multifaceted construct, motivation plays a critical role in shaping learning outcomes, especially in mobile and technology-enhanced educational contexts. It is commonly categorized into two types: intrinsic and extrinsic motivation (Deci & Ryan, 1995). Intrinsic motivation—driven by internal interest, curiosity, or enjoyment—has been shown to be particularly beneficial in the context of second language acquisition (Noels et al., 2000). In contrast, extrinsic motivation—rooted in external rewards or pressures—has, in some cases, been found to negatively affect learning outcomes (Gonzales, 2011). Given these divergent findings, it is crucial to investigate how mobile English language learning environments influence motivational dynamics.

Language learning motivation, distinct from general academic motivation, is especially complex, comprising a wide array of interrelated factors (Csizér & Dörnyei, 2005). It involves learners' attitudes toward the process of language acquisition and the various internal and external factors that drive their engagement (Gardner, 2006). These factors span both learner-centric characteristics—such as identity, preferences, cognition, and satisfaction—and social determinants—including socioeconomic status, perceptions of the target language and its communities, cultural background, gender, and sociolinguistic interactions. The interaction between these internal and external influences must be considered when analyzing learners' motivation. For example, learners from higher socioeconomic backgrounds often exhibit higher motivation levels than those from less privileged contexts. Similarly, learners with positive attitudes toward language learning tend to demonstrate stronger and more sustained motivation.

In this study, motivation was measured using the Academic Motivation Scale (AMS; Vallerand et al., 1992), a 28-item instrument based on a 7-point Likert scale (1 = does not correspond at all to 7 = corresponds exactly). The AMS encompasses seven subscales: three types of intrinsic motivation (to know, to accomplish, and to experience stimulation), three types of extrinsic motivation (external regulation, introjected regulation, and identified regulation), and amotivation. While the AMS offers a comprehensive framework for analyzing different motivational dimensions, its interpretation can be challenging due to potential overlaps among subscales.

Overall, motivation—especially intrinsic motivation—is a key driver

of learner engagement and success in second language writing. This is particularly true in mobile and AI-supported learning environments, where learner autonomy and sustained interest are critical. These findings highlight the potential benefits of integrating self-evaluation practices with AI tools in instructional settings to enhance learner outcomes in EFL writing courses, where both motivation and self-perception are closely intertwined with academic success.

Despite the voluminous research on self-evaluation, cognitive emotion regulation, self-competence, and motivation, the interconnected roles of these factors in influencing academic writing outcomes remain understudied, especially within instructional environments that incorporate AI. While AI tools such as ChatGPT and Grammarly have been shown to provide promise in improving writing proficiency and delivering tailored feedback, there is a dearth of understanding about how these tools impact learners' self-regulatory capacities, emotional resilience, and motivation in the context of writing tasks. Moreover, the interplay of these factors—particularly how self-assessment fosters emotional and cognitive flexibility—calls for further investigation to better promote support for students' academic writing success in the dynamic context of technology-enhanced education.

3. Method

3.1. Design

This study utilized a quantitative quasi-experimental pretest-posttest design involving two intact pre-intermediate level writing classes. These classes were randomly assigned to an experimental group and a control group. Both groups received AI-integrated instruction, but only the experimental group received explicit training and practice in self-evaluation, while the control group followed AI-based instruction without the self-evaluation component.

3.2. Participants

The study was set in a high school in Iran. The participants were selected from two intact classes, each consisting of 30 male learners. These classes were randomly assigned to an experimental group and a control group. The participants in each group ranged in age from 16 to 18 years. The inclusion criteria for participant selection were: enrollment in the designated high school, a lower-intermediate proficiency level in English as assessed by the Oxford Quick Placement Test (OQPT), a monolingual Persian background, and the absence of prior or concurrent attendance at private language institutes during the data collection period. Participants who indicated travel to English-speaking countries or bilingualism were eliminated to mitigate possible confounding variables associated with language exposure.

Using the OQPT, it was confirmed that all participants possessed lower-intermediate proficiency in English. None of the participants reported ever having traveled to an English-speaking country, and all were monolingual Persian speakers. Furthermore, all participants had not attended private language institutes before and were not attending any during the study period. This selection ensured a relatively homogenous sample in terms of language proficiency and exposure, making them appropriate for examining the effects of the intervention on EFL writing skills.

3.3. Instruments

In order to conduct a thorough evaluation of participants' motivation, self-perceived competence, emotion regulation, and language proficiency, a battery of validated instruments was meticulously chosen for this investigation.

The Oxford Quick Placement Test (OQPT) was implemented to guarantee that all participants were consistently proficient in English at

the lower-intermediate level, thereby establishing a standardized foundation for subsequent analyses.

The Cognitive Emotion Regulation Questionnaire (CERQ; [Garnefski & Kraaij, 2007](#)) is a 36-item instrument comprised of 9 subscales: Self-blame, Acceptance, Rumination, Positive Refocusing, Refocus on Planning, Positive Reappraisal, Putting into Perspective, Catastrophizing, and Other-blame. It is evaluated on a 5-point Likert scale (1 = almost never, 5 = almost always). This instrument evaluates cognitive strategies for managing emotions in the aftermath of distressing events. Potential self-report bias and situational variability are limitations that must be taken into account when interpreting results, despite its strengths in reliability and validity.

The Self-Competence Scale ([Tafarodi & Swann Jr, 2001](#)) comprises two subscales: Self-Liking and Self-Competence, and it comprises 16 items that are rated on a 5-point Likert scale (1 = strongly disagree to 5 = strongly concur). It has established psychometric properties and measures learners' perceived competence and self-worth, but it is acknowledged to have cultural response biases.

The Academic Motivation Scale (AMS; [Vallerand et al., 1992](#)) includes 28 items on a 7-point Likert scale (1 = does not correspond at all to 7 = corresponds exactly). The scale is divided into 7 subscales that capture the dimensions of intrinsic motivation, extrinsic motivation, and amotivation: Intrinsic Motivation to Know, Intrinsic Motivation to Accomplish, Intrinsic Motivation to Experience Stimulation, Extrinsic Motivation—External Regulation, Extrinsic Motivation—Introjected Regulation, Extrinsic Motivation—Identified Regulation, and Amotivation. This scale is frequently employed in educational settings, such as research on second language acquisition.

Writing proficiency was assessed with TOEFL iBT-based writing problems, scored using a detailed analytic rubric. This rubric evaluated five essential criteria: organization, coherence and cohesiveness, grammatical correctness, vocabulary variety and appropriateness, and goal fulfillment. Each criterion was evaluated on a scale that contributed to a cumulative score between 0 and 30. The rubric included comprehensive descriptions for each score tier to guarantee objective and consistent assessment by evaluators. High inter-rater reliability was attained (ICC = .89), facilitated by calibration sessions to ensure scoring uniformity. The internal consistency of writing evaluations was robust at both pretest (KR-21 = .862) and posttest (KR-21 = .827).

To assess the intervention's effect, all instruments were given at two separate time intervals (pretest and posttest).

In order to measure the intervention's impact, all instruments were administered at two distinct time points (pretest and posttest). Furthermore, writing assessments that were based on TOEFL iBT tasks were evaluated on a scale of 0–30 using a comprehensive rubric that prioritized organization, coherence, grammar accuracy, vocabulary utilization, and task fulfillment. A high level of inter-rater reliability was achieved by two trained raters who independently scored all samples following calibration sessions (ICC = .89). The writing exams' internal consistency was also robust and reliable at both the pretest (KR-21 = .862) and posttest (KR-21 = .827).

3.4. Treatment

Participants, aged 16 to 18, provided informed consent, with parental consent obtained for minors. Both participants and guardians were informed of the study's aims and confidentiality measures, with consent forms securely stored per ethical standards. The intervention spanned nine weeks, with both experimental and control groups attending three 90 min sessions weekly. In both groups, AI technologies—ChatGPT (OpenAI) and Grammarly—were integrated to support the writing process across prewriting, drafting, and revision phases. However, only the experimental group actively engaged in structured self-evaluation practices designed to foster learner autonomy, metacognitive awareness, and writing fluency. During the prewriting phase, students used ChatGPT for brainstorming, planning, and

organizing ideas, guided by teacher-designed prompts (e.g., “Generate reasons for prohibiting single-use plastics”). They refined AI-generated outputs through iterative questioning and critically evaluated these using a self-assessment checklist focusing on content relevance, organization, coherence, and task adherence. This encouraged active engagement with AI-generated material rather than passive acceptance. In the drafting phase, students composed essays based on their outlines and submitted drafts to Grammarly for automated feedback on grammar, punctuation, vocabulary, and style. Prior to reviewing Grammarly’s suggestions, the experimental group completed a self-assessment form rating grammatical accuracy, coherence, and goal fulfillment. This sequence was intended to heighten linguistic awareness and promote reflective language choices. Students were trained to critically evaluate Grammarly’s feedback to decide which corrections improved clarity without altering meaning, fostering editorial judgment and autonomy. During revision, students combined Grammarly feedback with their self-assessments to amend drafts. They also revisited ChatGPT for targeted rewriting (e.g., “Rephrase this sentence to sound more formal”), examining lexical variety and coherence. Students compared AI-generated alternatives with their revisions and justified final choices in reflective logs, reinforcing higher-order thinking and positioning AI as an aid rather than a substitute. Final submissions included brief reflections on changes made and rationale. To support the experimental group’s emotional well-being, weekly cognitive and emotional training sessions addressed common writing anxieties such as fear of negative evaluation and perfectionism. Techniques included positive reappraisal, mindfulness, and emotion regulation strategies to boost resilience and confidence, enhancing students’ capacity to manage the cognitive demands of AI-assisted writing. The control group also used AI tools for writing support but did not participate in formal self-evaluation or emotional training. Their instruction followed a conventional grammar-translation approach emphasizing accuracy through instructor-led grammar, vocabulary, and translation exercises. Writing assignments were handwritten and submitted for manual correction. Revisions relied solely on teacher feedback, without opportunities for self-assessment or autonomous error correction. Thus, the control group’s experience was more teacher-centered and lacked the reflective and emotional regulation components embedded in the experimental group’s approach.

3.5. Data analysis procedures

In order to analyze the data, several tests are conducted using SPSS software. To analyze cognitive emotion regulation, self-competence and motivation chi-squares are conducted on both pretests and posttests to compare and contrast the effect of the treatment on these constructs. That is, the researchers aim to understand the extent to which the treatment can enhance the development of cognitive emotional regulation, self-competence, and motivation in response to self-evaluation in AI-integrated writing instruction. Additionally, to determine the influence of the treatment on writing skills of the participants, separate independent samples t-tests are conducted for analyzing both the pretest means scores and the posttest mean scores of the two groups. It is important to acknowledge that before conducting this inferential test of significance, a Kolmogorov-Smirnov test is conducted to ensure the normality assumption.

4. Results

4.1. The effect of self-evaluation in AI-integrated writing instruction on EFL learners’ emotion regulation

As discussed above, to measure the effect of self-evaluation in AI-integrated writing instruction on cognitive emotion regulation chi-squares were conducted on both time intervals.

Table 1 shows that on the pretest only a few learners (5 learners in

Table 1
Emotion regulation pretest crosstabulation.

		Emotion Regulation Pretest		Total
		Regulated	Unregulated	
Group	Experimental	5	25	30
	Control	4	26	30
Total		9	51	60

the experimental group and 4 in the control group) could regulate their emotions.

Table 2 shows that at 1 degree of freedom, the difference between the two groups on the pretest was not significant ($p > .05$).

Table 3 indicates that on the posttest 20 learners in the experimental group could regulate their emotions, while only 6 learners in the control group were able to do so.

Table 4 demonstrates a substantial difference between the two groups on the posttest ($df = 1, p = .001$). Additionally, the effect size is enormous (Phi Cramer’s $V = .471$).

4.2. The role of self-evaluation in enhancing EFL learners’ self-competence in AI-integrated writing instruction

Just like what was done for the emotion regulation, chi-squares were performed to measure the effect of the treatment on self-competence.

Table 5 demonstrates that only 7 learners in the experimental group and 6 learners in the control group were self-competent on the pretest.

Table 6 shows that the difference between the two groups in terms of self-competence on the pretest was not significant ($df = 1, p > .05$).

Based on the statistics presented in Table 7, 23 learners in the experimental group and 6 learners in the control group were reported as self-competent on the posttest (see Table 8).

The chi-square tests of self-competence on the posttest demonstrates a significant difference between the two conditions on the posttest ($df = 1, p = .001$) with a substantial effect size (Phi Cramer’s $V = .567$).

4.3. The influence of self-evaluation in AI-integrated writing instruction on EFL learners’ motivation

Chi-squares were need to measure the influence of self-evaluation in AI-integrated writing instruction on L2 learners’ motivation.

Table 9 shows that merely 3 learners in the treatment group and 5 learners in the comparison condition were motivated on the pretest.

Table 10 shows a non-significant difference between the two groups in terms of motivation on the pretest ($df = 1, p > .05$).

Table 11 shows a sharp increase in the motivation that the experimental group reported on the posttest with 19 experimental learners being motivation, while only 4 control learners were motivated on the posttest.

Table 12 indicates that a significant difference exists between the two groups in terms of their motivation on the posttest ($df = 1, p = .001$) with a huge effect size (Phi Cramer’s $V = .514$).

Table 2
Chi-square tests on the pretest.

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.131	1	.718		
Continuity Correction	.000	1	1.000		
Likelihood Ratio	.131	1	.717		
Fisher’s Exact Test				1.000	.500
Linear-by-Linear Association	.129	1	.720		
N of Valid Cases	60				

Table 3

Emotion regulation posttest crosstabulation.

		Emotion Regulation Posttest		Total
		Regulated	Unregulated	
Group	Experimental	20	10	30
	Control	6	24	30
Total		26	34	60

Table 4

Chi-square tests on the posttest.

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	13.303	1	.000		
Continuity Correction	11.471	1	.001		
Likelihood Ratio	13.893	1	.000		
Fisher's Exact Test				.001	.000
Linear-by-Linear Association	13.081	1	.000		
N of Valid Cases	60				

Table 5

Self-competence pretest crosstabulation.

		Self-competence Pretest		Total
		Competent	Incompetent	
Group	Experimental	7	23	30
	Control	6	24	30
Total		13	47	60

Table 6

Chi-square tests on the pretest.

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.098	1	.754		
Continuity Correction	.000	1	1.000		
Likelihood Ratio	.098	1	.754		
Fisher's Exact Test				1.000	.500
Linear-by-Linear Association	.097	1	.756		
N of Valid Cases	60				

Table 7

Self-competence posttest crosstabulation.

		Self-competence Posttest		Total
		Competent	Incompetent	
Group	Experimental	23	7	30
	Control	6	24	30
Total		29	31	60

4.4. The effect of self-evaluation in AI-integrated writing instruction on writing achievement among EFL learners

In order to study the effect of self-evaluation practices in AI-integrated writing courses on writing achievement of the participants of this study t-tests were needed. However, a Kolmogorov-Smirnov test was first conducted to ensure the normality assumption.

Table 13 demonstrates that on both pretest and posttest data was normally distributed.

Table 14 shows a more or less similar performance between the

Table 8

Chi-square tests on the posttest.

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	19.288	1	.000		
Continuity Correction	17.086	1	.000		
Likelihood Ratio	20.490	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	18.967	1	.000		
N of Valid Cases	60				

Table 9

Motivation pretest crosstabulation.

		Motivation Pretest		Total
		Motivated	Unmotivated	
Group	Experimental	3	27	30
	Control	5	25	30
Total		8	52	60

Table 10

Chi-square tests on the pretest.

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.577	1	.448		
Continuity Correction	.144	1	.704		
Likelihood Ratio	.582	1	.445		
Fisher's Exact Test				.706	.353
Linear-by-Linear Association	.567	1	.451		
N of Valid Cases	60				

Table 11

Motivation posttest crosstabulation.

		Motivation Posttest		Total
		Motivated	Unmotivated	
Group	Experimental	19	11	30
	Control	4	26	30
Total		23	37	60

Table 12

Chi-square tests on the posttest.

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	15.864	1	.000		
Continuity Correction	13.819	1	.000		
Likelihood Ratio	16.891	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	15.599	1	.000		
N of Valid Cases	60				

experimental group ($M = 4.833$, $SD = 1.723$) and the control group ($M = 4.300$, $SD = 1.578$) on the pretest.

Table 15 indicates that the difference between the two groups on the pretest was not significant ($t = 1.250$, $df = 58$, $p > .05$).

Table 16 indicates that the experimental group ($M = 12.766$, $SD =$

Table 13

One-sample Kolmogorov-smirnov test.

		Pretest Scores	Posttest Scores
N		60	60
Normal Parameters	Mean	4.566	8.300
	Std. Deviation	1.660	5.422
Most Extreme Differences	Absolute	.139	.198
	Positive	.100	.198
	Negative	-.139	-.107
Kolmogorov-Smirnov Z		1.079	1.531
Asymp. Sig. (2-tailed)		.195	.118

Table 14

Group statistics on the pretest.

	Group	N	Mean	Std. Deviation	Std. Error Mean
Pretest Scores	Experimental	30	4.833	1.723	.314
	Control	30	4.300	1.578	.288

3.962) outperformed their peers in the control group ($M = 3.833$, $SD = 1.683$) on the posttest.

As expected, Table 17 demonstrates a statistically significant difference between the two group on the posttest ($t = 11.365$, $df = 58$, $p = .001$).

5. Discussion

The present study explored the impact of self-evaluation embedded within AI-supported writing instruction on emotion regulation, self-competence, motivation, and writing achievement of EFL learners.

Table 15

Independent samples test on the pretest.

		Levene's Test for Equality of Variances		t-test for Equality of Means					
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95 % Confidence Interval of the Difference
									Lower Upper
Pretest Scores	Equal variances assumed	.117	.733	1.250	58	.216	.533	.426	-.320 1.387
	Equal variances not assumed			1.250	57.559	.216	.533	.426	-.321 1.387

Table 16

Group statistics on the posttest.

	Group	N	Mean	Std. Deviation	Std. Error Mean
Posttest Scores	Experimental	30	12.766	3.962	.723
	Control	30	3.833	1.683	.307

Table 17

Independent samples test on the posttest.

		Levene's Test for Equality of Variances		t-test for Equality of Means					
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95 % Confidence Interval of the Difference
									Lower Upper
Posttest Scores	Equal variances assumed	14.171	.000	11.365	58	.000	8.933	.786	7.359 10.506
	Equal variances not assumed			11.365	39.136	.000	8.933	.786	7.343 10.523

The results suggested improvements in all measured variables for the experimental group, indicating the potential benefits of the combination of self-assessment and AI tools in L2 writing instruction. However, given the quasi-experimental design, caution is warranted in attributing these improvements solely to either component.

Findings showed that self-assessment within the combined AI-supported writing framework was associated with gains in learners' emotion regulation abilities. While both groups demonstrated limited emotion regulation at pretest, the experimental group exhibited greater improvement at posttest. This suggests that metacognitive strategies such as self-evaluation might contribute to better emotional recognition and management. The reflective process encouraged by self-assessment may foster emotional resilience and reduce anxiety related to writing. Additionally, the AI tools' consistent, non-judgmental feedback could have supported learners' ability to manage frustration. Nevertheless, it is important to note that these effects likely result from the interplay of self-evaluation and AI feedback rather than either in isolation. Other unmeasured factors may also have influenced these changes. Similarly, the experimental group showed enhanced self-competence after the intervention. The opportunity for learners to reflect on their progress may have helped them recognize strengths and identify areas needing improvement. The personalized feedback from AI tools likely reinforced these effects by providing tailored suggestions, which could have increased learners' confidence in their writing abilities. The notable difference between groups supports the idea that reflective practices combined with technological assistance may play an important role in developing self-efficacy. However, due to the study design, causality cannot be definitively established for either element alone.

The increase in motivation observed in the experimental group aligns with theoretical perspectives emphasizing the role of autonomy and competence in intrinsic motivation (Deci & Ryan, 1995). The

immediate, personalized feedback provided by AI tools may have enhanced learners' sense of control and engagement, fostering motivation more effectively than traditional instruction methods. However, motivation is influenced by multiple complex factors, and these findings should be interpreted as correlational rather than causal. The results suggest that the combination of AI feedback and self-evaluation contributed to this increase. Writing achievement improvements were the most pronounced effect observed. It is plausible that self-evaluation enhanced learners' critical awareness of their writing, and AI-generated feedback provided timely guidance to address specific issues, facilitating revision and skill consolidation. These outcomes are consistent with prior research on the benefits of AI-supported feedback in writing development (Chang et al., 2021; Hwang et al., 2023). However, the absence of random assignment and potential instructor or contextual influences limit claims about direct causation. The observed gains likely reflect the synergistic impact of AI and self-assessment combined.

The improvements observed in emotion regulation, self-competence, and writing achievement support the literature emphasizing the importance of self-evaluation in fostering metacognitive and emotional regulation skills (Judge et al., 1997; Andrade, 2019). The integration of AI feedback appears to enhance these processes, potentially by serving as an external, supportive resource that reduces cognitive load and provides consistent feedback (Barthel et al., 2018). Nevertheless, future research with more rigorous designs is necessary to unpack the mechanisms underlying these relationships and to differentiate the distinct contributions of AI and self-evaluation.

The study's findings suggest that AI-supported self-assessment may help learners develop metacognitive and reflective capacities, consistent with Wei's (2020) assertions. The experimental group's improvements in emotion regulation likely reflect the activation of regulatory strategies (Bielak & Mystkowska-Wiertelak, 2022; Gross, 2015) through the combined influence of self-evaluation and AI feedback. These processes are important contributors to academic success (Gkonou & Miller, 2019; Thompson et al., 2008). Similarly, the increases in self-competence align with Pajares' (1997) theory linking perceived competence to motivation and learning outcomes. Motivation gains observed support theories emphasizing the role of intrinsic motivation in language learning (Gardner, 2006; Noels et al., 2000). The AI tools' interactive features and the reflective tasks appear to have positively influenced learners' engagement. While these findings are promising, they must be viewed as preliminary due to the study's scope and design.

This study adds to a growing body of literature highlighting the interconnected roles of self-assessment, emotion regulation, self-competence, and motivation in academic achievement (Ismail & Heydarnejad, 2023). It provides empirical indications that AI tools may augment these processes by offering personalized, real-time feedback addressing cognitive and emotional aspects of learning. The results have meaningful implications for educators, policymakers, and researchers aiming to optimize EFL writing instruction in AI-augmented contexts. For educators, integrating AI tools like ChatGPT may enhance writing instruction by providing tailored feedback and fostering self-regulated learning skills. Encouraging self-assessment habits can help learners develop critical reflection on their work and emotional resilience, which are important for writing success. Teachers should also consider learners' emotional and motivational needs to create supportive learning environments. For policymakers, findings highlight the potential benefits of incorporating AI technologies in language curricula. Investments in infrastructure, teacher training, and resources are essential to maximize the educational impact of such tools. Policies promoting a holistic approach to language teaching that addresses cognitive, emotional, and motivational factors can support deeper, more sustainable learning. For researchers, this study points to several avenues for further inquiry. More detailed and longitudinal research is needed to clarify how self-evaluation and AI support influence writing performance and related psychological factors over time. Additional variables such as language proficiency, cultural background, digital literacy, and

special education needs should be considered to tailor AI-supported instruction to diverse learners. Furthermore, examining how AI feedback complements or interacts with human feedback will be important to optimize instructional approaches.

6. Conclusion

This research investigated the effects of self-evaluation incorporated into AI-assisted writing instruction on EFL learners, emphasizing emotion regulation, self-efficacy, motivation, and writing performance. The findings indicated that integrating self-assessment techniques with AI technologies significantly improved learners' emotional regulation, self-perception of competence, motivation, and writing performance relative to conventional teaching methods. The experimental group regularly surpassed the control group across all assessed categories, underscoring the transformational potential of AI-enhanced pedagogies in writing instruction and comprehensive learner development. Furthermore, the results underscore the essential function of self-assessment in enhancing learners' self-regulatory and cognitive skills. When integrated with AI technologies like ChatGPT, these techniques enabled learners to engage in critical reflection, surmount emotional and motivational obstacles, and generate superior written output. By using individualized AI feedback and engaging in reflective self-assessment, learners enhanced their language competency while also developing transferable life skills, like self-awareness and resilience.

Although these results are encouraging, it is important to recognize a number of constraints. The generalizability of the findings to broader populations is restricted by the context-specific nature of the study and the relatively small sample size. Furthermore, the research's primary focus was on the short-term effects, leaving the long-term impact of incorporating AI tools and self-evaluation into writing instruction unexplored. These factors limit the capacity to formulate definitive conclusions regarding the intervention's long-term effectiveness. Additionally, the study design renders it impossible to isolate the individual effects of AI or self-evaluation, and the favorable results are most effectively attributed to their combined implementation.

Future research could circumvent these constraints by utilizing participant samples that are both more extensive and diverse in order to improve generalizability. Additionally, longitudinal research is required to evaluate the long-term effects of AI-supported self-evaluation on writing skills and related psychological constructs. Additionally, a more thorough comprehension of the pedagogical implications of AI tools could be achieved by examining their impact on other language domains in addition to writing. It would be beneficial to investigate the potential challenges and biases that are inherent in AI-generated feedback, as well as its interaction with human feedback, in order to optimize the application of AI in language learning environments. This research has the potential to inform the most effective methods for incorporating AI tools into pedagogical frameworks that cater to the cognitive and affective requirements of learners.

Ethics declarations

The author confirm that she used Quillbot paraphraser for paraphrasing, grammar checking, and enhancing the readability of the text under human oversight and control.

Consent for publication

Not applicable.

Authors' contributions

The author contributed to the design and implementation of the research, to the analysis of the results and to the writing of the manuscript.

Declarations ethics approval and consent to participate

This study constitutes a research proposal (No. 4/3748) submitted to the University of Gonabad and has been reviewed and approved by the University's Research Committee. All methodologies were conducted in accordance with the relevant guidelines and regulations. The participants provided their written informed consent to participate in this study. The study protocol was approved by the University of Gonabad Institutional Review Board and followed the principles of the Declaration of Helsinki. The participants were aged between 16 and 18 years. For those under 18, written informed consent was obtained from their parents or guardians. All participants, including those of legal age, provided their written informed consent to participate in this study. Additionally, all participants and their parents or guardians were fully informed about the objectives of the study and assured of the confidentiality of their data.

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Declaration of competing interest

The author declares that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this study.

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Data availability

The datasets used and/or analyzed during the current study are available on reasonable request.

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