



The Effect of AI-Assisted Blended Self- and Peer-Assessment on Iranian EFL Learners' Writing and Motivation: The Role of Extroversion and Introversion

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Abstract

This mixed-methods study examined the effects of AI-assisted blended self- and peer-assessment on the writing performance and motivation of 80 intermediate Iranian EFL learners, while also exploring the mediating role of introversion/extroversion. Participants from a language institute in Babol were divided into two experimental and two control groups. Over 12 sessions, the experimental groups received AI-supported feedback within a process-based writing approach, whereas the control groups followed conventional instruction. Quantitative results showed that the experimental groups significantly outperformed the control groups in both writing and motivation. However, no significant interaction was found between treatment and personality type, indicating that both introverts and extroverts benefited equally. Qualitative data revealed benefits such as better revision quality, increased autonomy, and higher engagement, alongside challenges like concerns about feedback reliability and peer evaluation quality. Overall, the findings support the integration of AI-assisted blended self- and peer-assessment as an effective formative assessment tool for enhancing writing skills and motivation across different personality styles in EFL contexts.

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Introduction

Feedback acts as a catalyst in second language (L2) learning processes since it focuses on guiding learners toward aspects concerning linguistics, structuring content, and communicativeness in writing. There is substantial literature indicating that the type of feedback may exert significant impacts on cognitive, affective, and motivational states. For example, Mehri et al. (2023) showed how specific types of feedback based on comparisons could impact learners' achievement emotions and goal orientations. Likewise, Mehri (2024) has demonstrated that various forms of non-linguistic feedback can help to develop complexity, accuracy, or fluency for learners in EFL writing tasks and so support the notion that feedback can serve to correct learners as well as contribute to their development. Furthermore, these examples illustrate how effective feedback made available to learners, goes beyond just providing the right answers, so that learners will display willingness to continue to engage with their learning, and also include the affective and motivational aspects of engaging learners in a positive way. Therefore, when learners in an EFL writing context experience limited exposure to the language and/or delayed teacher feedback, using effective feedback practices will be necessary in order to improve learners' performance and motivation.

In English as a Foreign Language (EFL) writing classroom, large classes often restrict teachers' capacity to provide prompt and individualized feedback, which can hinder students' writing development (Cheng et al., 2025; Li & Chen, 2025). To mitigate this challenge, self-assessment and peer-assessment, as two variants of alternative assessment, have been introduced. Through peer assessment, learners engage in activities to evaluate the quality of their peers' writing and identify their strengths and weaknesses in order to improve their own writing proficiency (Abo et al., 2025). Peer-assessment, functioning as a formative assessment, allows writers to discuss their texts and gain insight into how others interpret their writing (Hyland & Hyland, 2019). On the other hand, self-assessment, as another sub-category of alternative and formative assessment, helps students critically reflect on their own work and learning, assess how well their performance aligns with clearly defined criteria, identify areas of strength and weakness, and revise their work accordingly (Yang et al., 2025). Self-assessment enhances learners' self-awareness, autonomy, and self-regulation by encouraging them to reflect on their own performance in a supportive and low-anxiety context (Butler, 2018).

However, the effectiveness of peer-assessment and self-assessment is often limited by the lack of real-time monitoring of feedback quality, which can result in superficial or unreliable peer comments and reduce students' willingness to use peer feedback (Zong et al., 2023). To remedy this problem, researchers have proposed strategies such as implementing interactive peer assessment, where learners respond to peer comments during the review process (Yan & Gao, 2025; Zhang & Gao, 2024). However, this approach is time-consuming and difficult to sustain in large classes, and their success depends heavily on students' feedback literacy and emotional regulation, which require systematic teacher support (Carless & Boud, 2018; Winstone & Boud, 2022). To address these challenges, recent studies have begun exploring the integration of AI into peer feedback processes to support and monitor feedback quality (Guo, 2024). Learners can use AI-based feedback to improve the quality of their writing flexibly, as

it allows them to revise their work at their own pace and independently of time and location, hence accelerating their learning process (Wang et al., 2024). Besides, a blended AI-assisted framework may reduce the effects of inaccurate self-judgment of self-assessment and inconsistent feedback quality of peer assessment (Birjandi & Bolghari, 2015) as it hosts both methods of assessment in itself.

One of the psychological elements being relevant to self-assessment and peer-assessment with the potential to act as a mediator is the learning style of learners because it affects the evaluation processes of individuals in L2 writing classrooms. Various studies conducted have indicated that distinct learning styles affect self-assessments and peer-assessments in distinct ways (Birjandi & Bolghari, 2015; Panadero et al., 2017; Hsu et al., 2023). For example, learners who possess analytical and problem-solving styles in their learning patterns are known to be highly accurate in self-assessments, whereas those in the other category possess better performance in peer-assessments (Panadero et al., 2017). Similarly, introverted or extroverted traits in individuals' personality types influence distinct performance measures in formative assessment contexts concerning their performance in judgment accuracy tasks using peer-correction techniques (Han & Xu, 2024; Zhang et al., 2023).

Although previous research has examined self-assessment, peer assessment, and AI-supported feedback in L2 writing, these strands have largely developed separately, and empirical evidence on their combined implementation remains limited—particularly with respect to learner motivation and individual differences (Panadero et al., 2017; Stevenson & Phakiti, 2019). Moreover, little is known about whether personality traits such as introversion and extroversion shape learners' engagement with and outcomes from AI-assisted formative assessment practices. Therefore, this study investigates the effects of AI-assisted blended self- and peer assessment on Iranian EFL learners' writing ability and motivation and explores whether these effects differ between introverted and extroverted learners. It also examines learners' perceptions of this assessment approach. These goals are sought through the following questions:

- RQ1.** Does AI-assisted blended self- and peer assessment significantly improve Iranian upper-intermediate EFL learners' writing ability?
- RQ2.** Does AI-assisted blended self- and peer assessment significantly improve Iranian upper-intermediate EFL learners' motivation?
- RQ3.** Do introverted and extroverted learners differ significantly in writing improvement and motivation gains following AI-assisted blended self- and peer assessment?
- RQ4.** What are Iranian upper-intermediate EFL learners' perceptions of using AI-assisted blended self- and peer assessment?

Literature Review

Theoretical Framework: Sociocultural Theory

Sociocultural Theory (SCT), grounded in Vygotsky's (1978) work, conceptualizes learning as a socially mediated process in which cognitive development emerges through interaction with others and the use of cultural tools. A central concept in SCT is the Zone of Proximal

Development (ZPD), which highlights how learners can perform beyond their independent abilities when supported through scaffolding provided by more capable peers or instructors (Lantolf et al., 2014). SCT therefore emphasizes collaborative meaning-making and the dynamic relationship between learners, their social context, and mediational resources (Lantolf, 2013).

AI-assisted blended self- and peer assessment aligns with SCT principles by functioning as a form of mediated learning in which digital tools support learners' writing development. From this perspective, AI feedback can serve as a cultural artifact that mediates learners' attention to language form, organization, and task requirements, potentially facilitating reflection and revision (Lantolf, 2006). When combined with peer assessment, such mediation may promote interaction and reciprocal scaffolding, allowing learners to operate within their ZPD during feedback interpretation and text improvement. Moreover, engaging in self-assessment can be viewed as a form of developing self-regulation that emerges through earlier socially guided activity and gradually becomes internalized. As argued by Lantolf and Poehner (2014), technology-mediated support can reflect Vygotskian praxis when it promotes meaningful interaction and guides learners toward greater autonomy.

Overall, SCT provides a relevant framework for examining AI-assisted blended assessment in EFL writing because its core concepts—mediation, scaffolding within the ZPD, and movement from other-regulation toward self-regulation—closely correspond to the interactive and reflective processes involved in AI-supported self- and peer assessment practices.

Previous Related Studies

Research has mushroomed in using AI to teach EFL and second language (L2) written communication. Various AI-assisted tools such as Grammarly, QuillBot, and the recently available ChatGPT (and others) can facilitate the use of correct grammar, coherence of the text and autonomy of the student while writing in one of these two dialects. Research has indicated that feedback generated by AI can improve the grammar and vocabulary of EFL and L2 students and promote self-monitoring and independent revising of their written communication skills (Barrot, 2022; Takallou, 2025; Abdalkader, 2022). QuillBot has been shown to support students in overcoming impairments associated with writing block, as well as diversifying their use of sentence structures through paraphrases and computerized text generation (Amyatun & Kholis, 2023). Taken together, these findings point to the impact of AI tools on the cognitive and metacognitive aspects of writing development.

In the available literature, examples of how AI-assisted self-assessment and peer assessment can upscale the quality of feedback on writing and enhance engagement have been reported. In one study by Guo et al. (2024), the authors incorporated an AI chatbot (Eva) as part of an online peer review system that was used by 64 Chinese undergraduate EFL students to complete nine peer assessment tasks. Based on their results, following the integration of AI-assisted peer assessment and self-assessment, students' performance and the quality of the feedback they received improved significantly. This showed that AI can help support those providing and receiving feedback from outside the traditional classroom. Likewise, Yang et al. (2025) carried out an empirical study involving 137 subjects to see if traditional peer assessment with AI-based positive summaries produced different outcomes based on two experimental conditions:

peer critiques versus AI-generated positive summaries. The results indicated that both AI-generated and traditional peer assessments showed greater levels of acceptance than those receiving only traditional peer assessments. This reinforces the view that the use of AI improves the emotional and motivational dimensions involved in the peer assessment process. Additionally, Yang et al (2024) conducted a study on automated writing evaluation (AWE) and found that with increased interaction with AI feedback, students changed their approach to revising their writing from mechanical corrections to reflective self-regulation.

Apart from the aforesaid advantages, authors of AI-assisted assessment have also warned against some pervading challenges, including concerns about privacy and security, algorithmic bias, inconsistent or unreliable feedback, learners' technological competence, equitable access, and potential limitations in fostering critical thinking without instructional guidance (Fitria, 2021; Zhao, 2024). They argue that overcoming these challenges AI requires structured learning and assessment environments.

Individual differences, particularly learner characteristics, have also been shown to influence the effectiveness of assessment. Hsu et al. (2023) reported that in mobile-based peer assessment, active learners displayed higher motivation and achieved better learning outcomes than passive learners. Similarly, in the Iranian EFL context, Borna et al. (2024) examined 96 intermediate learners across two private institutes and compared ProWritingAid and Grammarly in an eight-session quasi-experimental study, finding that both tools significantly improved writing performance, with Grammarly producing slightly stronger gains. In addition, Birjandi and Bolghari (2015) reported that learning style played a key role in enhancing the accuracy of learners' self- and peer-assessments, which confirmed the effect of individual learner variables on assessment outcomes.

Although prior studies provide evidence for the benefits of AI-assisted writing and peer/self-assessment, few have investigated personality traits, such as introversion and extroversion, as potential moderators of engagement, motivation, and writing outcomes. Furthermore, the integration of AI-assisted blended self- and peer-assessment remains underexplored in Iranian EFL contexts, particularly at the upper-intermediate level. Learners' motivational responses and perceptions toward such blended AI-supported approaches are also insufficiently examined, leaving important gaps in understanding how individual differences influence outcomes. Addressing these gaps, the present study investigates the effects of AI-assisted blended self- and peer-assessment on Iranian upper-intermediate EFL learners' writing performance and motivation, with a specific focus on differences between introverted and extroverted learners.

Methods

Design

The present study adopted a mixed-methods explanatory sequential design to address the research questions through both quantitative and qualitative data. In the quantitative phase, a quasi-experimental pretest–posttest nonequivalent group design was employed to examine the effects of AI-assisted blended self- and peer-assessment on writing performance and motivation, with personality type (introversion vs. extroversion) as a grouping variable. Prior

to and following the intervention, participants completed writing and motivation measures to evaluate changes in their performances during the different instructional conditions.

The qualitative phase was conducted through semi-structured interviews to explore learners' perceptions and experiences regarding the implementation of AI-assisted blended self- and peer assessment practices. Qualitative findings were used to complement and help interpret the quantitative results by providing deeper insight into participants' attitudes toward the intervention.

Participants

A total of 110 Iranian students were enrolled in the academic writing course at Arkane Andishe Institute (Babol, Mazandaran Province, Iran). After being informed about the purpose and procedures of the study, students who agreed to participate were screened. Because the participants were drawn from intact classes at Arkane Andishe Institute, this study utilized a quasi-experimental research design. Upon administering OQPT and a personality questionnaire, students were classified as introverts or extroverts. Participants were assigned to either the experimental or control group based on their existing classes due to logistical constraints rather than random assignment. Accordingly, the sample was organized into four equal-sized groups ($n = 20$), consisting of two experimental groups (introvert and extrovert) and two corresponding control groups (introvert and extrovert). To ensure group comparability prior to the treatment, the groups' OQPT scores were compared statistically, and no significant differences were found at the pretest stage.

Regarding participant selection, convenience sampling was employed. This approach was adopted based on Dornyei's (2007) assertion that researchers benefit from selecting readily available participants who meet the study criteria. A convenience sampling method was used due to accessibility constraints, though this may limit the generalizability of the study's findings. Ethical considerations were fully addressed through informed consent, voluntary participation, and assurances of confidentiality and anonymity.

Instrumentation

To gather the data, the following instruments were utilized:

Oxford Quick Placement Test (OQPT)

Before the intervention, to test the participants' general English proficiency, the Oxford Quick Placement Test was given to the participants to ensure they met the eligibility requirements for the study. Participants were given 1 hour to take the OQPT, and learners who received scores in the upper-intermediate range (40 – 47) were selected to participate in the study.

Writing Pre- and Post-Test

To determine how effective the intervention was in terms of improving learners' writing abilities, participants took both a pre-test and a post-test essay on an argumentative topic (minimum 250 words) in 40 minutes. The writing prompt for the essays was adapted from IELTS Task 2 writing prompts and asked students to take a firm stand on a particular argument and support their position with relevant reasons and examples. All essays were scored independently by three experienced raters holding M.A. degrees in TEFL using IELTS analytic

criteria. The essays were anonymized prior to scoring, and the raters were blind to participants' group membership. The final writing score for each script was calculated by averaging the three raters' scores. Inter-rater reliability was examined for both administrations and yielded acceptable coefficients ($\alpha = .88$ for the pre-test and $\alpha = .90$ for the post-test).

Rating Scale

The analytic rubric used to rate learner's writing skills from pre- to post-test was developed by Jalilifar & Hemmati (2013). Their rubric includes rating scales for 5 dimensions of writing: Content, Organization, Vocabulary, Language Use, and Mechanics. Each of these 5 dimensions has 4 levels of achievement from Excellent to Very Good (83 - 100), Good to Average (63 - 82), Fair to Poor (52 - 62), Very Poor (34 - 51). In line with Jalilifar and Hemmati (2013), a score of 63 was considered the minimum criterion for distinguishing higher-graded from lower-graded writing performance. All essays were scored independently by three trained raters holding M.A. degrees in TEFL and possessing at least six years of IELTS writing instruction experience. Prior to scoring, the raters participated in a brief calibration session to ensure consistent interpretation of the rubric descriptors. The essays were coded and anonymized before rating, and the final writing score for each script was obtained by averaging the three raters' total scores. Any scoring discrepancies were reviewed and resolved through discussion to maintain scoring consistency.

Motivation Pre- and Post-Test

The motivation questionnaire created by Delita et al. (2022), which was given to the learners before and after the implementation of the plan, contained 20 items divided into four areas (i.e., Attention, Relevance, Confidence and Satisfaction) using a five-point Likert scale (1 = strongly disagree, 5 = strongly agree) was used to evaluate the responses and was found to have good internal consistency (Cronbach's $\alpha = .89$). Averages of the relevant items were calculated to arrive at total motivation scores (including the subscales).

Personality Type Questionnaire

The Persian version of the Eysenck Personality Questionnaire (EPQ) was used to identify learner's personalities (Eysenck, 1967). The EPQ is a 90-item questionnaire with Yes/No responses and provides measures for Extraversion/Introversion (with 21 items), Neuroticism (with 23 items), Psychoticism (with 25 items), and a Lie Scale (21 items) to identify socially desirable responding. In this study, only the Extraversion–Introversion dimension was used to categorize participants as introverts or extroverts using the cutoff method. Shapurian and Hojat (1985) reported acceptable psychometric properties of the Persian adaptation of this instrument with internal reliability coefficients greater than .80 for both the Extraversion and Neuroticism dimensions of the EPQ.

Semi-Structured Interview

The purpose of this study was to obtain insight into learners' experiences with AI-assisted blended self- and peer assessment through interviews that included questions about their perceptions of the assessments. In total, ten participants were selected to represent both introverted and extroverted learners across the groups. Interviews occurred after the intervention and averaged approximately 30 – 40 minutes per participant. The developed

interview protocol based on Kim et al. (2025) can be found in Appendix A. Audio recordings of all sessions were made to assure accurate data collection. Content- validity for both the question and the interview instrument was determined by four M.A. TEFL (Teaching English as a Foreign Language) graduates with expertise in that area, one of whom was the researcher. Those members provided judgement about clarity, relevance, and appropriateness of each to achieve the overall study goal. The transcribed text from each interview was analyzed thematically searching for common themes and similarities in the learners' experience and perception.

Procedure

An English language proficiency assessment (Oxford Quick Placement Test, OQPT) was given to all students before starting the study in order to establish proficiency for sample selection. After administering the OQPT and determining participants' proficiency level per this study's inclusion criteria (upper-intermediate level), 80 learners (male = 45, female = 35) aged between 21 and 24 years were ultimately selected for inclusion in the study. The researcher obtained necessary administrative permissions from a language school in Babol (Mazandaran) as an attempt to observe the ethical standards. An orientation was given to all participants regarding the goals of the study. All participants provided an informed consent prior to the execution of the research, and participation was voluntary. Learners were entitled to withdraw from the study at any time without any negative consequences. Participants completed the Eysenck Personality Questionnaire (EPQ - Persian version), and by sticking to the previously defined cut-off points they were split into two groups based upon personality type (introverts and extroverts).

Prior to the treatment phase, all participants received an overview of the components of essay writing (e.g., thesis statement, topic sentences, and supporting evidence). Instructional materials (e.g., 10 essays taken from Bailey (2003) and Bill (2011)) were provided to the participants during the instruction; the instructor also supplemented these instructional materials with other available resources at her discretion.

The experimental group's participation in an AI-assisted blended self- and peer-assessment program was integrated into their existing writing course and consisted of 12 sessions (which equals 24 hours). All sessions followed the same structured 4-stage cycle:

Stage 1: Drafting (In-Class, 30–40 minutes): For the first stage of the cycle, students were given an argumentative or opinion-based prompt objective for which to write their first draft (250 words to 300 words). The prompted objective used the IELTS Task 2 Format so that all sessions were consistent with one another.

Stage 2: AI-Assisted Self-Assessment (Out-of-Class + In-Class, 30 minutes): For the second stage, self-assessment, students uploaded their draft to QuillBot. In Week 1 (the introductory week), students were trained to understand all of the AI suggestions provided through the Quillbot tool, to distinguish between grammar corrections and style changes, and to make an appropriate decision regarding whether to accept or reject a suggestion. The students completed an AI-Reflection form where they reflected upon their use of AI by identifying three of the AI suggestions they accepted along with the reasoning for the acceptance; identifying one AI

suggestion they rejected and providing the reasoning for rejecting, and describing evidence of continual language problems related to their use of the tool (the AI-reflection form that they submitted to the instructor reflected active engagement and discouraged any passive reliance on the AI tool).

Stage 3: Peer Assessment (In-Class, 30–40 minutes): In the third stage, peer assessment, participants exchanged their revised drafts and used Jalilifar and Hemmati's (2013) four-variable analytic rubric to assess each other's drafts. The participants were required to use a checklist to assess their drafts, which included: clarity of the thesis, organization of the paper, coherence of the arguments (for or against the paper), appropriateness of the lexis (the words used within the argument), and accuracy of the grammar used in their draft. Each participant provided two positive aspects of the evaluated peer's draft.

Stage 4: Teacher Mediation and Final Revision (In-Class + Homework): The instructor shared some of the anonymous peer comments from the first set of drafts to students. Any AI comments that were inaccurate or any comments that were inaccurate from their classmates were corrected and clarified. The instructor modeled how to select which global (organization and argument) versus which local (grammar) edits to revise in their drafts before handing them in for a final revision.

The control group students received traditional writing instruction, based on Hinkel (2004). The instructor provided explicit writing instruction, including instruction on different essay genres, grammatical structure, and paragraph structure, by modeling components of writing, teaching writing conventions, and guiding students through the process of creating original written pieces. The primary focus of instruction in this group was development of main ideas and coherence of writing, as well as supporting main ideas with appropriate evidence. This group received no AI tools or structured self-assessment form.

All participants completed pre- and post-tests of writing and motivation to evaluate the effects of the intervention. Additionally, semi-structured interviews were conducted online with 9 participants from the experimental groups to explore their perceptions of AI-assisted blended self- and peer assessment. Interview sessions were audio-recorded, transcribed, and analyzed using thematic analysis.

Data Analysis

The research used a mixed method approach, combining both quantitative measures of writing skill and motivation in the pre- and post-intervention with qualitative semi-structured interviews to explore participant experiences. The quantitative data was analyzed via two-way ANCOVA (SPSS 24) to determine if an experimental versus control condition, along with participant introversion or extroversion, resulted in significant differences among mean posttest scores, while controlling for pretest scores. Assumptions of the ANCOVA analysis were checked and met including normality, linearity, and homogeneity of regression slopes; descriptive statistics summarized group means. The qualitative data was analyzed using content analysis (Dörnyei, 2007); meaningful data were identified and categorized into themes to provide insight into the patterns present in learners' experiences. The results from both the

quantitative and qualitative analyses were synthesized to generate a comprehensive understanding of the impact of the intervention and participants' perspectives.

Results

Writing Performance

To examine the effects of AI-assisted blended self- and peer assessment on the writing proficiency of Iranian upper-intermediate EFL learners, pre- and post-test writing scores were analyzed. Descriptive statistics (Table 1) indicated that both introverted and extroverted learners in the experimental groups improved from pre- to post-test (Introvert: $M_{pre} = 59.85$, $M_{post} = 63.50$; Extrovert: $M_{pre} = 60.35$, $M_{post} = 62.80$), whereas control groups showed only minimal gains.

Table 1. Descriptive Statistics for the Writing Pre- and Post-Tests of the Four Groups

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Pre-test Writing	Experimental1	20	59.85	6.115	1.367	56.99	62.71	48	71
	Experimental2	20	60.35	6.792	1.519	57.17	63.53	48	70
	Ontroll1	20	59.95	5.414	1.211	57.42	62.48	48	69
	Control2	20	59.60	5.335	1.193	57.10	62.10	48	69
	Total	80	59.94	5.836	.652	58.64	61.24	48	71
Post-test writing	Experimental1	20	63.50	6.083	1.360	60.65	66.35	53	76
	Experimental2	20	62.80	6.849	1.531	59.59	66.01	51	73
	Ontroll1	20	60.45	5.176	1.157	58.03	62.87	50	71
	Control2	20	60.30	4.996	1.117	57.96	62.64	50	69
	Total	80	61.76	5.885	.658	60.45	63.07	50	76

All pre- and post-test scores satisfied the normality assumption (Kolmogorov-Smirnov, $p > .05$), and Levene's test confirmed homogeneity of variances ($p > .05$). A two-way ANCOVA controlling for pre-test writing scores revealed a significant main effect of Treatment, $F(1,75) = 71.18$, $p < .001$, partial $\eta^2 = .487$, with the experimental groups outperforming the controls. Personality (introvert vs. extrovert) was not significant, $F(1,75) = 2.90$, $p = .092$, partial $\eta^2 = .037$. However, the Treatment $\times$ Personality interaction was significant, $F(1,75) = 5.47$, $p = .022$, partial $\eta^2 = .068$, indicating that introverted learners benefitted slightly more from the intervention than extroverted learners. Pairwise comparisons (Table 2) confirmed significant differences between experimental and control groups for both introverts ($p = .03$) and extroverts ($p = .04$), while differences between introverted and extroverted learners were not significant ($p = .98$).

Results from pre-test and post-test scores indicated that both were normally distributed (Kolmogorov-Smirnov, $p > .05$), and that there was homogeneity of variance (Levene's test, $p > .05$). After adjusting for the pre-intervention scores through ANCOVA, the results revealed a strong treatment effect, with the experimental group outperforming the control group ($F(1,75) = 71.18$, $p < .001$, $\eta^2 = .487$). Personality type alone did not notably influence writing performance ($F(1,75) = 2.90$, $p = .092$, $\eta^2 = .037$). Nonetheless, a significant treatment-by-personality interaction was detected ($F(1,75) = 5.47$, $p = .022$, $\eta^2 = .068$), indicating that students responded differently to the intervention depending on their personality traits. Specifically, introverted students displayed greater gains than extroverted students. Results for pairwise comparisons (Table 2) indicated that both introverted ($p = .03$) and extroverted ($p = .04$) experimental groups significantly improved their writing skills compared to the control group, while there was no statistically significant difference between experimental groups of introverted and extroverted students ($p = .98$).

Table 2. Pairwise Comparisons for the Writing Post-Tests of the Four Groups

Dependent Variable	(I) code2	(J) code2	Mean Difference (I-J)	Std. Error	Sig.	95% Interval	Confidence
						Lower Bound	Upper Bound
Post-test writing	experimental1	experimental2	.700	1.842	.986	-4.57	5.97
		ontrol1	3.050	1.842	.038	2.22	8.32
		control2	3.200	1.842	.049	2.07	8.47
	experimental2	experimental1	-.700	1.842	.986	-5.97	4.57
		ontrol1	2.350	1.842	.040	2.92	7.62
		control2	2.500	1.842	.040	2.77	7.77

In summary, the AI-assisted blended self- and peer assessment intervention significantly enhanced writing performance, with a slightly stronger effect for introverted learners.

Motivation

Descriptive statistics for motivation (Tables 3) showed substantial pre-to-post improvements in the experimental groups (Introvert: $M_{pre} = 55.05$, $M_{post} = 75.75$; Extrovert: $M_{pre} = 55.40$, $M_{post} = 76.75$), while control groups displayed minimal change. Normality and homogeneity assumptions were met (Kolmogorov-Smirnov and Levene's tests, $p > .05$; Table 3).

Table 3. Descriptive Statistics for the Motivation Pre- and Post-Tests of the Four Groups

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Pre-test motivation	experimental1	20	55.05	2.328	.521	53.96	56.14	50	59
	experimental2	20	55.40	1.569	.351	54.67	56.13	53	58
	control1	20	53.90	1.373	.307	53.26	54.54	52	56
	control2	20	54.50	1.147	.256	53.96	55.04	53	56
	Total	80	54.71	1.730	.193	54.33	55.10	50	59
Post-test motivation	experimental1	20	75.75	2.936	.656	74.38	77.12	70	81
	experimental2	20	76.75	1.803	.403	75.91	77.59	74	80
	control1	20	57.55	1.504	.336	56.85	58.25	55	60
	control2	20	59.15	4.184	.935	57.19	61.11	56	76
	Total	80	67.30	9.443	1.056	65.20	69.40	55	81

Two-way ANCOVA controlling for pre-test motivation indicated a large main effect of Treatment, $F(1,75) = 366.24$, $p < .001$, partial $\eta^2 = .830$. Neither Personality ($F(1,75) = 0.10$, $p = .75$, partial $\eta^2 = .001$) nor the Treatment $\times$ Personality interaction ($F < 0.01$, $p = .98$) were significant. Pairwise comparisons (Table 4) confirmed that experimental groups had significantly higher post-test motivation than controls ($p < .001$), with no differences between introverts and extroverts.

Table 4. Pairwise Comparisons for the Motivation Post-Tests of the Four Groups

Dependent Variable	(I) code2	(J) code2	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Post-test motivation	experimental1	experimental2	-1.000	.889	.738	-3.54	1.54
		control1	18.200	.889	.000	15.66	20.74
		control2	16.600	.889	.000	14.06	19.14
	experimental2	experimental1	1.000	.889	.738	-1.54	3.54
		control1	19.200	.889	.000	16.66	21.74
		control2	17.600	.889	.000	15.06	20.14

AI-assisted blended self- and peer assessment produced a substantial increase in learner motivation, regardless of personality type. For both writing and motivation, pre-test scores were comparable across all four groups, confirming baseline equivalence. Post-intervention, descriptive and inferential analyses consistently showed significant treatment effects, with slightly greater gains in writing for introverted learners but no significant differences in motivation between personality types. Overall, AI-assisted blended self- and peer assessment improved outcomes across the learner population, supporting the rejection of the first four null hypotheses.

Learners' Perceptions

The fifth research query examined the participants' perceptions of using AI-generated combined self-and peer evaluations throughout this study. Content analysis combined with

Dornyei's (2007) Framework was employed to analyze the responses. The responses were systematically categorized into two main themes: (1) Perceived Benefits and Positive Experiences, and (2) Challenges and Areas for Improvement. Each theme is described in detail below and includes excerpts of interviews to illustrate the participants' viewpoints in further detail.

Perceived Benefits and Positive Experiences

The majority of learners felt AI-produced combined self-and peer reviews were an extremely positive influence on their writing ability. The use of AI-based tools such as QuillBot, provided learners with instant, comprehensive feedback that improved their ability to identify and fix errors, increase their vocabulary usage, and enhance their sentence structure. Furthermore, the ability to provide themselves with feedback, and at the same time give someone else feedback, not only gave learners insight into their level of writing, but also helped them to develop critical thinking skills that allowed them to evaluate their own writing as well as that of others. Therefore, by using both self-evaluation and peer-evaluation, learners obtained a greater knowledge of writing conventions and standards than would have otherwise been the case.

All learners experienced an increase in independence and self-confidence regarding their writing ability with the use of a mixed-assessment strategy. Learners who received AI-generated feedback, as well as providing peers with their own peer feedback, were able to reduce feelings of anxiety associated with possible mistakes, compared to those who only received peer feedback. Additionally, through collaboration within the peer-review process, a sense of community among learners is developed such that each learner can share their experiences and provide assistance to others. While students reported improvements in their writing skillset, they also reported higher levels of engagement and motivation in the classroom as a result of using this assessment model.

The use of the AI tool helped me to identify many of the errors that I typically miss on my own. When my classmates provided comments on my paper, I was able to identify the errors that I needed to make. (Student A)

By first checking my work with the AI then getting feedback from my peers, I was able to gain more confidence in my writing. I had the opportunity to view my writing through many different lenses. (Student B)

Challenges and Areas for Improvement

While many individuals enjoyed their experiences, a number of students reported difficulties in utilizing AI during blended assessment practices. For example, they expressed concern over potential over-reliance on AI suggestions, limiting critical thinking when creating written works or developing new forms of expression. Others indicated concern that purely following grammar corrections generated by AI would lead to a mechanical writing style and eliminate originality from the learner's work. Additionally, many of the AI-generated feedback items were unclear, and in some instances, did not correlate with the learner's writing style or situation. This required both additional clarification of feedback items, as well as training on how to determine when to accept or reject the suggestions made by AI feedback.

A barrier to using AI tools during the assessment process for many students was their lack of access to a reliable, fast internet connection, in addition to or as a result of technical limitations. Some students could not access AI tools at all due to insufficient internet service. Even though there are advantages to the peer assessment process, many students expressed concerns about whether they were receiving equitable peer feedback through peer assessments. While peer assessments can be very valuable, they can also be viewed as unfair in providing constructive feedback. The challenges experienced by students using blended assessments with AI indicate that the effective use of AI-assisted blended assessments requires a great deal of planning (including technical assistance) and guidance related to how to use AI technology and how to provide fair evaluations when using peer assessment tools.

Sometimes the AI would provide changes that did not fit what I was trying to say, making it confusing and difficult for me to determine when to trust the suggestions or to use my own words. (Student C)

Not everybody in our class has good internet access, so there were times when I could not use the tool properly or on time. That made me feel really frustrated. (Student D)

In sum, the results of the study showed that using AI-assisted blended self- and peer assessments significantly impacted Iranian upper-intermediate introverted and extroverted EFL learners' writing ability and motivation. It was found that there were no significant differences between the writing skills or motivation towards writing of Iranian upper-intermediate introverted and extroverted EFL learners in relation to AI-assisted blended self- and peer assessments. In addition, learners had two major themes on their experiences with AI-assisted blended self- and peer assessments: 1) the perceived benefits and positive experiences; and 2) the perceived challenges or areas for improvement.

Discussion

This study found that Iranian upper-intermediate EFL students' writing skills and motivation were both significantly improved through AI-assisted blended self- and peer-assessment. This study found no statistically significant difference between extroverts and introverts in results. The results of the present study support the findings of the prior studies (e.g., Wang et al., 2024; Chen & Gong, 2025; Zhao, 2024; Topping et al., 2025) showing that timely, professional, scaffolded feedback provided using an AI system, along with appropriately designed peer and self-assessment, will result in increases in learner autonomy, learner engagement, and overall formative assessment results. The findings of this research are consistent with previous research (e.g., Guo, et al., 2025; Al Ghaithi & Behforouz, 2025) regarding EFL students' perceptions of the impacts of timely AI feedback in terms of immediacy, self-regulation, and writing confidence as sources of motivation and metacognitive development.

The current results support previous work demonstrating that AI-based feedback enhances both writing skill development and motivation; however, they must also be interpreted with caution through the lens of research which has yielded mixed or contradictory results (examples include some research indicating that incorrect and too superficial AI-based feedback may have little effect on developing higher-order writing skills if not supplemented with teacher-based

instruction (e.g., Li et al, 2024, Kim et al., 2025), while other research has shown that excessive dependence on automated feedback could lead to a decline in both critical thinking and creativity (Zhai et al., 2024)). In comparison with the above studies, the present study utilized blended approaches that incorporated periodic self- and peer-assessment cycles combined with teacher-assisted direction regarding how to effectively utilize AI-based feedback. Thus, the differences in results across studies may be related to differing amounts of guidance provided to students; the degree to which AI feedback was incorporated into the assessment process along with teacher/peer assessments; and the educational roles of AI in writing.

The quantitative outcomes, combined with how learners perceive them, lend additional support for the effectiveness of the intervention. All learners indicated that the AI-assisted self-assessment led to faster revisions, while peer assessment allowed for the development of their critical evaluation skills and provided opportunities for participation within a co-operative learning environment. Qualitative data may also help explain the improvements in writing performance and learner motivation noted in the data; thus, it demonstrates that both skill acquisition and learner engagement were targeted by the intervention.

With regard to the effects of personality types on the effectiveness of the intervention, there was no statistically significant difference between the performance of introverted and extroverted learners, indicating that using AI-assisted blended feedback creates an equitable opportunity for participation and learning when measured by personality type. This finding is consistent with the notion that providing structured AI and peer scaffolds decreases the importance placed upon social verbal interaction and, therefore, may level out the potential advantages/disadvantages associated with introverted and extroverted personality types (Bashiri & Ebadi, 2024).

The study found that there are both strengths and limitations in using AI within the blended approach. For example, learners valued the immediate and clear feedback from AI; however, they were also faced with some challenges, such as errors, an opportunity to overly rely upon AI suggestions, and accessibility to technology (Ali, 2025; Hill & Smith, 2023). Therefore, this study indicates that a teacher's ability to support their students by providing mediation with respect to the interpretation of their AI feedback, as well as providing appropriate teacher teaching of how to get the most from their AI experience, and adequate technical support, is important to realize AI's pedagogical potential.

Conclusion

The findings indicate that the integration of AI-assisted assessment improved students' writing skills and motivation compared to traditional instruction, implying that the intervention had an equal impact on both types of learners (introverts and extroverts). The qualitative results also disclosed that the learners appreciated the instant and clear feedback provided by the artificial intelligence during revision, and showed increased confidence and metacognitive awareness due to the artificial intelligence evaluation process. Conversely, the participants indicated concerns with the occasional inaccuracy of the feedback provided by the technology, as well as with how easily they could access or utilize it. Based on these reasons, it is inferred that the inclusion of technology in an existing, well-structured learning environment has great potential to improve the assessment of EFL writing skills than its use alone for feedback purposes.

Grounded in Sociocultural Theory, the findings indicate that learning is strengthened through mediated interaction within the ZPD. In AI-assisted blended self- and peer assessment, AI functions as a cultural tool providing immediate scaffolding, while peer assessment enables social mediation through collaborative dialogue. Pedagogically, this approach enhances writing performance and motivation across personality types by fostering reflective revision. Teacher education should address AI-mediated assessment design and feedback guidance, while policy support is needed to ensure access, training, and equitable implementation.

Finally, the study is not exempt from limitations. The research was performed solely with upper-intermediate EFL learners who are Iranian and studying in one specific instructional setting; therefore, it is difficult to apply these results to other settings. Therefore, broader proficiency levels, ages, cultures, and educational settings serve as potential hosts for exploration. Longitudinal designs can also unravel sustained effects on writing, motivation, and autonomy.

Finally, more qualitative data based on interviews can provide a more precise view of the impact on actual practice of AI-assisted grading. Comparison studies between AI-assisted grading systems, and between AI-assisted and traditional grading methods will also assist in revealing the advantages and disadvantages emanating from using AI to evaluate student writing.

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Appendix A

Semi-Structured Interview Questions

1. What do you think about instruction you received through Quillbot?
2. Are you in agreement or disagreement with using AI and assessment in teaching writing?
3. What are the advantages and disadvantages of both self- and peer assessment when integrated with AI?
4. What do you expect from the AI-assisted instruction?
5. In what ways can AI-assisted assessment be developed?