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Implementation of a Collaborative Digital Peer-Assessment Model to Enhance Writing Competence in German as a Foreign Language Learning

June Carmen Noya van Delzen
German Language Education Study Program, Faculty of Teacher Training and Education, Universitas Pattimura, Ambon, Indonesia

Henderika Serpara
German Language Education Study Program, Faculty of Teacher Training and Education, Universitas Pattimura, Ambon, Indonesia

Jolanda Tomasouw
German Language Education Study Program, Faculty of Teacher Training and Education, Universitas Pattimura, Ambon, Indonesia

Juliaans E. R. Marantika
German Language Education Study Program, Faculty of Language and Literature, Universitas Negeri Makassar, Makassar, Indonesia

Alamsyah
German Language Education Study Program, Faculty of Language and Literature, Universitas Negeri Makassar, Makassar, Indonesia

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ABSTRACT:

Objective: This study aimed to implement a collaborative digital peer-assessment model in German as a foreign language learning and to analyze its impact on students' writing competence and their perceptions of the model.

Methods: A mixed-methods approach with a quasi-experimental one-group pre-test–post-test design was employed with 22 second-semester students of a German Language Education Study Program. Over one semester, students uploaded writing assignments to Padlet, commented on three to five peers' texts, provided rubric-based feedback, and took part in discussion and reflection. Data were collected through writing tests and interviews and analyzed using a paired-samples *t* test and thematic analysis.

Findings: The mean writing score increased from 70.25 on the pre-test to 82.60 on the post-test, $t(21) = 6.12$, $p < .001$, $d_z = 1.30$. Interviews showed that students initially experienced affective barriers, such as low self-confidence, fear, and hesitation in assessing peers' work, but gradually developed greater self-confidence, critical thinking, error awareness, and a sense of shared learning through mutual feedback.

Significance: The findings suggest that digital peer-assessment supports not only writing competence but also the cognitive, affective, and social dimensions of foreign language learning, provided that students are trained to use assessment rubrics and supported in digital literacy.

KEYWORDS: peer-assessment, digital learning, writing skills, German language, collaborative learning

INTRODUCTION

Writing skill is one of the most complex productive competencies in foreign language learning, including German as a foreign language (Deutsch als Fremdsprache). This skill requires not only mastery of linguistic aspects such as grammar and vocabulary but also the ability to organize ideas logically and coherently (Hyland, 2003). Moreover, writing involves higher-order cognitive processes, including planning, drafting, and revising texts continuously.

However, in higher education practice, writing skill often becomes one of the most challenging aspects for students. Many students face difficulties in structuring texts systematically, using appropriate vocabulary, and avoiding grammatical errors. One contributing factor is the predominance of teacher-centered approaches and conventional assessment methods that provide limited opportunities for active student participation (Brown, 2004).

With the advancement of digital technology, various innovations in language learning have emerged to enhance learning effectiveness. The integration of technology enables the creation of more interactive, flexible, and collaborative learning environments (Warschauer, 2002). In this context, digital platforms can support the writing process by providing faster and well-documented feedback.

In Indonesian German language education programs, many students begin their studies with little or no prior knowledge of German. In the first semesters, their linguistic resources are still limited, which makes giving and receiving feedback on written texts a particular challenge. At the same time, these students are prospective teachers who will later need to assess their own learners' writing, so experiencing structured peer-assessment early in their studies is relevant both to their language development and to their professional preparation.

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Based on this background, this study aims to: (1) implement a collaborative digital peer-assessment model in German writing instruction; (2) analyze its impact on improving students' writing competence; and (3) identify students' perceptions of the implemented learning model.

LITERATURE REVIEW

Peer-Assessment in Writing Instruction

One approach that has gained increasing attention is peer-assessment, which refers to the process in which students evaluate each other's work. This approach functions not only as an assessment tool but also as a learning strategy that enhances students' understanding of assessment criteria and writing quality (Liu & Carless, 2006). In addition, peer-assessment encourages students to develop critical and reflective thinking through the process of giving and receiving feedback.

Recent studies indicate that the integration of self-assessment and peer-assessment can enhance student engagement and metacognitive awareness (Tomasouw & Marantika, 2023). Furthermore, research in the Indonesian context of German language learning shows that peer-assessment in essay writing improves students' writing quality, particularly in text organization and language accuracy (Zahra & Retnantiti, 2022).

Meta-analytic evidence now provides a firmer basis for these claims. Synthesizing 54 controlled studies, Double et al. (2020) found a small-to-medium overall effect of peer assessment on academic performance ($g = 0.31$), with gains over both no assessment and teacher assessment, and observed that the effect was remarkably stable across contexts. Li et al. (2020) reported a comparable effect across 58 studies and identified rater training as the most important moderator: students who were trained to assess benefited considerably more than those who were not. For writing specifically, Huisman et al. (2019) showed that higher education students who engaged in peer feedback improved their writing more than students who received no feedback or only assessed their own work, and that peer feedback led to improvements similar to those achieved with teacher feedback.

In second language writing, Yu and Lee (2016) reviewed a decade of peer feedback research and concluded that its benefits extend to the feedback giver, not only to the receiver. Their review also highlighted the importance of peer feedback training, learners' stances and motives, group dynamics, and cultural factors. Experimental evidence underlines the role of preparation: in an EFL writing course, Cui et al. (2021) found that trained peer feedback improved writing competence and writing self-efficacy to a similar extent as teacher feedback and, in addition, strengthened students' autonomous motivation.

Digital and Online Peer-Assessment

Digital platforms have changed how peer assessment is organized. In a meta-analysis of 37 studies, Zheng et al. (2020) found a medium effect of technology-facilitated peer assessment on learning achievement, and supporting strategies such as assessor training produced similarly positive effects. When online and offline formats are compared directly, online peer feedback appears to be more effective ($g = 0.33$), and students generally view it positively, although they also report drawbacks such as reduced opportunities for direct dialogue (Jongsma et al., 2023). Asynchronous online environments give students time to read their peers' texts carefully, consult resources, and formulate considered comments, and they leave a written record that teachers can monitor (Jongsma et al., 2023). Online peer feedback has also been shown to support the quality of written argumentation (Latifi et al., 2021). A recent systematic review further indicates that the effectiveness of online peer feedback depends on students' characteristics and on how the online learning environment is designed (Kerman et al., 2024).

Padlet, a collaborative digital board on which students can post texts and comment on one another's posts, has become a popular tool for such activities in language classrooms. In a quasi-experimental study with Vietnamese EFL students, Nguyen and Trang (2023) found that peer feedback through Padlet improved students' e-mail writing and increased their motivation to write. This task type closely resembles the *E-Mail Schreiben* assignments used in the present study.

Social Constructivism as a Theoretical Framework

From the perspective of social constructivism, learning is viewed as a process that occurs through social interaction and collaboration. Vygotsky (1978) emphasizes that cognitive development is strongly influenced by interaction with others, particularly within the zone of proximal development (ZPD). Therefore, the implementation of collaborative learning models such as peer-assessment is highly relevant in enhancing foreign language learning.

Kollar and Fischer (2010) similarly argue that peer assessment is fundamentally a collaborative activity in which assessors and assessees jointly construct an understanding of quality. Because of this collaborative character, peer assessment is also an interpersonal process: van Gennip et al. (2010) showed that interpersonal variables such as psychological safety and trust shape how students experience peer assessment. Students' capacity to benefit from feedback is itself a competence that develops over time. Carless and Boud (2018) describe student feedback literacy as the ability to appreciate feedback, make evaluative judgments, manage the emotions that feedback evokes, and act on it. From this perspective, the initial anxiety that students often experience in peer assessment (Liu & Carless, 2006) is not merely an obstacle but part of the process through which feedback literacy develops.

Research Gap

Previous studies have also demonstrated that peer-assessment has strong potential in improving learning quality, particularly in writing skills (Topping, 1998). However, the implementation of this model in the context of German as a foreign language, especially when integrated with digital technology, remains relatively underexplored.

Most of the evidence summarized above comes from English as a second or foreign language. Research on peer assessment in German as a foreign language in Indonesia is still limited. The available studies include work at secondary school level (Zahra & Retnantiti, 2022), the introduction of self- and peer-assessment in a German language education program (Tomasouw & Marantika, 2023), and a comparison of self- and peer-assessment of B1-level German essays, in which students reported difficulties in assessing, a reluctance to judge their peers' work harshly, and a preference for lecturer assessment (Fitrisia & Wijayati, 2021). Little is known about how beginning university learners of German, whose linguistic resources for evaluating texts are still limited, engage in digital peer-assessment, and how their affective responses change over a semester. The present study addresses this gap by combining a pre-test–post-test comparison of writing scores with interview data on students' experiences.

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MATERIALS AND METHODS

Research Design

This study employed a mixed-methods approach (Creswell & Plano Clark, 2018) with a quasi-experimental one-group pre-test–post-test design. Quantitative data on writing performance were combined with qualitative interview data in order to explain how students experienced the model. Because no comparison group was available, the design allows changes in scores to be documented but not attributed causally to the intervention alone (Shadish et al., 2002); this limitation is considered in the Discussion. The model was implemented over one semester.

Participants

The participants were 22 second-semester students of the German Language Education Study Program, Faculty of Teacher Training and Education, Universitas Pattimura, who were enrolled in the course *Produktive Sprachfertigkeiten A1.2*. All students of one intact class took part, so no sampling procedure was applied. The course targets writing and speaking at CEFR level A1. Participation was voluntary, students were informed about the aims of the study, and written informed consent was obtained before data collection.

Instruments

Writing competence was measured with a writing test administered before and after the intervention. In line with the focus of the course, the test required students to write a short e-mail in German on an everyday topic; the pre-test and post-test tasks were parallel in format and length. Texts were scored on a scale of 0–100 using an analytic rubric that covered text organization, grammatical accuracy, and vocabulary use. The tests were scored by the course lecturers. The same rubric was given to students for the peer-assessment activities, so that the criteria for assessing and for learning were aligned.

Qualitative data were collected through semi-structured interviews with number students after the post-test. The interview guide addressed students' experiences of giving and receiving feedback, their feelings when assessing their peers' work, the perceived benefits of the activity, and the difficulties they encountered.

Procedure

The research procedure consisted of the following stages: administration of the pre-test, implementation of the model over one semester, administration of the post-test, and collection of qualitative data. The peer-assessment model was implemented through the stages shown in Figure 1.

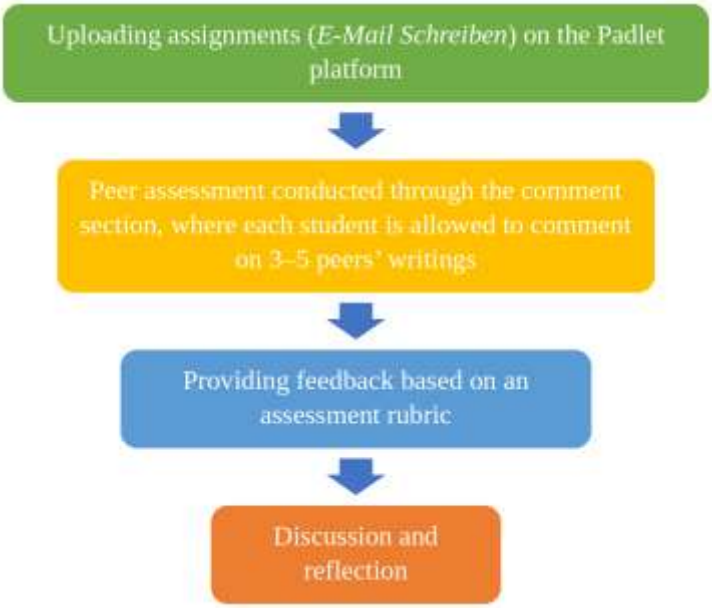


Figure 1: Peer-Assessment Model

First, students wrote their e-mail texts (*E-Mail Schreiben*) and uploaded them to a class Padlet board. Second, each student read and commented on the texts of three to five peers in the Padlet comment section. Third, the feedback was formulated on the basis of the assessment rubric, so that comments addressed specific criteria rather than general impressions. Finally, students discussed the feedback in class and reflected on how to revise their texts. This cycle was repeated for each writing assignment during the semester.

Data Analysis

Pre-test and post-test scores were compared with a paired-samples t test at $\alpha = .05$ (two-tailed). The effect size was calculated as Cohen's d_z, that is, the mean difference divided by the standard deviation of the differences, and interpreted following Cohen (1988). Interview data were analyzed thematically following Braun and Clarke (2006): the transcripts were read repeatedly, initial codes were generated, codes were grouped into candidate themes, and the themes were reviewed, defined, and named. Interviews were conducted in Indonesian, and the excerpts reported here were translated into English by the authors.

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RESULTS

Quantitative Results

To examine the effectiveness of the collaborative digital peer-assessment model, a paired-samples *t* test was conducted on the pre-test and post-test scores of a single experimental group ($n = 22$). The mean score increased from 70.25 on the pre-test to 82.60 on the post-test, a mean gain of 12.35 points, 95% CI [8.15, 16.55] (Table 1). The calculated *t* value (6.12) was greater than the critical *t* value (2.080) at a significance level of .05 ($df = n - 1 = 21$), $p < .001$. Therefore, the null hypothesis (H_0) was rejected and the alternative hypothesis (H_1) was accepted: there is a significant difference between the pre-test and post-test results. The effect size was large, $d_z = 1.30$.

Table 1: Pre-test and Post-test Writing Scores (Paired-Samples t Test)

Test	*n*	*M*	Mean gain	95% CI	*t*(21)	d_z
Pre-test	22	70.25				
Post-test	22	82.60	12.35	[8.15, 16.55]	6.12	1.30

Note. M = mean. The standard deviation of the score differences (SD = 9.47), the confidence interval, and d_z were derived from the reported t value, n, and mean gain. Critical t(21) = 2.080 (α = .05, two-tailed); p < .001.

Qualitative Results

Based on interview results regarding the perceived benefits of the peer-assessment model, various student perceptions were identified, reflecting the dynamics of their learning experiences during the implementation process.

Theme 1: Affective aspect – lack of confidence and hesitation. Some students reported low self-confidence and concerns when evaluating their peers' work. This was reflected in statements such as "lack of confidence," "fear of making mistakes," "feeling uncomfortable," "reluctance," and "embarrassment." These findings indicate that, at the initial stage, students experienced psychological barriers in providing peer evaluations.

Theme 2: Cognitive aspect – improved understanding and error awareness. On the other hand, students also experienced significant cognitive benefits. Responses indicated that through evaluating their peers' work, students became more careful before writing, were better able to distinguish between correct and incorrect forms, learned from their peers' mistakes, and avoided making similar errors in their own writing. Students expressed that "errors in peers' work can become shared learning opportunities," helping them improve their own writing quality. This reflects an increase in metacognitive awareness.

Theme 3: Collaborative aspect – shared learning. Students also perceived this activity as beneficial for collaborative learning. They realized that mutual correction made the learning process more meaningful. One student stated: "By correcting each other, we can learn together, even if there are mistakes in my corrections." This indicates that students function not only as evaluators but also as active learners within an academic community.

Theme 4: Development of positive attitudes and self-confidence. Although students initially experienced fear and low confidence, many reported positive development after participating in peer-assessment. They felt more confident, became more skilled in providing evaluations, and were more open to receiving criticism. Students also understood that feedback is reciprocal, fostering a sense of fairness and trust in the assessment process.

DISCUSSION

The results of the analysis indicate a significant improvement in students' writing skills following the implementation of the collaborative digital peer-assessment model. This improvement is reflected in several key aspects, namely more systematic text organization, more accurate use of grammar, and a richer variety of vocabulary.

Given that the calculated t-value is substantially higher than the critical value, it can be concluded that the implemented learning model is effective in improving students' writing competence. This confirms that a digitally supported collaborative approach is not only pedagogically relevant but also statistically significant.

The magnitude of the gain should nevertheless be interpreted with caution. Meta-analyses of controlled studies report considerably smaller effects of peer assessment (Double et al., 2020; Li et al., 2020), and a within-group effect size from a one-group design also reflects regular instruction and practice over the semester, not only the peer-assessment model. The present result is therefore best understood as evidence that students' writing improved substantially during a semester in which the model was used, rather than as a precise estimate of the model's own effect.

Improvements in text structure suggest that students are increasingly able to organize ideas logically and coherently. Meanwhile, advancements in grammar and vocabulary indicate a more developed level of linguistic competence. These findings reinforce the notion that active engagement in peer evaluation can help students gain a deeper understanding of writing quality standards.

This finding is consistent with previous studies indicating that peer-assessment enhances learning quality through active student engagement in the evaluation process (Liu & Carless, 2006). Furthermore, interactions among students during feedback exchange support knowledge construction, as emphasized by Vygotsky (1978).

The peer-assessment model has proven to be effective in enhancing the quality of learning. Students are not only recipients of feedback but also active evaluators of their peers' work. This process promotes greater student engagement, develops critical evaluation skills, and strengthens self-reflection.

Through the activities of evaluating and providing feedback, students learn to identify both strengths and weaknesses in writing, whether in their peers' work or their own. This is consistent with the theory of social constructivism proposed by Vygotsky (1978), which emphasizes that social interaction plays a crucial role in knowledge construction.

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The integration of digital technology in the peer-assessment model also contributes significantly to learning effectiveness. The use of digital platforms allows students to access assignments and feedback flexibly, without constraints of time and place. Furthermore, the entire learning process can be well documented, enabling students to reflect more easily on their learning progress.

In addition, digital technology enhances the intensity of interaction among students. Online discussions and feedback exchanges facilitate broader and deeper idea-sharing. This aligns with Warschauer (2002), who argues that technology expands the space for interaction in language learning. These observations are consistent with meta-analytic findings that online peer feedback is somewhat more effective than offline formats and is generally welcomed by students (Jongsma et al., 2023), as well as with the Padlet-based study by Nguyen and Trang (2023), in which peer feedback on e-mail writing improved both writing performance and motivation. At the same time, Jongsma et al. (2023) note that asynchronous online comments can limit dialogue between students. In the present model, the discussion and reflection phase may have compensated for this limitation by giving students the opportunity to clarify and negotiate the meaning of the feedback they had received, which Zhu and Carless (2018) identify as a central function of dialogue in peer feedback.

Most students demonstrated positive perceptions of the peer-assessment model. They reported that learning became more interactive and less monotonous. Moreover, students felt they had a better understanding of assessment criteria and experienced increased confidence in their writing. However, the study also identified several challenges. Variations in the quality of feedback among students indicate that not all participants possess equal evaluative skills. Additionally, limited digital literacy among some students posed a challenge in the implementation of the model. This points to the importance of training. Meta-analytic evidence shows that peer assessment is considerably more effective when students are trained as assessors (Li et al., 2020), and trained peer feedback can match the effect of teacher feedback on writing (Cui et al., 2021).

Interestingly, interview findings revealed that, at the initial stage, students experienced affective barriers such as fear, embarrassment, and lack of confidence. Over time, however, they began to demonstrate positive development, including increased confidence and the ability to provide constructive feedback. This suggests that affective factors are part of the adaptation process in collaborative learning. This condition aligns with Liu and Carless (2006), who noted that peer-assessment often generates initial anxiety, particularly related to confidence and social relationships. A similar reluctance to judge peers' work harshly was reported among Indonesian learners of German by Fitrisia and Wijayati (2021). The development observed in the present study can be understood as the growth of feedback literacy, which includes the ability to manage the emotions that feedback evokes (Carless & Boud, 2018), and it underlines that peer assessment is an interpersonal process in which trust and a sense of safety matter (van Gennip et al., 2010).

These findings suggest that the peer-assessment model not only improves writing skills but also contributes to the development of affective aspects (self-confidence), critical thinking skills, and reflective awareness. This aligns with Vygotsky (1978), who emphasized the crucial role of social interaction in cognitive development and learning.

Overall, the findings indicate that the integration of digital technology with a collaborative learning approach can significantly enhance the quality of foreign language learning. The collaborative digital peer-assessment model not only improves writing skills but also contributes to the development of 21st-century skills, such as critical thinking, self-reflection, and collaboration.

The pedagogical implications of this study highlight the need for instructional designs that focus not only on outcomes but also on learning processes. Instructors should provide clear guidance on the use of assessment rubrics and train students to deliver effective feedback. Furthermore, improving students' digital literacy is essential to support the successful implementation of this model.

This study has several limitations. First, the one-group pre-test–post-test design without a control group means that the improvement cannot be attributed solely to the peer-assessment model; regular course instruction, maturation, and familiarity with the test format may also have contributed (Shadish et al., 2002). Second, the sample was small ($n = 22$) and drawn from a single course in one study program, which limits the generalizability of the findings. Third, scores for the individual rubric aspects were not analyzed separately, so the conclusions about improvements in text organization, grammar, and vocabulary rest mainly on the qualitative data. Finally, the qualitative findings rely on students' self-reports. Future studies should include a comparison group and larger samples, report aspect-level scores, and analyze the content and quality of the peer comments themselves.

CONCLUSION

This study confirms that the implementation of a collaborative digital peer-assessment model not only results in quantitative improvements in students' writing skills but also triggers a transformation in how students learn. The significant improvement between pre-test and post-test results indicates that active engagement in peer evaluation strengthens students' mastery of text structure, language accuracy, and vocabulary use.

Beyond academic improvement, the findings reveal that peer-assessment functions as a reflective learning tool. Students learn not only from their own mistakes but also from analyzing their peers' work, creating a deeper and more meaningful learning experience. Although initial affective barriers such as low confidence and hesitation were observed, continuous collaborative processes transformed these challenges into opportunities for personal development.

The integration of digital technology further enhances learning effectiveness by providing flexible, well-documented, and sustainable interaction spaces. This demonstrates that technology serves not merely as a supporting tool but as a catalyst in building a collaborative and participatory learning ecosystem.

Overall, this study positions peer-assessment as a pedagogical approach that is not only relevant but also strategic in foreign language learning in the digital era. The model holds strong potential for broader application, provided that its success is supported by student readiness, well-structured instructional design, and effective facilitation by instructors.

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ETHICAL AND COMPLIANCE STATEMENTS

Research ethics and informed consent: Participation was voluntary, and written informed consent was obtained from all participants before data collection. No formal ethical approval was required by the institution for this classroom-based study / state the approving committee and approval number.

Conflict of interest: The authors declare no conflict of interest.

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Author contribution: June Carmen Noya van Delzen: conceptualization, methodology, implementation of the model, data collection, and writing – original draft; Henderika Serpara: data analysis; Jolanda Tomasow: validation, and writing; Alamsyah: review and editing. The authors read and approved the final manuscript.

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Corresponding Author: June Carmen Noya van Delzen