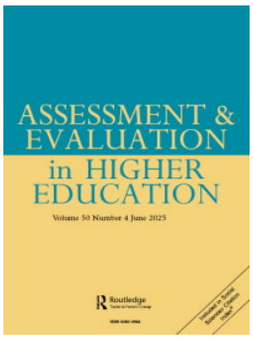

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Effects of teacher, peer and self-feedback on student improvement in online assessment: the role of individuals' presumptions and feedback literacy

Joana Heil[a] and Dirk Ifenthaler[a,b]

[a]University of Mannheim, Mannheim, Germany; [b]Curtin University, Perth, Australia

ABSTRACT

Previous research highlights discrepancies between students' evaluation of feedback methods and their impact on the learning process. Hence, it remains an open question to synthesise different feedback modes (teacher, peer and self) and examine the relationship between students' evaluation and their actual use of feedback. This quasi-experimental study with $N=62$ participants was designed as a within-subjects design to investigate students' evaluation of different feedback modes, their actual improvement in essay writing, and their presumptions' influence. The results reveal that students evaluated teacher feedback significantly higher than peer feedback, before and after the intervention. Furthermore, the feedback led to a significant increase in the essay quality from pre- to post-test, but this effect was only significant for the peer condition. Additionally, the effect was mediated by students' individual feedback literacy. The presumptions about the feedback modes did not have a significant influence on the improvement. The results of this study call for a more in-depth analysis of effective co-implementation of multiple assessment modes in higher education, as well as support for students' feedback literacy and the utilisation of the benefits of self- and peer assessment.

KEYWORDS

Online assessment; peer feedback; self-feedback; teacher feedback

Introduction

Assessment is often historically understood as a way of certifying competences, with a strong focus in practice on summative assessment and grading students (Boud and Falchikov 2005). Nonetheless, research shows that it holds much more potential and goes beyond the summative teacher assessment, which is employed frequently in higher education practice. Especially through means of online assessment, potentials can be elicited, such as personalisation, adaptation, scaffolding, and many more

CONTACT Joana Heil joana.heil@uni-mannheim.de University of Mannheim, Mannheim 68161, Germany.

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(Kem 2022). Additionally, online assessment allows for grading large groups and providing feedback in real-time (Heil and Ifenthaler 2023). Practitioners are asked to actively engage in the assessment and feedback process beyond grading and consider supporting students in their learning process (Boud and Falchikov 2005). Considering increased higher education enrolment and a lack of time by teachers to grade, different types of assessment and feedback need to be explored to ensure sufficient feedback for students, such as analytics-based feedback (Pardo et al. 2019), as well as peer- or self-feedback. Furthermore, students are generally not satisfied with feedback, and feedback should be provided using a dialogic approach (Nicol 2014). The appreciation of feedback through students in higher education is even more split between the different modes, with students having a clear preference for actionable teacher feedback compared to other modes, such as peer feedback (Dressler et al. 2019; Tian and Zhou 2020), of which students are critical. Empirical research highlights that peer assessment shows a reasonable accuracy (Li et al. 2016; Vuogan and Li 2023), as well as a positive effect on learning progress, not only for the students receiving but also the ones providing it (Li, Liu, and Steckelberg 2010).

This study focuses on online assessment and feedback, related individual feedback literacy, and students' acceptance of different feedback modes. This study aims to provide a comprehensive overview of students' acceptance of feedback modes, their implications for learning processes, and individual evaluations' effects on the learning process and essay quality.

Online assessment

Assessment is an essential part of learning and can be defined as a systematic method of sampling information about a learner's actions to draw inferences about the learning process (Baker, Chung, and Cai 2016). Formative assessment is characterised by its impact on the ongoing learning process (Black and Wiliam 2009). Summative assessment can provide insights into an expected outcome or standard (Dixson and Worrell 2016). Another difference is made between assessment *of* and assessment *for* learning, emphasising their distinct effects on learning processes and outcomes (Wiliam 2011).

Current practices in online assessment can be classified according to their mode, format, and type. The *mode* depends on the assessor, whether teacher, peer, automated, or self-assessment. The *format* can be either formative or summative, and the *type* encompasses all different kinds of assessment, ranging from quizzes to project-based work or essays (Heil and Ifenthaler 2023). Further, the support through means of digital features in online assessment offers a wide range of possible pedagogical functions such as scaffolding, intelligent tutoring systems, automated feedback, and more (Kem 2022). Additionally, assessment data collected in an online environment can be used to inform analytics-based feedback (Nouira, Cheniti-Belcadhi, and Braham 2019). For assessment analytics, the data is used to analyse, predict or visualise the learning progress or outcome for teachers and learners (Gašević, Greiff, and Shaffer 2022). These solutions can be implemented through dashboards, for which, among others, assessment data can be used to reflect individuals' learning outcomes (Jivet et al. 2018). A systematic review by Kaliisa et al. (2024), which

included $N = 38$ records, reflected the impact analytics can have on students' engagement in online environments. However, the results highlight the lack of reliable data regarding learning outcomes. Furthermore, they call for diversifying assessment methods that accurately measure learning to be used as a data basis for visualisation of assessment data for learning analytics dashboards. Another systematic review, including $N = 39$ studies by Paulsen and Lindsay (2024), emphasises the rising importance of theory-based analytics solutions based on pedagogical research. Additionally, the authors recommend that learning analytics should facilitate reflection through recommendations and feedback for learners.

Feedback

Feedback is the process of learners receiving information from various sources about their work, making sense of it, making judgments, and acting upon it in their learning (Boud and Molloy 2013; Henderson et al. 2019). This ties in with the 'feed up, feed back, feed forward' concept by Hattie and Timperley (2007), which sees feedback for students as reflecting where they are, how they got there, and how they can achieve their goals. Even though one usually considers learners as feedback recipients, they must nonetheless actively participate in the feedback process (Winstone et al. 2017). A meta-review by Van der Kleij, Adie, and Cumming (2019) reflected a historical shift from a greater focus on the provision of feedback to students toward a focus on their interaction with feedback. In recent years, the concept of feedback literacy has become more important when considering students' engagement with feedback. Feedback literacy is the capacity to act upon feedback received to improve learning processes (Sutton 2012). According to Carless and Boud (2018), four key concepts build up students' feedback literacy: appreciating feedback, making judgments, managing affect, and taking action. Analysing students' views in a focus group study on effective feedback, Molloy, Boud, and Henderson (2020) identified that feedback-literate students should accept, process, and act upon feedback. Building upon these two frameworks, Dawson et al. (2024) developed a feedback literacy scale focusing on behavioural terms, consisting of five sub-components: seek feedback, make sense of the information, use the feedback, be able to provide feedback to others, and manage one's affect towards it. Feedback literacy is essential in taking on the received feedback, particularly in online environments and with data-based feedback (Shibani, Knight, and Buckingham Shum 2022; Tepgec, Heil, and Ifenthaler 2024).

Feedback should be of sufficient quantity and quality for students to further engage with it (Winstone et al. 2021), as research shows feedback to be more effective the more information it contains (Wisniewski, Zierer, and Hattie 2020) and that multiple sources of feedback foster learning (Henderson et al. 2019). In a systematic review with $N = 46$ publications, Banihashem et al. (2022) found that learning analytics can support feedback through visualisation, data mining, text analysis, and social network analysis. They further call for systematically evaluating different feedback modes, such as peer and teacher feedback. In this vein, based on the different modes of assessment, different modes of feedback can be derived: teacher

feedback, peer feedback, and self-feedback (Ifenthaler, Heil, and Greiff 2023). The data basis required for these modes allows for different ways of evaluation and, therefore, for different ways of using analytics to support learning processes.

Modes of feedback

Higher education practices focus on teacher feedback, with teachers providing feedback accompanied by grades (Winstone and Boud 2022). Teachers are expected to have greater knowledge and competence, and therefore, students report a preference for feedback that can help with revision and a dislike for too generic feedback (Zacharias 2007). Nonetheless, even in teacher-focused scenarios, feedback is a shared responsibility between teacher and learner as they must incorporate it into their learning processes (Carless 2022).

The conceptual shift in the understanding of feedback processes and involving students more in the feedback process also led to increased integration of peer feedback (Winstone et al. 2022). Peer feedback refers to students providing feedback to peers (Topping 2009). Peer feedback has been widely implemented in Massive Open Online Courses (MOOCs) (Huisman, Admiraal, et al. 2018). A central stake in peer feedback is its effect on the assessor and the assessed, as the students providing feedback also learn through providing feedback (Li, Liu, and Steckelberg 2010). Empirical research reflects no relationship between the perception of the adequacy of peer feedback and an increase in writing performance (Huisman, Saab, et al. 2018), while other studies report that students who perceive peer feedback as more useful might be more willing to revise their work (Misiejuk, Wasson, and Egelandsdal 2021).

The term self-assessment is often used ambiguously by referencing automated assessment as well as assessing oneself. In the context of this study, it refers to students assessing themselves by comparing their work using exemplars or grading criteria to foster active engagement (Carless 2022). Using exemplars can foster feedback literacy in students by allowing them to engage with high-quality work (Carless and Boud 2018). Students should be able to assess their current learning process, their goals, and how to get there (Panadero, Lipnevich, and Broadbent 2019). Self-assessment, therefore, refers to learners determining and applying assessment criteria and reflecting on their learning, leading to continuous self-reflection (Yan and Carless 2022). In self-assessment processes, learners need to fulfil three steps: determine assessment criteria, perform self-reflection, and perform self-assessment judgment and calibration (Yan and Carless 2022).

Comparison of modes

Studies directly comparing teacher and peer feedback among students highlight a clear preference for teacher feedback by students as reliance on teacher feedback in online environments compared to peer and automated was detected, even if it was more superficial (Tian and Zhou 2020), as well as more confidence in teachers'

judgment and a preference of teacher over peer to provide feedback, even if the performance improvement is higher in the peer condition (Mahvelati 2021).

This is also reflected in a higher preference for surface-level feedback provided by teachers, such as grammar or spelling, compared to meaning-level feedback by a peer provided on the content of the work (Dressler et al. 2019). Students appreciate teacher feedback and are critical of peer feedback, and the peer mode leads to a more complex engagement with the feedback (Cheng, Liu, and Wang 2023). This is further highlighted in a between-subject study by Martin and Sippel (2024), which showed that, after an intervention, the group receiving feedback from a teacher appreciated the feedback significantly more and also qualitatively used more positive descriptions than the group receiving peer feedback. Moreover, even if students have a positive attitude towards peer assessment, they might not identify its benefit as a learning aid and perceive it instead as an assessment tool (Wen and Tsai 2006).

Nonetheless, research shows that peer feedback can be productive and foster the skills and learning of the student providing the feedback. Furthermore, an earlier meta-analysis with $N = 48$ studies by Falchikov and Goldfinch (2000) identified an average correlation of $r = 0.69$ between peer and teacher assessment. A subsequent meta-analysis by Li et al. (2016) focusing on more digital assessment reported a Pearson correlation coefficient of 0.63 between teacher and student feedback (Li et al. 2016). Therefore, the ratings by the teachers and peers do not differ clearly. Furthermore, in a between-group study by Zhang and McEneaney (2020), the peer feedback group outperformed the teacher feedback group. Additionally, a meta-analysis by Vuogan and Li (2023) of $N = 26$ empirical studies focusing on L2 learners revealed that, although there was no difference in the learning improvement between peer- and teacher feedback, the effect sizes were higher for peer feedback. They also did not identify a difference between self- and peer feedback. Their analysis calls for more research into directly comparing teacher, self-, and peer feedback. However, Zou, Xie, and Wang (2023) found no difference between the improvement based on peer or teacher feedback in a technology-enhanced setting. Regarding analytics-based feedback, Banihashem et al. (2022) advocate for a detailed analysis of peer and teacher feedback separately, considering their distinct impact on learners.

This study

The current literature indicates that the effects of different feedback modes in online assessment settings on learners, as well as the impact of learners' presumptions, have not been thoroughly researched. There seems to be a discrepancy between students' presumptions about feedback modes and the support these can provide, especially in online and analytics-enhanced learning scenarios. These concerns are becoming increasingly relevant, particularly in light of the need for assessment and feedback methods that are alternative to the teacher mode in higher education. Therefore, this needs to be researched in detail. Current research on feedback shows that students prefer teacher feedback. However, whether this is due to higher quality or better improvement is unclear. Psychological theories and evidence suggest that

cognitive processes are supported by peer and self-assessment, and empirical research highlights that the grading can be equally sound in quality and effects on the learning process. While students might be more prone to engage with teacher feedback, the improvement is similar. The question remains how the acceptance of different modes of feedback ties in with the actual improvement of learning and which role factors, such as feedback literacy, can play. Based on the current literature, this study aims to get an in-depth insight into the effect that these different modes of online feedback can have on students' learning processes and their perception of the feedback.

RQ1: How do students evaluate different feedback modes in an online assessment setting?

To investigate this research question, based on the results of existing studies that reflected a clear preference for teacher over peer feedback (Dressler et al. 2019; Mahvelati 2021; Tian and Zhou 2020), we assume that this is also replicated for peer and self-feedback, therefore:

Hypothesis 1: Students evaluate the usefulness of teacher feedback higher than that of peer and self-feedback.

RQ2: What impact do different modes of feedback have on students' improvement in online assessment, and what is the role of feedback literacy?

Based on the research considering the quality of peer and teacher feedback (Falchikov and Goldfinch 2000; Li et al. 2016; Vuogan and Li 2023), we assume that:

Hypothesis 2a: The different feedback modes lead to similar improvement.

Additionally, research shows that feedback literacy is essential for students to use feedback (Carless and Boud 2018; Tepgec, Heil, and Ifenthaler 2024). Therefore, we assume for all modes that:

Hypothesis 2b: Feedback literacy mediates the improvement of the essay quality.

RQ3: What impact does the perception of the assessment mode have on students' improvement?

As research shows that the presumptions about peer feedback do not influence the improvement of learners (Huisman, Saab, et al. 2018), we assume this for all modes and therefore hypothesise that:

Hypothesis 3: Students' presumptions about a feedback mode do not influence their improvement through it.

Materials and methods

Participants

Sixty-two students initially participated in this study, of which $N = 59$ were eligible for data analysis. They all studied a Business and Economics Education course at

a European university. Demographically, 20 identified as male and 42 as female, with non-binary status not stated. Their average age was 24 years ($SD = 2.68$). Ethics approval was obtained for this research at the participating university, and the students provided informed consent upon participation.

Procedure and materials

To eliminate inter-individual differences, this study uses a within-person design. The quasi-experiment took place over two hours, comprising two sittings, each lasting one hour, a week apart. To recreate a realistic assessment scenario for the students, both parts of the experiment took place in a computer lab at the university under the supervision of the researchers. The environment of the experiment was a development instance of the learning management system (LMS) of their university, which they were already familiar with but received anonymous dummy accounts to log in. In the first sitting, students logged into the LMS and received access to a course with a clear structure referring to the different stages of the experiment. All these steps were carried out simultaneously by all participants under the guidance of the researchers. The content of this course was vegan diet, its definitions, regulations, and effects on health.

First sitting

1. **Pre-survey:** As a first step, they filled out a pre-survey. This included their perceptions about the different feedback modes in aiding their learning processes before the actual interaction in the experiment. These items were based on Schumacher and Ifenthaler (2018) and adapted to fit the context of online assessment (average $\alpha = .9$). All items were assessed on a five-point Likert scale. Furthermore, the students' feedback literacy was assessed using the instrument by Dawson et al. (2024), which was assessed on their six-point Likert scale ($\alpha = .78$).
2. **Pre-test:** Next, ten multiple-choice and single-choice items concerning students' prior knowledge about veganism were administered. For this quiz, students received automated feedback from the LMS.
3. **Learning Phase:** After assessing their prior knowledge, the students received study materials on a vegan diet to engage with for 15 minutes and were allowed to study individually, as they also would for an exam.
4. **Essay 1:** Then, they were instructed to write their first essay, answering the prompt: 'Is a vegan diet generally harmless to health? In a short essay, weigh the possible risks and ways of counteracting them.'
5. **Peer Feedback:** After finishing the first essay, the students received two essays that their peers wrote and were asked to provide feedback. To support students in providing feedback to their peers, they received a rubric (Xie and Zhang 2024), which was based on the works by Mathias and Bhattacharyya (2018) on grading short-form essays on the four different aspects: content, formalities, sentence flow, and organisation. For each aspect, the students could provide points from one to five. Each of the different possible grades

was provided a description, which value to attribute to them, with the distance between each level being assumed to be equal.

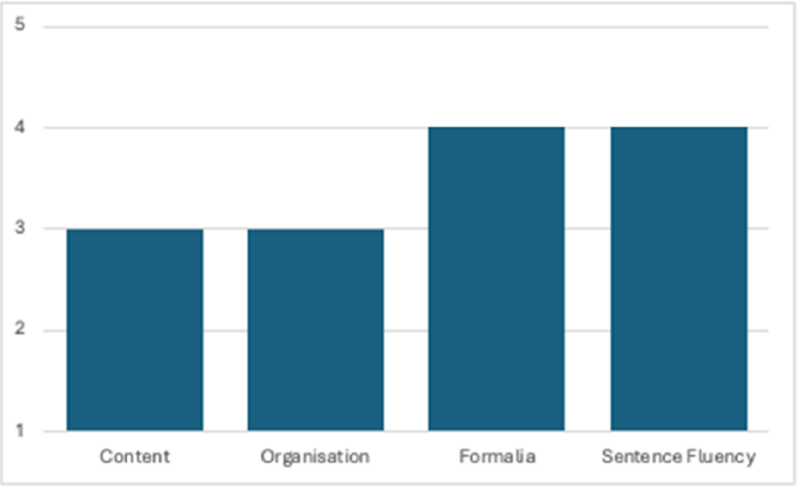
6. **Essay 2:** Ultimately, they were asked to write a second essay, this time with the prompt, 'A friend of yours would like to follow a vegan diet but is unsure whether she can trust the products labeled as vegan in the supermarket. In a short essay, explain what needs to be considered when shopping vegan in the supermarket and what the vegan labeling means.' After writing the second essay, the first session was over.

Second sitting

1. **Receive Feedback & Revise**: In the second sitting, one week later, the students first received feedback from the teacher on the second essay they wrote the previous week on vegan labels in the supermarket, after which they reworked it. The feedback included ratings according to the provided rubric and the respective average in the group, as well as open comments on the essays. They also received feedback from two peers on the first essay focusing on the possible risks of a vegan diet, of which they were provided the individual assessments as well as the average and the comparison to the group. The peer feedback was anonymous (Panadero and Alqassab 2019). In both cases, it was processed graphically and thus made available to the students in the form of bar charts. Examples can be found in Figure 1 and Figure 2.
2. **Essay 3:** The students were then asked to write a third essay answering the prompt: 'Your relatives are a bit confused about all the different types of diets. Explain in a few sentences the different vegetarian/vegan diets and how they differ'.
3. **Self-assessment:** After finishing the essay, they were provided an exemplar for self-assessment (Carless and Boud 2018). After engaging with the exemplar, the students reworked and re-submitted their essays.
4. **Post-Survey:** The students completed the post-survey, asking for their evaluation of the assessment modes, and answered the Motivated Strategies for Learning Questionnaire (MSLQ) by Pintrich (1991).
5. **Post-Test:** The students completed a quiz-based posttest, encompassing the same multiple-choice and single-choice questions as the pretest, and received automated feedback.

After completing the experiment, two independent graders rated all the essays based on the same rubric. As the value for the essays was on a continuous scale from 4 to 20, the inter-class correlation was used to calculate the inter-rater reliability with an average of 0.64, which can be considered moderate reliability.

Dear students, this is the feedback you received from the teacher on Essay2: 'Explain in a short essay what you have to consider when shopping vegan in the supermarket and what the vegan declaration means?'.



This table shows the average rating of the individual aspects in the entire course course, as well as your rating in comparison.

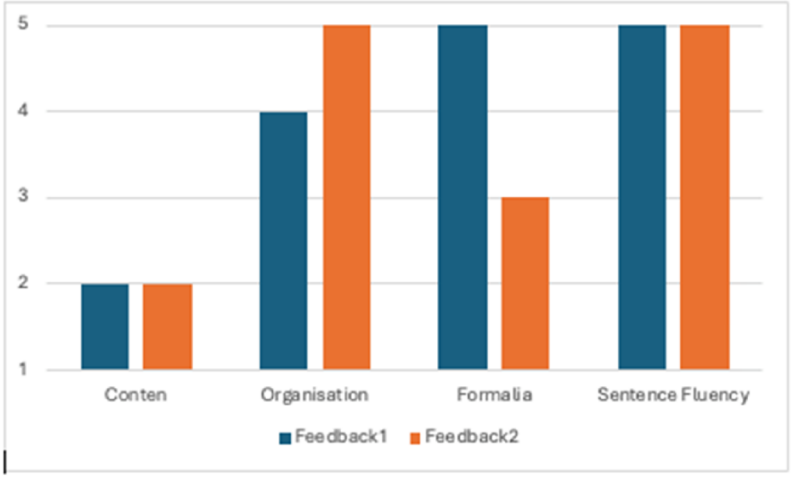
	Your Rating	Average Rating
Content	3	3
Organisation	3	3,33
Formalia	4	3,17
Sentence Fluency	4	3,67

Open Comments

- The essay is successful. Some aspects are mentioned in terms of content. However, there is no explanation of the awarding of the V-label or mention of other possible labels.
- Formally, the text contains a few (1-3) spelling and grammatical errors.
- The organisation is successful, but a stronger common thread and a clear summary would aid understanding.
- The sentence flow is well organised. However, the repetition of terms hinders the reading flow somewhat.

Figure 1. Example feedback teacher.

Dear students, this is the feedback you received from your fellow students on Essay1: 'Is a vegan diet basically harmless to health?'.



This table shows the average rating of the individual aspects in the entire course, as well as your rating in comparison.

	Your Rating	Average Rating
Content	2	3,5
Organisation	4,5	3,83
Formalia	4	4,25
Sentence Fluency	5	4,42

Open Comments:

Reviewer1	Reviewer2
• Open comments	• Open comments

Figure 2. Example feedback peer.

Results

Preliminary analysis

The data was preprocessed using Pycharm and further analysed with R. Regarding the descriptive analysis of the grades provided to the participants, the average points awarded by the teachers on essay two ($M = 15.12$, $SD = 1.64$) was significantly lower than the points provided by the peers on essay one ($M = 17.05$; $SD = 1.61$) during the course, $W = 443$, $p < 0.001$. Nonetheless, a significant correlation could be found

between the peers' average grades and the subsequent raters' rating, $r = 0.43$; $p = 0.002$. The two peers deviated from each other on average by $M = 2.1$ ($SD = 1.65$).

Research question 1: How do students evaluate different feedback modes in an online assessment setting?

The respective values regarding the evaluation of the different modes by the students can be found in Table 1. To identify the difference in evaluation between the different modes in the pre- and post-test, a two-factor repeated-measure Analysis of Variance (ANOVA) with the conditions of *time* and *mode* was conducted.

Table 1. Rating of feedback according to students.

Mode	Pre	Post	Increase
Peer	3.69 0.65	3.71 0.61	0.02 0.64
Teacher	3.97 0.55	4.01 0.51	0.02 0.64
Self	3.77 0.67	3.77 0.71	0.03 0.47

ANOVA

The normal distribution of the data in all levels was confirmed through the Shapiro-Wilk test (all $p > 0.05$). The independence of observations was assumed based on the repeated measures design. Further, the sphericity was tested using the Mauchly's Test. Due to it reporting a significant deviation from sphericity for the mode ($W = 0.86$, $p = 0.013$) and interaction ($W = 0.85$, $p = 0.01$), the Greenhouse-Geiser corrections are reported for mode and the interaction effect. A significant effect of the mode could be found, $F(1.75, 101.66) = 6.93$, $p = 0.002$, $\eta^2 = 0.11$, which can be considered a medium effect. Yet, no effect was found for time, $F(1, 58) = 0.25$ $p = 0.622$ or the interaction $F(1.74, 101.06) = 0.17$, $p = 0.979$. The post-hoc analysis revealed that a significant difference was found between teacher feedback and peer feedback in the pre-test, $t(58) = 3.5$, $p < 0.001$, $d = 0.47$, and the post-test, $t(58) = 4.25$, $p < 0.001$. $d = 0.53$.

The graphical representation can be found in Figure 3.

Hypothesis 1 is therefore partially accepted, with teacher feedback being significantly higher evaluated than peer feedback.

Research question 2: What impact do different feedback modes have on students' improvement in online assessment?

The respective values regarding the evaluated essays in the different modes can be found in Table 2.

Table 2. Average evaluation of the essays assessed by the independent assessors.

Mode	Pre	Post	Increase
Peer	14.32 1.96	15.28 1.73	.96 1.82
Teacher	15.15 2.02	15.46 1.81	.31 1.8
Self	14.96 2.03	15.36 2.06	.39 1.87

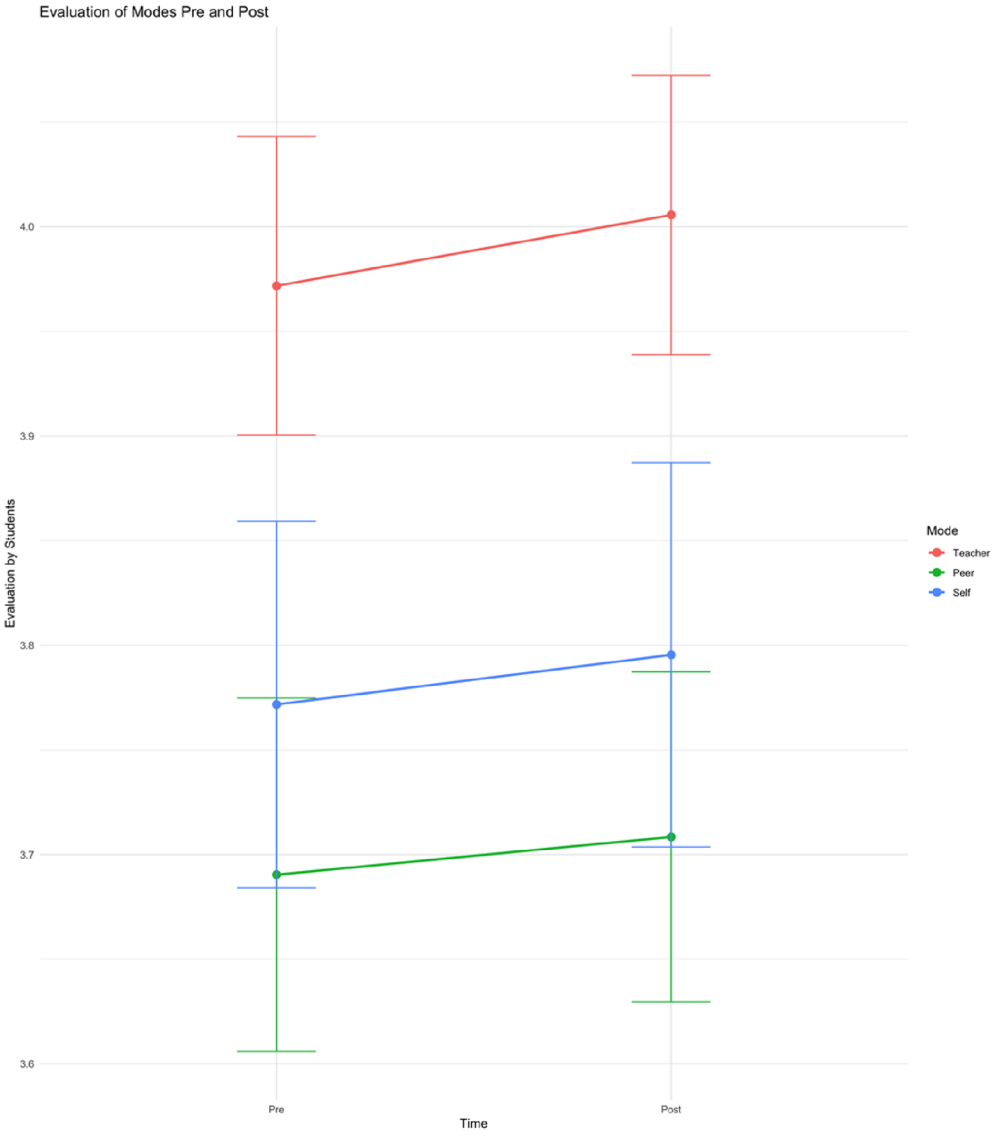


Figure 3. Evaluation of the assessment modes by students, pre- and post-test.

ANOVA

The normal distribution of the data in all levels was confirmed through the Shapiro-Wilk test (all $p > 0.05$). The independence of observations was assumed based on the repeated measures design. Further, the sphericity was tested using Mauchly's Test, which did not find a significant deviation from sphericity for either the mode ($W = 0.99$, $p = 0.847$) and the interaction ($W = 0.99$, $p = 0.785$). A two-factor repeated measures ANOVA with the conditions *time* and *mode* revealed a significant effect of time and, therefore, the increase between pre- and post-essay quality, $F(1, 51) = 15.7$, $p < 0.001$, $\eta^2 = 0.24$, which can be considered a large effect. Neither the effect of the mode, $F(2, 102) = 2.48$, $p = 0.089$, $\eta^2 = 0.05$, nor the interaction effect was significant, $F(2, 102) = 1.87$, $p = 0.159$, $\eta^2 = .04$. The post-hoc pairwise comparison

under the time condition revealed a significant increase from pre- to post-test in the peer condition, $t(51) = -3.81$, $p < 0.001$, $d = 0.52$, which can be considered a medium effect.

The graphical representation can be found in Figure 4.

Hypothesis 2a: is therefore rejected, with peer assessment being the only condition in which the increase was significant.

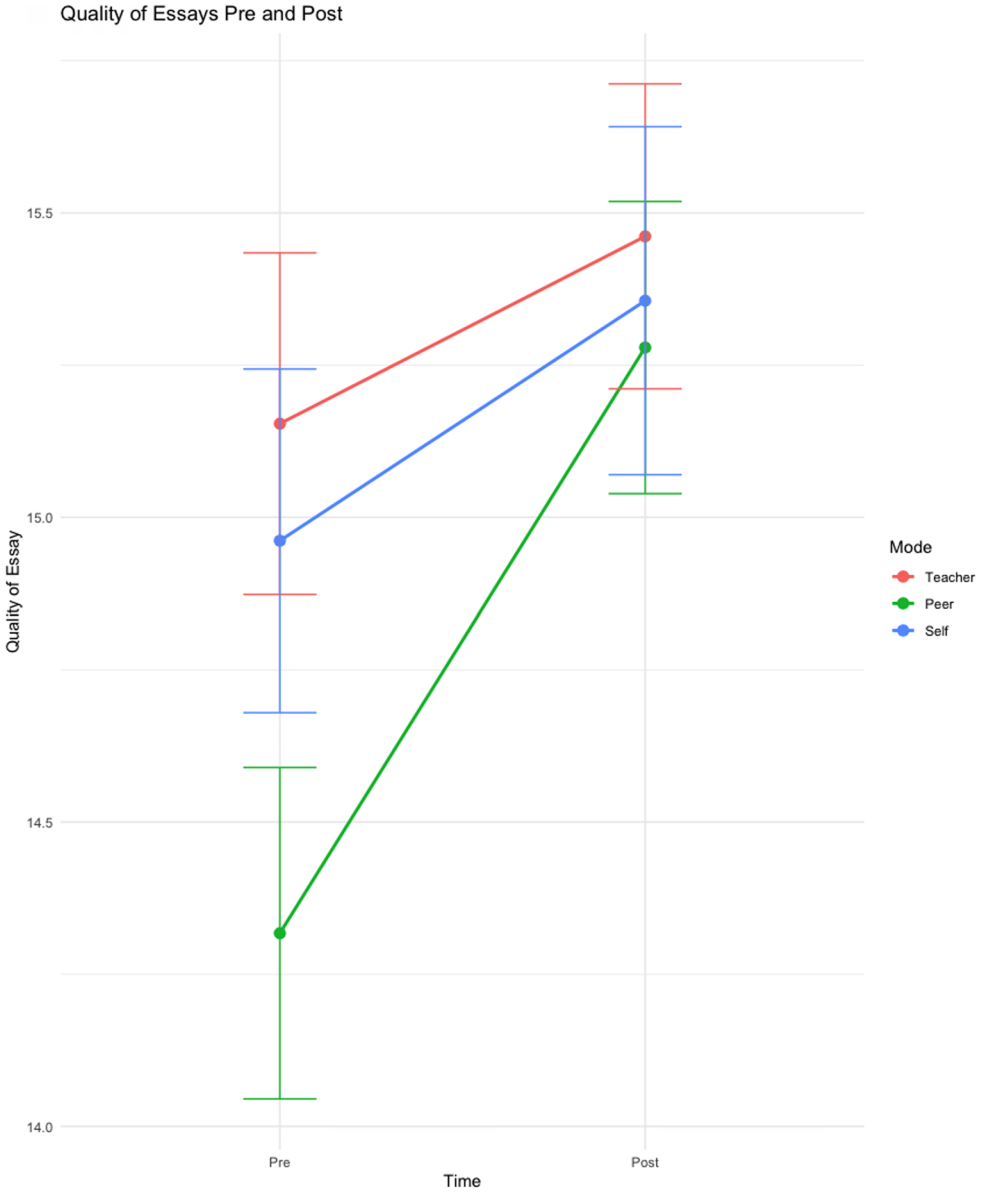


Figure 4. Quality of essay in modes, pre- and post-test.

A subsequent mediation analysis revealed a partial mediation of the time condition by the feedback literacy of the participants. The effect of time on the essay quality was significant, $b=0.55$, $p=0.011$, and the indirect effect of feedback literacy on the essay quality, $b=0.67$, $p=0.017$. The graphical representation can be found in Figure 5.

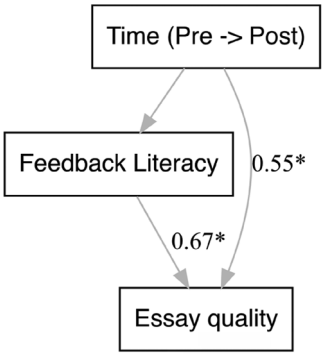


Figure 5. Mediation analysis of feedback literacy on the increase in essay quality.

Hypothesis 2 b is therefore accepted, with feedback literacy mediating the effect of pre- and post-conditions on the quality of the written essay.

Research Question 3: What impact do the presumptions about the assessment mode have on students' actual improvement?

Considering the effect of the presumption that students have on the actual improvement in essay quality, three linear regression analyses were conducted. A linear regression could find no influence of the pre-acceptance of peer feedback on the actual improvement, $R^2 = -0.02$, $F(1,50) = 0.03$, $p = 0.844$. $\beta = -0.03$. The same result was found for teacher feedback, $R^2 = -0.02$, $F(1,50) = 0.02$, $p=0.898$, $\beta = 0.02$, as well as for the self-feedback condition, $R^2 = -0.01$, $F(1, 50) = 0.61$, $p=0.438$, $\beta = 0.11$.

Hypothesis 3 is therefore accepted, as there was no significant effect of the presumptions about the feedback modes on the quality improvement.

Discussion

The results of this study tie in with pre-existing research and add new insights into the practice of online assessment by comparing different modes as well as the attitude of students towards feedback and the effect of feedback on their learning. Our results regarding RQ1 reflect a higher teacher feedback evaluation by the students compared to peer feedback. This ties into previous findings regarding the acceptance of teacher, peer, and self-feedback (Dressler et al. 2019; Tian and Zhou 2020). Additionally, these results highlight that even the interaction with the feedback does not change these assumptions. Therefore, ways of addressing this issue need to be developed that go beyond students interacting with peer- and self-assessment. The assessment of the peers correlated significantly with the subsequent evaluation of the raters, which supports the quality

of peer assessment, which has been reflected in previous meta-analyses (Falchikov and Goldfinch 2000; Li et al. 2016). This underlines the value that peer assessment can bring to higher education. Another interesting implicit result is that the students did not evaluate the self-feedback significantly worse than teacher feedback, perhaps because exemplars are considered feedback that the teacher provides, and the disregard stems from not trusting their peers and evaluating them as less competent than the teacher (Zacharias 2007). This should be systematically investigated in future research.

Our results regarding RQ2 shed light on multiple different aspects. First, there seemed to be an effect of the feedback on the quality of the essays, with further analysis revealing the peer condition being the only one showing a significant improvement. This is an important result reflecting peer feedback's effectiveness (Mahvelati 2021). The mediation showed that the individual feedback literacy significantly but partially mediated this effect. This ties in with previous research emphasising its role, as feedback uptake somewhat depends on individual feedback literacy (Carless and Boud 2018; Tepgec, Heil, and Ifenthaler 2024). Practitioners should, therefore, aid students in developing feedback literacy, especially considering the dimension of seeking and using feedback (Dawson et al. 2024). This could be achieved through implementing formative feedback practices, including iterative and dialogic praxis (Vaughan and Uribe 2024).

The results regarding RQ3 underline the presumptions that arise from RQ1 and RQ2. We found no impact of students' presumptions of the modes of feedback on the actual increase through the type of feedback. This ties into the results by Huisman, Saab, et al. (2018), reflecting that the acceptance of feedback does not predict how well students will actually benefit from it. Furthermore, this effect is expanded not only for peer feedback, but also for teacher and self-feedback. Consequently, the results of this study shed light on the importance of systematically investigating learners' progress beyond their subjective evaluation. The results show that their rating of the feedback modes differed significantly, with peer assessment being the lowest evaluated. Therefore, students would have reported peer feedback as less effective than teacher feedback, even though it was the only condition that showed significant improvement (Li et al. 2016). Even if students might not evaluate peer feedback as supporting their learning process, it might still do. Therefore, the effect of feedback on learning processes needs to be visible and understandable for students, especially in monitoring their self-regulated learning. If used effectively, this could be achieved through implementing feedback practices, metacognitive reflection, and analytics-based implementations (Viberg, Khalil, and Baars 2020). Fostering awareness and acceptance of feedback in practice is still a remaining issue, so students might be more motivated to engage with it (Misiejuk, Wasson, and Egelandsdal 2021). Practice would benefit from supporting the role of feedback beyond justifying grades and highlighting its relevance (Winstone and Boud 2022).

Implications

An open question remains in the underlying processes that lead to the discrepancies between the actual improvement and the subjective evaluation. One insight

of this study is that the grading provided by the teacher was significantly lower than that of the peers. Maybe the more critical feedback by the teacher leads the students to believe that it was more detailed and, therefore, would support them more in their learning, as research shows that more critical feedback can impact performance. Actionable feedback is perceived more positively by students (Zacharias 2007). Furthermore, students might prefer teacher feedback because it is connected to their grades. Therefore, the feedback is considered a justification of grades (Winstone and Boud 2022), or they might evaluate teachers as competent counterparts (Zacharias 2007). Clear recommendations for practitioners in higher education and researchers can be derived based on the results of this study. Practitioners should employ peer- and self-assessment in online learning scenarios as an alternative to teacher assessment. Furthermore, in this study, the three modes were separately discussed but can also be fruitfully combined in engaging in discussion with teachers and peers in a dialogic way, engaging with exemplars (Carless et al. 2018; Nicol 2014). Students should receive support in developing feedback literacy to benefit from the feedback provided in online learning environments and actively engage with assessment (Tepgec, Heil, and Ifenthaler 2024).

The results of this study also call for investigating students' actual learning rather than solely their perception of certain types of feedback, as these appear to differ. Additionally, research should be conducted on overcoming the negative assumptions regarding assessment modes that are not teacher-led. An open question remains in investigating how the different modes of feedback influence other factors such as motivation, self-regulated learning, or feedback literacy and how this could affect the evaluation as well as the learning progress of students. Motivational factors and their role and interplay with improvement must be investigated in future research, and guidelines must be developed for educational use in practice.

Limitations

Nonetheless, this study has multiple limitations that must be considered. The students already provided their peers' feedback, which might have led them to have higher scores in their second essays (Li, Liu, and Steckelberg 2010). Furthermore, the sample size is limited, and due to technical issues, not all students could participate in all conditions. Moreover, all participants stem from the same university. Ultimately, there were no incentives in this scenario for students to perform well, and the authenticity of the study must be evaluated critically.

Disclosure statement

No potential conflict of interest was reported by the authors.

Notes on contributors

Joana Heil is a PhD candidate at the Chair of Learning, Design and Technology at the University of Mannheim. She received a BA in educational science/education management at the

Albert-Ludwigs- University Freiburg and a MSc in cognitive science with a focus on artificial intelligence and computational linguistics at the University of Osnabrück. Her main research interests lie in the fields of online assessment, learning analytics, and adaptive feedback.

Dirk Ifenthaler is a Professor and Chair of Learning, Design and Technology at the University of Mannheim, Germany, and UNESCO Co-Chair on Data Science in Higher Education Learning and Teaching at Curtin University, Australia. Dirk's research focuses on the intersection of cognitive psychology, educational technology, data analytics, and organisational learning.

ORCID

Joana Heil http://orcid.org/0000-0001-5069-0781
Dirk Ifenthaler http://orcid.org/0000-0002-2446-6548

Data availability statement

The data that support the findings of this study are available on request from the corresponding author [JH].

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