

Enhancing Self-regulation Strategies through Peer Feedback in Online Higher Education

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Abstract. *Specific research addresses the adoption of self-regulation strategies through peer feedback and the use of chatbots for supporting Higher Education institutions to transform online assessment. The purpose of the study presented below was to evaluate the design of a learning activity containing a peer-feedback intervention in order to suggest improvements. A set of data collection instruments was designed and distributed after the first iteration of the experience to gain insights into the students' perception of the peer-review task, designed to enhance their self-regulation capacity and supported by the use of a chatbot throughout the learning activity. The data collected allowed us to identify the learning activity design aspects that should be improved for future iterations to enhance student process performance skills.*

Keywords. Peer feedback, Chatbot, Self-regulated learning, e-Assessment, e-Feedback

1 Introduction

Under the umbrella of the eFeedskills project¹, this paper presents a research experience that took place in the Faculty of Psychology and Education of the Open University of Catalonia (UOC), in the online master's degree in Education and ICT (Information and Communication Technology) and e-learning. The experience consists of an e-learning activity implementation that includes a peer-review task within the course 'Fundamentals of e-learning technological design', which aims to train learning design professionals for technology-mediated learning environments.

The learning activity studied in this research asked students to complete an academic essay writing exercise. The essay format was chosen to encourage students to organise their thinking through a creative writing process, requiring the cognitive effort of

describing their ideas and opinions, defending them by citing the sources used and consulted throughout the course, and substantiating them appropriately and adequately (Dysthe, 2015; Klimova, 2012).

In the middle of the essay learning activity, a peer-review task was proposed. This specific task aims to promote student reflection and critical thinking and enhance self-regulatory capacity. Through feedback from their colleagues on their unfinished essays, students are better able to achieve the objectives of the learning activity (Carless & Winstone, 2020; Nicol & Macfarlane-Dick, 2006). In this sense, the feedback provided by peers promotes reflection on what is written, improves progress in academic essay writing and prevents student procrastination (Cerezo et al., 2017).

2 State of the art

The literature recognises the benefit of peer feedback in the development of self-management, evaluative judgement, social skills and self-regulated learning (Nicol, 2009). At the same time, the progressive development of the ability to evaluate the quality and impact of the work produced by others enables students to become more independent and less reliant on the teacher (Tsui & Ng, 2000).

The integration of peer feedback can help to improve the quality of learning as it requires students, firstly, to comprehend the assessment criteria provided by the rubric and learn how it should be applied, and secondly, to read and compare, or question ideas, suggest modifications and even reflect by comparing their learning outcomes with those of others (Liu et al., 2001). In addition, by providing feedback on the work of their peers, students participate in each other's learning and thus achieve greater understanding and appreciation for their peers' experiences and perspectives (Corgan et al., 2004). Existing research also shows a strong focus on providing peer feedback

¹ eFeedskills, <https://www.ub.edu/digital-feedback/es/inicio/>

as separate from grading because it is so relevant to the formative process (Liu & Carless, 2006; Nicol & Macfarlane-Dick, 2006; Nicol, 2013).

In recent years, the process of providing peer feedback has been increasingly facilitated online. Some authors argue that it may play an even more important role in online learning (Lynch, 2002; Palloff & Pratt, 2001) than in traditional face-to-face learning. A growing emphasis is also placed on the design of online activities providing students with the opportunity to not only reflect on the actual work and performance of their peers (peer feedback), but also to provide them with directions towards achieving the desired goal (Latifi et al., 2021). This type of constructive feedback, known as feedforward, is closely linked to learning activities leading students to implement the suggestions for improvement in further actions (Hattie & Timperley, 2007), and thus feed into the next assignment (Hounsell et al. 2008). Additionally, it is relevant to consider that students' time management impacts on academic performance and can have negative effects on academic achievement (Cerezo et al., 2017), and fostering students' self-regulation capacity could support them in reducing academic procrastination.

In parallel, the development and application of educational chatbots, providing learning content and feedback in an interactive manner (Jia, 2009; Lee et al., 2009), has increasingly gained popularity due to their potential for supporting on-demand interaction with students through dialogue. Scholars have also found that interacting with chatbots generally increases students' learning interests (Johnson, 2001). However, despite the emphasis on the exploration of the possibilities of chatbot technologies for education, their use in the self-regulation of learning is still scarce (Fernández-Ferrer et al., 2021).

Against this scenario, we advocated for fostering self-regulated learning and improving the final outcomes of a complex task (academic essay writing exercise) through peer feedback. The application of a Design-Based Research (DBR) methodological approach (Reeves, 2000) for the design, testing and refinement of the intervention targeted to this purpose aims to overcome some of the shortcomings of traditional research methods in exploring the function of tools and approaches in an educational environment (Amiel & Reeves, 2008). As a result, the DBR iterative process provided pointers for improving the learning activity design, as well as evidence for the elaboration of design principles regarding self-regulation support in academic writing activities.

3 Research context and questions

The learning activity consisting of an academic essay writing exercise comprised several tasks which are detailed below (Figure 1). The self-regulation strategy was supported by a chatbot that played the role of a

monitoring and supporting system during the whole process from the forethought to the self-reflection phase.

The chatbot was structured as a decision tree with an initial question (the root of the tree) aimed at identifying the self-regulation phase the student was in before moving the conversation forward. The subsequent closed questions were then calibrated to the corresponding self-regulation phase accompanied by a set of predefined options that the students were asked to select. Through the indicated option, the chatbot was able to guide the students through the entire process. The questions were formulated using student-friendly language.

The chatbot was integrated into the activity sequence presented in Moodle through a direct link to the external application. The instructions of the activity included an explanation of the role of the tool for the development of the learning-to-learn competence, directly related to the students' self-regulation capacity.

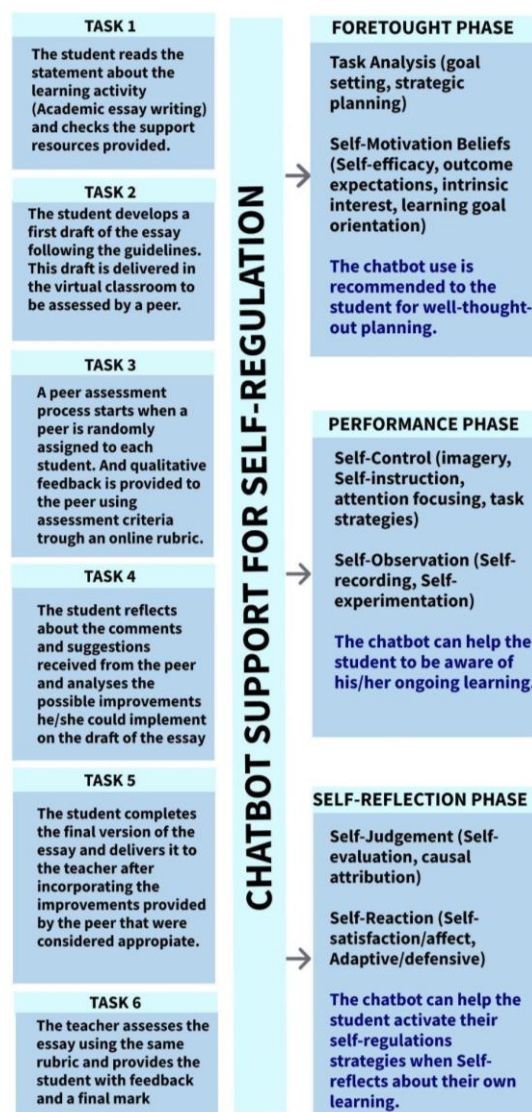


Figure 1. Self-regulation support chatbot for an essay writing activity based on Zimmerman (2002)

The design of the peer-feedback task was based on the three cornerstone principles of the DBR framework (Reeves, 2006) which envisage addressing complex problems in real-world situations, integrating design principles with technological advances to produce realistic solutions, and conducting a reflective inquiry to test and refine innovative learning environments and establish new design principles.

As a result, first we analysed the practical problem to be addressed. The main objective was to improve students' academic performance in essay writing. Being a complex learning task, it requires an already advanced level of writing, creative and critical thinking skills. As such, these skills had to be further improved along with self-regulated learning and the enhancement of the students' time management, goal setting, self-monitoring and motivation. Additionally, the course also aimed to train future professionals in the design of activities promoting self-regulated learning, learning-to-learn skills and autonomous work.

To achieve these objectives, the next step involved developing a peer-feedback task to be performed by the students within the Moodle, and a dedicated forum for communication with the teacher. The design of the solution was informed by existing design principles relating to peer review, self-regulated learning and feedback (Nicol & Macfarlane-Dick, 2006; Zimmerman, 2002). Its integration, therefore, aimed to help students work on the skills needed for the essay writing exercise more effectively, as it promoted self-reflection during the writing process. Such self-reflection on one's own work at an intermediate stage of the process was also encouraged in order to prevent students from doing the whole piece of work shortly before its delivery.

The proposed solution was then submitted to a reflective inquiry organised in iterative cycles to test and refine it in practice. For this purpose, a first iteration was carried out with the aim of testing its impact and gathering information through two data collection instruments. The analysis of the results obtained led us to formulate improvements to the proposed solution before the launch of the next iteration (second semester). The reflection on the design of the solution and its refinement based on the test results also aimed at producing new design principles.

3.1 Research questions

The guiding research questions in the study presented in this paper are the following:

- Have the chatbot and the peer feedback facilitated self-regulation of learning for the development of the academic writing activity?
- Does the design of the learning activity enhance student process performance skills?

4 Methodology

A set of data collection instruments was designed and distributed after the first iteration (first semester) in order to gain insights into the students' perception of the peer-review task and the use of the chatbot to enhance their self-regulation skills. These instruments included:

1. A questionnaire about the students' self-regulation skills.
2. A satisfaction questionnaire about the peer-review task.

Both of them included open-ended and closed-ended questions based on a 5-point Likert scale.

Some of the closed-ended questions from the satisfaction questionnaire were selected to analyse the overall satisfaction with the peer-feedback task and the chatbot that guided them through the process with personalised instructions. Additionally, two open-ended questions (one from questionnaire 1 and one from questionnaire 2) were selected to collect information on the improvements to be made to the design of the second iteration. The question selected from questionnaire 1 involves explaining the benefits and difficulties of the peer-review process, while the one selected from questionnaire 2 asks what aspects of the task could be improved.

Participants in the questionnaires are reported in *Table 1*. Most of them answered both questionnaires, and just a reduced number participated in only one of them. As such, we calculated that the total number of students who provided feedback through at least one of the two questionnaires was 280.

Table 1. Instruments and participants

Instrument	Participants
Questionnaire on self-regulation	174
Satisfaction questionnaire	157

Qualitative content analysis (Schreier, 2012) was applied to the corpus of data from the two selected open-ended questions. Open-ended responses to the two questionnaires coming from the same user were analysed together as a whole.

Atlas.ti was used for coding and analysis. The codebook for this research was developed through open coding techniques. Instead of employing a predefined set of categories or codes, open coding involved selecting bits of text that were of interest and classifying them with a keyword that emerged from the data itself (Creswell & Creswell, 2014). The codebook included definitions (Creswell & Poth, 2018).

In order to generate conclusions from the coded data, the identified codes were ranked with respect to their relevance. Following the idea to focus on the individual as a unit of analysis, such relevance was established on the basis of the number of users who

mentioned a specific conceptual category. Opting for coding at the ‘individual level’ (Syed & Nelson, 2015), we assigned a code even if it was deemed to be present in only one of the open-ended questions. Finally, we decided to exclude the codes with a frequency lower than 5.

5 Discussion of the results

5.1 General overview of the results of the task

The analysis of the questionnaires shows positive results regarding the overall satisfaction with the peer-review task (see Figure 2). In fact, 83.4% of the students expressed satisfaction with the assignment.

Overall satisfaction with the peer feedback task

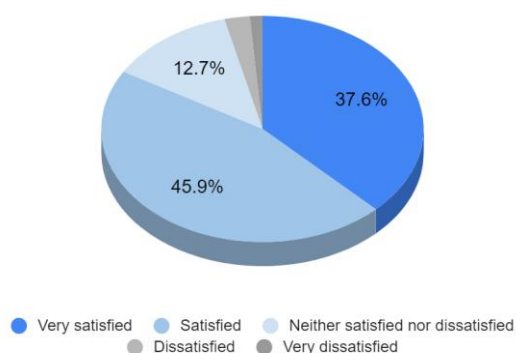


Figure 2. Level of satisfaction with the peer feedback

Data also reveals that more than 50% of students consider that the chatbot played a supporting role by fostering their self-reflection and self-regulation skills along with their ‘learning to learn’ competence (see Figure 3).



Figure 3. Students’ perception of the chatbot

Suggested improvements collected from the questionnaires

Despite the overall positive results, the analysis of the answers provided to the open-ended questions also led to the identification of a number of improvements to be implemented in the second iteration (see Table 2).

Table 2. Suggested improvements (SI) for the second iteration

Nº	Suggested improvements	Frequency	Percent
1	improve the objectivity of the assessment	38	18.7
2	deal with the evaluator’s superficial knowledge of the topic covered in the peer’s essay	37	18.2
3	remove the inhibition to carry out an honest assessment of peers	26	12.8
4	increase expertise in the use of assessment criteria	25	12.3
5	motivate students to enhancing their commitment	23	11.3
6	enhance the expertise of the students in peer assessment	20	9.8
7	improve workflow and the supporting technology	20	9.8
8	produce an advanced draft of the essay	20	9.8
9	foster a closer relationship with the assessed peer	11	5.4
10	integrate teacher supervision	7	3.4
11	expand options regarding the feedback delivery format	7	3.4
12	improve the understanding of the task	6	2.9
13	receive feedback from more than one peer to compare the results	6	2.9
14	integrate a guide/template on the aspects to be taken into account	6	2.9

The results of the analysis emphasised the subjectivity of the feedback as one of the main concerns to be addressed in the design of the second iteration. In fact, a considerable number of students claimed that their peers might be influenced by their personal taste, preferences and knowledge. The feedback received, therefore, could largely depend on the assigned evaluator and also results in a lack of agreement with it. To face this bias, objectivity should be further fostered by providing clear instructions and supporting instruments (SI1). Another issue raised by the participants concerned the superficial knowledge that the evaluator may have of the subject matter of the peer's essay. The lack of mastery of the subject matter is considered to make the formative assessment intervention unhelpful and generate confusion instead of helping the peer. This result suggests that students should be reminded that the topics of the essays have been covered during the course and, therefore, they should feel confident in providing comments or suggestions on each of the assessment criteria of the rubric (SI2).

Students also emphasised that the evaluations of the peer's work are often insincere. There is a reluctance to criticise colleagues' essays for fear of hurting them and compromising the final results. This attitude inevitably leads students to fall into undesirable social biases. In response to this challenge, the importance of receiving critical feedback should be further nurtured (SI3). Another challenge highlighted by the participants is the interpretation of the evaluation criteria in the rubric and their correct and objective application. As such, they stated that it would be useful to further detail them and involve students in their co-design. Clearer guidelines on how to use them to provide feedback is also perceived as beneficial (SI4).

Moreover, students complained about the lack of commitment of some peers. They also claim that poor communication skills and empathy could reduce the meaningfulness of the formative assessment intervention. A clear strategy would be needed to encourage students to perform the task properly (SI5). Further preparation in providing peer feedback is also mentioned as necessary. According to them, sometimes changes are suggested without having a precise idea of how to assess a piece of work. To face this challenge, it would be advisable to improve the students' practice of giving feedback by enhancing the available instruments, instructions and resources (SI6).

The workflow of the task could be also improved with better coordination of the steps involved in the process and fine-tuning their schedule (e.g. the assessment of the draft should not be requested weeks before the final submission and the delay in receiving feedback should be avoided) (SI7). Furthermore, some difficulties are reported with the technology supporting the process (Moodle) and its monitoring (e.g. accessibility, display and download of the feedback, finding the assigned partner, etc.). Students also revealed that sometimes the work is not sufficiently

developed to carry out the evaluation. As such, it is necessary to set clear guidelines on what has to be included in the draft and the required level of development since if the draft is incomplete, the feedback will also be useless (SI8).

The results also reveal that, according to the students, interaction between evaluator and evaluatee (e.g. via chat or video call) should be fostered to provide meaningful feedback (SI9). The peer's lack of knowledge and the impossibility of interacting with him/her might incur the risk of providing the formative assessment in an incorrect way and, therefore, of generating misunderstandings. Moreover, not knowing the peer and not having worked side by side with him/her might also produce inputs that are not very relevant. Additional suggestions concerned the need for teacher supervision (SI10) that, according to the participants, could avoid inaccurate and incorrect assessments and ensure the quality of the feedback. The format of delivery could also be improved by providing the evaluator with more options (e.g. integrating a qualitative summary, adding comments to the file containing the essay, and attaching audio files) (SI11).

A reduced number of students also claimed that sometimes understanding the requirements of the activity is subject to the learners' personal interpretation. This challenge could be addressed by sharing detailed guidelines on how the assessment has to be carried out and the expected outcomes of the activity (SI12). Some participants also suggested involving more than one peer in the formative assessment intervention in order to gather more points of view (SI13) and compare the results obtained.

Finally, participants revealed that it would be beneficial to have a guide describing the aspects to take into account in the assessment of the essay (SI14) and a template with clear and visual information (cover, number of pages, sections, etc.) on the work to be delivered. These materials would enable the preparation of essays with the same structure and avoid doubts about the requirements to be met.

5.2 Implementation of the second iteration

With the information gathered from the test of the first iteration, the solution was refined. Improvements to the peer-feedback intervention were designed and implemented before the launch of the second iteration:

- a) A video was recorded and made available to students in response to improvement requests 1, 2, 3, 4, 5, 6, 8, 12 and 14 (see Table 2). In order to improve students' expertise in peer assessment, objectivity and competence in the use of the rubric, the video fostered the appropriation of assessment criteria included in the rubric and the general principles to be taken into account in providing good feedback. Among them is the use of an appropriate communication style to express a personal opinion in a constructive, objective and

respectful manner. Furthermore, the video clarified that students are expected to provide feedback on the format of the essay, the clarity of its presentation, the structure and the organisation of content and sections. Although one of the assessment criteria regards the mastery of the subject and the problem being addressed, they are not supposed to be experts on the topic. Similarly, in order to reduce inhibition when providing a critical assessment for their peers, the video also emphasised the usefulness of feedback for improving the peer's essay. The video also strived to stimulate students' motivation to perform the task properly by clarifying the usefulness of this assignment for the development of their learning to learn and self-regulation skills. In response to improvement request 14, the video also shared clear guidelines regarding the script and the structure that an essay should follow.

- b) The instructions concerning the task were refined in response to improvement requests 7, 8, 12 and 14 and published within the Moodle. The purpose of these new, more detailed instructions was to solve certain issues that had arisen in relation to the workflow and expected requirements. Besides the instruction, additional references on how to draft an essay were also made available to students within the virtual classroom.
- c) A dashboard was implemented in response to improvement requests 5 and 7. This dashboard has been incorporated to enable individual and group monitoring in relation to task accomplishment. Besides providing the opportunity to display relevant information, the dashboard also encourages the student's awareness of his or her own performance and the performance of the group. This should motivate him/her to take the necessary corrective measures to ensure optimal development of the task and to complete the activity in a satisfactory way.

The results of the analysis also identify other improvements that, despite their interest, were not implemented in the second iteration due to time constraints. They refer to improvement requests 9, 11 and 13, and envisage the need for a closer relationship with the peer assessor, the integration of additional options regarding the format of feedback delivery, and the involvement of more than one student in the assessment of an essay in order to compare the assessments obtained. Their implementation could be planned and tested in future tasks.

Finally, we also decided not to consider improvement request 10 because of its lack of alignment with the objectives of the peer-assessment task. Indeed, the participation of the teacher as a supervisor is not fully aligned with the goal of fostering student autonomy along with their critical capacity in evaluating their peers. However, this concept was further clarified in the video along with the list of

supporting instruments made available to students to work autonomously.

6 Conclusions

With this study, we conclude that students are satisfied with the peer-review task, because it allows them to activate, with the support of a chatbot, strategies of self-reflection on their assignment as well as self-regulation strategies of their learning process.

It is also shown that providing peer-review tasks in the middle of drafting an academic written essay keeps the student motivated and at their own pace and avoids academic procrastination.

We also conclude that the feedback received, therefore, could largely depend on the assigned evaluator and the maturity of the essay draft. Additionally, there is a reluctance to criticise colleagues' essay assignments for fear of hurting them and compromising the final results, so the relevance of receiving critical feedback should be better addressed.

Refinements emerged from the analysis that are necessary for the second iteration of the learning activity and could be translated into design principles for future iterations. In this sense, the instructional issues of the activity were improved in terms of giving students more detailed specifications aimed at fostering expertise in peer-feedback provision, promoting the objectivity of feedback, and improving understanding of the peer-review task and assessment criteria to improve appropriation. This was provided using a video explanation by the teacher and better guidance about how to write the academic essay and how to apply assessment criteria displayed with a rubric.

Improving students' motivation and engagement also emerged as one of the issues that should be addressed by providing an environment in which participants' assignment completion status can be visualised using a dashboard, or emphasising the usefulness of the task for the development of soft-skills like learning to learn and critical thinking.

Finally, according to the participants, this could avoid inaccurate and incorrect assessments and ensure the quality of the feedback and, in this sense, it is relevant to train students in terms of feedback literacy knowledge.

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