Peer assessment in a wiki: Product improvement, students’ learning and perception regarding peer feedback

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Abstract

The present study examines the added value of peer assessment in a computer-supported collaborative learning environment (CSCL) in higher education by focusing on (1) the learning effect, (2) wiki product improvement and (3) students’ perception of peer feedback in a CSCL-environment. The present study involved two conditions: structured peer feedback (S-PFB) and non-structured (control). The results do not indicate a significant learning effect between pretest and posttest or between the conditions. However, for both conditions the peer feedback process improved significantly the quality of the wiki product from draft to final version, although no significant differences between the control and the experimental group (S-PFB) were found. Furthermore, the S-PFB group adopted a more critical attitude when providing and receiving peer feedback. The S-PFB group also perceived the received peer feedback as being more profound and detailed.

Keywords: Peer assessment; Peer feedback; Computer-supported collaborative learning (CSCL); Wiki; Structuring peer feedback

1. Introduction

Peer assessment (PA) has been highly praised as an important component of a participatory culture of learning (Kollar & Fischer, 2010). Therefore, peer assessment might be an instructional strategy with the potential to correspond to the so-called imperatives of twenty-first century pedagogy: customisation, interaction and learner-control (Collins & Halverson, 2009). To increase the potential impact of peer assessment on learning, it is crucial “to understand which mechanisms affect learning, and how these mechanisms can be supported” (Gielen, Peeters, Dchoy, Onghena, & Struyven, 2010, p. 304). This introduction will start off by focusing on how peer assessment can be associated with ‘assessment for learning’. After this, we take a closer look at wikis as computer-supported learning (CSCL) environments to facilitate collaborative learning and peer assessment. Finally, we discuss students’
learning effect, product improvement, and perception regarding (structuring) peer assessment in a CSCL-environment.

1.1 Peer assessment for learning

The traditional perception of learning has shifted towards a more participatory culture of learning where learners collaborate and interact with each other. Therefore, modern education aims at self-directed and collaborative learning (Boud, Cohen, & Sampson, 1999). These new approaches of learning and instruction require new assessment practices (Strijbos & Sluijsmans, 2010). According to previous studies, this shift from ‘assessment of learning’ towards ‘assessment for learning’ requires students to become active participants in all phases of the assessment process (Dysthe, 2004). More specifically, assessment gives learners an indication of their strengths and weaknesses but also of the next steps to be taken in the learning process. In this respect, formative assessment aims at providing rich feedback and supporting learning (Black & William, 1998). The main goal of formative assessment is to close the gap between current and desired performance (Sadler, 1989). Therefore, feedback can be perceived as a practice of formative assessment to improve, accelerate, and self-regulate learning. Several studies highlight the power of assessment on the learning process (Black & Wiliam, 1998; Kennedy, Chan, Fok, & Yu, 2008; Pellegrino, Chudowsky, & Glaser, 2001). As peer assessment is a common practice of formative assessment, it is “an educational arrangement where students judge a peers performance quantitatively and/or qualitatively and which stimulates students to reflect, discuss and collaborate” (Strijbos & Sluijsmans, 2010, p. 265). In other words, it is a process whereby peers take on the role of assessor or and assessee (van Zundert, Sluijsmans, & van Merriënboer, 2010) to reflect on “the amount, level, value, worth, quality or success of the product or outcomes of learning of peers” (Topping, 1998, p. 250). Previous research has shown that peer assessment has a positive influence on the learning process both as a learning tool (Topping, 1998) and as an assessment tool (Cheng & Warren, 2000). As a learning tool, peer assessment involves learners directly in the learning process and provides them with skills to assess criteria that define high-quality work (Topping, 1998). As an assessment tool, peer assessment increases the responsibility towards students (Gielen, Dochy, & Ongena, 2010) as they are actively involved into their own assessment and consequently more engaged in their own learning (De Wever, Van Keer, Schellens, & Valcke, 2011).

1.2 Wikis as a tool for CSCL

Collaborative learning is a “mutual engagement of participants in a coordinated effort to solve the problem together” (Rochelle & Teasley, 1995, p. 70). Its secret to success is social interaction, such as giving and receiving help (Kreijns, Kirschner, & Jochems, 2003; Liaw & Huang, 2000; Northrup, 2001). Constructivism is perceived as the underlying learning theory for computer-supported collaborative learning (CSCL) (Kirschner, Martens, & Strijbos, 2004). CSCL is a learning approach, where learners collaborate on authentic problems and issues in an educational online environment (Jacobson & Wilensky, 2006). Collaborative learning systems are designed “to concentrate on refining, integrating, and facilitating the learning process and content knowledge of students during collaborative activities” (Kumar, Gress, Hadwin, & Winne, 2010, p. 826). In contrast with traditional environments, CSCL-environments are promising to merge learners’ present state with the intended learning outcomes (Hattie & Timperley, 2007), by offering rich educational experiences as a preparation for students (Reich, Murnane, & Willett, 2012). Previous research has proved that CSCL-environments have the potential to support and evaluate the regulation process (Soller, Martinez Monés, Jermann, & Muehlenbrock, 2005), the discovery learning process (De Jong, 2006), or the communication process (Saab, et al., 2007). A CSCL-environment simulates classroom situations by “providing shared work- spaces, on-line presentations, lecture notes, reference material, quizzes, student evaluation scores, and facilities for chat and online discussions” (Kumar, et al., 2010, p. 826). Regarding the communication aspect, research emphasises on the importance in CSCL research to take into account features that trigger students’ motivation to actively participate in online discussions (Naranjo, Onrubia, & Šegués, 2012). As a CSCL-environment, a wiki can be perceived as an interesting tool for individual or collaborative content creation (De Wever, et al., 2011). More specifically, wikis are an interesting learning environment for group assignments to work, write, share and construct knowledge together with other peers (Elgort, Smith, & Toland, 2008). Previous research found that students use wikis for a great diversity of learning activities, such as “to publish homework
assignments, maintain portfolios, peer review writing, post artwork, download music for rehearsals, and review drills for physical education” (Reich, et al., 2012, p.10). As each contribution of every student in a wiki is published online, wikis have great potential for facilitating peer assessment (Xiao & Lucking 2008). Therefore, Kollar and Fischer (2009) highlight that peer assessment is an important feature to take into account when educators design learning environments.

1.3 (Structuring) Peer Feedback: Effects on learning, product, perception and attitudes

Peer feedback is perceived as an approach of peer assessment, peer feedback aims to involve students in assessment for learning by students giving each other opinions, suggestions and ideas. Kaufman & Schunn (2010) stress the need for peer assessment research across settings and subjects to find out more on how students’ perception and attitudes affect their performance. Hence, students’ perception and attitudes towards peer assessment in CSCL will be examined in more detail in this study. Previous research discovered that students sometimes perceive peer assessment as unfair and often question peers’ qualifications to review and assess their work (Kaufmann & Schunn, 2010; Strijbos, Narciss, & Dünnebier , 2010). Additionally, Topping (1998) states that the quality of peer feedback is not comparable with the quality of instructor feedback, but “its immediacy, frequency, and volume compensate for this” (p. 255). Kaufmann and Schunn (2010) summarize the following strategies to improve students’ perception towards peer assessment: enlarging students’ peer assessment experience (Sluijsmans et al. 2001; Wen & Tsai 2006); clarifying peer assessment criteria (Falchikov 2005; Smith, Cooper, & Lancaster, 2002); and providing training and support in the peer assessment process (Cheng & Warren 1997; Falchikov 2005, 2007).

Regarding the quality and quantity of feedback in peer assessment of writing, Strijbos et al. (2010) highlight that more specific and elaborated feedback leads to better performance and outcomes. More specifically, process feedback has an impact on learning, students’ satisfaction and functioning of the group, while performance feedback seems to improve performance (Gabelica, Bossche, Segers, & Gijselaers, 2011). Although the learning effects of providing elaborated feedback are relatively obvious, Van der Pol (2008) states that receiving peer feedback, which depend on the feedback quality and assessor’s expertise, does not automatically results in significant learning effects. A review study by Hattie and Timperley (2007) revealed that further research on the impact of peer feedback on learning and achievement is required. Therefore, this first part of this study focuses initially on the learning effect of receiving and providing peer feedback, but also on the actual performance by evaluating the final product of the wiki assignment. In a CSCL-environment, instructors have the opportunity to structure the collaboration assignment and feedback process to a certain extent. Particularly, CSCL has the potential to facilitate students’ learning when structure or instructional support is foreseen (Strijbos & Weinberger, 2010; Fischer, Kollar, Mandl, & Haake, 2007; Järvelä, Häkkinen, Arvaja, & Leinonen, 2004; Kirschner & Kreijns, 2005; Schellens & Valcke, 2006; Strijbos, De Laat,Martens, & Jochems, 2005) They can provide scaffolds to support the cognitive processes and also to fairly divide the workload and responsibility between group members (O’ Donnell, 1999). Additionally, the peer feedback process encourages students’ critical thinking skills (Berg, 1999). Regarding structuring interaction, the literature mostly refers to aspects such as roles, facilitated by scripts and prompts, modelling, and specific task and communication instructions (King, 1999). Also, the aspect of ‘anonymity’, offers various advantages in CSCL-environments (Ainsworth, Gelmini-Hornsby, Threapleton, Crook, O’Malley, & Buda, 2011). According to Morris, Church, Hadwin, Gress, & Winne (2010), it would be valuable to examine “the extent to which interaction should be structured on an epistemic level in order to support the way learners cope with the uncertain situation of online learning” (Morris et al., 2010, p. 818). Since Strijbos and Weinberger (2010) underline benefits of offering structure in a CSCL-environment, the last part of this study focuses on students’ perception when structuring the peer assessment process.

For this study, we have formulated the following research questions:

- Question 1: Is there a difference (1a) in product quality before and after the PA process and (1b) between the two conditions?
- Question 2: Is there (2a) an increase in learning effect from pretest to posttest and (2b) between the two conditions?
- Question 3: Has structuring the PA process an effect on students’ perception?
2. Method

2.1. Participants, setting and research design

The participants in the present study were first-year bachelor students Educational Sciences (N = 179), enrolled in the course Instructional Sciences at Ghent University. During the collaborative phase, students could access the wiki anywhere and anytime. As shown in Figure 1, this study adopted a quasi-experimental research design. All students were requested to fill in a questionnaire before and after the group assignment. Students were randomly assigned to groups (N = 38) of maximum five students to collaborate on one wiki. Groups were randomly assigned to a condition: either the control condition (n = 19) or the experimental condition (n = 19). In total, 85 students were in the control condition and 94 were in the experimental condition. From the start, both groups had access to a general introduction movie on general feedback principles, accessible in the electronic learning environment. The assignments were organized as such that after intermediate peer feedback, students always had the time to revise their draft version into the final text. In the experimental feedback condition, called the structured peer feedback (S-PFB) condition, the instructor provided students with a structured feedback form to improve the quality of the peer feedback. In the control feedback condition, students had no specific format to provide peer feedback.

2.2. Wiki assignment

This course had a blended design, in which the weekly course lectures were combined with wiki assignments throughout the semester. The total grade of three wiki assignments took up 40% of the final course grade (the other 60% was based on a theoretical written exam). In total, the practical part of the subject consisted out of 4 wiki assignments. The first one was a trial wiki to get familiar with the educational technology and expectations. The duration of each of the 3 other wikis was 3 weeks, so 9 weeks in total. This research was based on the findings of the last wiki assignment. In this final wiki assignment, students had to collaborate in constructing a wiki by tackling previously used exam questions based on theory of the three main topics of the course, which were already taught in the lectures: behaviorism, cognitivism and constructivism, in which students had to receive and provide peer feedback. After receiving peer feedback, the assesses was requested to review the draft version of the previous main topic into the final version. At the end of the three-week period, each group submitted one wiki, including the final work of all five group members, resulting in a wiki consisting of ten questions on the three topics (5 students x 2 questions x 3 topics = wiki with 30 questions). Each question includes a draft version, peer feedback, and a final version. The learning environment provided for each group a wiki area as CSCL-environment.

2.3. Peer feedback

To provide peer feedback, each group of students was organized following a rotation system to assure that no student could give or receive twice feedback from the same student during the process. The rationale behind this was “to prevent the possibility that the quality or tone of comments would become conditional on comments received in the previous round” (Gielen et al., 2010, p. 309). From the start, students were made attentive that the received peer feedback had no influence on the grade of their final work. On the other hand, the quality of the provided feedback was taken into account for summative assessment.
2.4. Research instruments

The pretest, which was completed by the students before the start of the writing assignment, consisted out of six multiple-choice exam questions to examine the insight on the three main topics. Therefore, they had to choose one answer out of four options. After the submission of the wiki assignment, students were requested to fill in a posttest. This posttest consisted out of six comparable multiple-choice exam questions, to examine the insight on the three main topics after the wiki assignment. Once again, they had to choose one answer out of four options.

In addition to the posttest, students were asked to fill out a questionnaire at the end of the wiki-assignment. This questionnaire was divided into four subsections. Variables in this study were the students’ preferences, perceptions and attitudes. All items were measured using 5-point Likert scales, and anchored by 1 (totally disagree) and 5 (totally agree). The first section investigated the perception of students towards the writing assignment in a wiki environment (e.g., “I am satisfied about the contribution of the other group members”) (14 items). The second and third section examined the perception of students respectively towards receiving feedback (e.g., “I consider the received feedback as relevant”) (11 items) and providing feedback (e.g., ”I consider my provided feedback as profound and detailed”) (13 items). The fourth section evaluated general feedback assumptions (e.g., “I prefer to provide feedback anonymously”) (4 items).
3. Findings

3.1. Quality of the wiki product

In order to answer the first research question, namely if the quality of the wiki product increases from draft to result (1a), a repeated measures ANOVA found that there was a significant difference between the quality of the initial work and the quality of the final product, $F(1, 175) = 390.399, p < .001$. As shown in Table 1, a repeated measures ANOVA found for the second part of the first research question (1b) that there was no significant difference between the quality of the product between the control and S-PFB condition, $F(1, 175) = 3.533, p = .062$.

| Quality of Product of Wiki Assignment | Draft | Result |
|--------------------------------------|-------|--------|
| Comparison of quality of group work  |       |        |
| S-PFB condition                      | 14.47 | 19.56  |
|                                      | 3.77  | 2.32   |
| Control condition                    | 15.89 | 20.10  |
|                                      | 3.34  | 1.75   |

***$p<.001$

3.2. Learning effect of the feedback process

To answer the second research question, namely if the feedback process has a learning effect on the students between the pretest and the posttest (2a), a repeated measures ANOVA found no significant difference in learning effect between the pretest and posttest scores of the multiple-choice questions, $F(1, 175) = .005, p = .945$.

As shown in table 2, a repeated measures ANOVA did not show a significant difference between the learning effect between the control and S-PFB condition (2b), $F(1, 175) = .405, p = .525$.

| Learning Effect of Feedback Process | Pretest MCQ | Posttest MCQ |
|------------------------------------|-------------|--------------|
| Scores on multiple choice questions (MCQ) | M   | SD    | M   | SD    |
| S-PFB condition                    | 2.43 | 1.41  | 2.52 | 1.76  |
| Control condition                  | 2.42 | 1.18  | 2.31 | 1.71  |
3.3. Structuring peer feedback: students’ perception and attitudes

In order to answer the third research question, namely if structuring the PA process has an effect on students’ perception, independent-samples t-tests were conducted. Table 3 provides an overview of students’ perception towards providing and receiving structured peer feedback between the two conditions. Regarding providing peer feedback, students’ perception in the experimental condition (M=4.20, SD=.720) claims to be more critical towards giving peer feedback than students in the control condition (M=3.90, SD=.715), who had no structure at all for giving feedback. An independent samples t-test showed this difference to be significant; t(155)=2.584, p=.011. Regarding receiving peer feedback, students who made use of a S-PFB form indicated to be more critical towards receiving peer feedback (M=3.81, SD=.702), than students from the control group (M=3.56, SD=.748). An independent samples t-test showed this difference to be significant; t(154)=2.184, p=.030.

An independent-samples t-test also revealed a significant difference in students’ perception towards how profound and detailed the received peer feedback is. The S-PFB (M=3.16, SD=.833) group perceived the received peer feedback as more profound and detailed than the control (M=2.86, SD=.698) group; t(153)=2.372, p=0.19. On the other hand, there was no significant difference found regarding the profundness and level of detail of provided peer feedback between the experimental (M=3.40, SD=.805) group and the control (M=3.19, SD=.762) group; t(155)=1.633, p=104. Cohen’s d statistics indicate a small to moderate effect size for students’ perception towards giving and providing peer feedback.

Table 3

| Perception towards peer feedback                                                                 | Control (PFB) | Exp. (S-PFB) | t    | df     | d    |
|--------------------------------------------------------------------------------------------------|---------------|--------------|------|--------|------|
| A wiki is an ideal tool to facilitate the process of providing and receiving peer feedback       | 3.30          | 3.44         | .745 | 130    | 0.13 |
| I consider receiving peer feedback as an added value                                             | 4.11          | 4.08         | .256 | 153    | 0.04 |
| I consider providing peer feedback as an added value                                              | 3.79          | 3.87         | -.641| 155    | 0.10 |
| I am critical towards the received peer feedback                                                 | 3.56          | 3.81         | -2.18*| 154    | 0.34 |
| I am critical towards the work of a peer when providing feedback                                 | 3.90          | 4.20         | -2.58*| 155    | 0.42 |
| I consider the received peer feedback as profound and detailed                                   | 2.86          | 3.16         | -2.37*| 153    | 0.39 |
| I consider the given peer feedback as profound and detailed                                      | 3.19          | 3.40         | -1.63| 155    | 0.27 |
| I am satisfied with the quality of the received peer feedback                                    | 3.63          | 3.71         | -.666| 153    | 0.10 |
| I am satisfied with the quality of the given peer feedback                                       | 3.74          | 3.81         | -.753| 155    | 0.11 |
| I prefer providing peer feedback anonymously                                                     | 2.14          | 2.16         | -1.58| 155    | 0.02 |

1 Equal variances not assumed (Hildebrand et al. 2005: 362); * p <.05
4. Discussion

The findings in this study showed that the quality of the wiki product clearly improves after receiving peer feedback. This is in agreement with the research of Kaufman and Schunn (2010), who suggest that improvements could be linked to the higher quantity or a more positive nature of peer feedback. In this respect, Nadler (1979) argues by stating that individual-level feedback provided in a team setting improves individual performance. Previous studies, which examined the quality and quantity of peer feedback in writing assignments, revealed that more specific and elaborated feedback stimulates better performance and outcomes (Strijbos, et al., 2010). In this study, the results showed a significant difference between the draft and final version of the wiki product. On the other hand, there is no significant difference in quality of the product between the two conditions.

"Feedback guides, motivates, and reinforces effective behaviors and reduces or stops ineffective behaviors" (London, 2003, p. 1). Although feedback is widely accepted as an appreciated tool for learning (Falchikov, 2001), the findings of the present study did not show a significant learning effect between the pretest and posttest. Previous research of Alvero, et al. (2001) emphasizes that studies are ambiguous regarding requirements for the effectiveness of feedback. This is in agreement with the review study by Hattie and Timperley (2007). The results also showed no difference in the learning effect between the experimental and the control condition. As far as we know, there is no research that investigates the difference in learning effect when structuring the peer feedback process. Additionally, previous research pointed out a difference in learning effect between providing and receiving feedback (Van Der Pol, et al., 2008). By providing peer feedback, it is essential that students “invest time and effort into actively constructing content-oriented reactions” (Van der Pol, et al., 2008, p.1816). The learning effect of receiving peer feedback depends on the quality of the feedback by the assessor, who is not an expert. Previous studies highlight that the competence level of the assessor influences students’ perception towards feedback (Strijbos, et al., 2010).

Regarding the perception of students towards structuring peer feedback, the results pointed out that students, who gave and received peer feedback with the help of S-PFB, had a more critical attitude in the feedback process, than the other students. This finding is in agreement with Berg (1999), who discovered that peer feedback stimulates critical thinking. The findings also showed that students, who used S-PFB in the feedback process, perceive the received peer feedback as being more profound and detailed. Li, Liu, and Steckelberg (2010) discovered that students acknowledge the value of peer feedback, but that they were not always satisfied about the quality of their received peer feedback. The lack of constructive and more detailed feedback was associated with poor quality feedback. In general, previous research highlights that CSCL facilitate students’ learning, especially when the instructor offers some kind of support or structure to concretize the roles and activities of the involved students (Strijbos & Weinberger, 2010; Fischer, et al., 2007; Kirschner & Kreijns, 2005; Schellens & Valcke, 2006; Strijbos, et al., 2005). Therefore, we might assume that offering a little structure to provide peer feedback helps students in a certain extent through the different steps of the thinking process when they are requested to provide profound and detailed peer feedback.

When interpreting the results, the limitations of the study should be taken into account. First of all, it is worth mentioning that the multiple-choice questions, which were used to calculate the learning effect, were not calibrated accurately. The lecturer of Educational Sciences selected the different questions for the pretest and posttest, but the equality of pretest and posttest was not statistically tested. Another limitation is the basic and limited structure of the S-PFB form. The present study revealed several gaps in existing research on structuring peer assessment in CSCL that provide starting points for future experimental research. Further research is needed to investigate the impact of different S-PFB approaches (e.g. a more elaborated structured feedback form) and the influence of students’ critical attitude on product improvement and students’ learning and perception.
5. Conclusion

Although the literature suggests several benefits of the peer assessment process, the results of this study do not show a significant difference in learning effect from pretest to posttest, and also not between the two conditions. Based on the received peer feedback, the wiki product improves significantly when students have the opportunity to revise their initial draft before submitting the final result in the wiki-based CSCL-environment. The results point out that the basic intervention of S-PFB through a feedback form does not have a significantly additional impact on students’ final product. When structuring the peer assessment process in a wiki-based CSCL-environment, this study revealed that students have a stronger critical attitude when they both provide and receive peer feedback with the help of S-PFB. To conclude, students experience received peer feedback as being more profound and detailed when the feedback is constructed with the help of S-PFB.

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