Sustainable peer feedback in higher education: category-driven analysis on pre-service students’ perceptions

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Abstract: Students who had been actively engaged in mediated collaborative activities, were asked for their perceptions about the sustainable peer feedback they had received and provided. Their views were then analyzed and categorized in terms of receiver and provider feedback, cognitive feedback and previously acquired feedback to further knowledge about sustainable education processes. A peer supported feedback questionnaire was created and validated, and its categories were correlated. The questionnaire was then aligned with the activities used to foster peer feedback between the pre-service students from the three bachelor’s degrees. The perceptions the students had of the feedback processes were analyzed using defined peer support feedback categories and the results showed a correlation between cognitive feedback and both provider and receiver self-efficacy feedback. In addition, there was a further correlation between both provider and receiver self-efficacy feedback as well as provider and receiver involvement and feedback structure. However, the results also revealed that neither receiver nor provider autonomy support were significant categories for supportive feedback.

Keywords: sustainable feedback, peer feedback, higher education, peer receiver, peer provider.

1. Introduction

Sustainable education in higher education fosters skills in initiative such as being proactive and more independent and thinking critically [1]. In higher education, once the active role of students is acknowledged, the concept of sustainable education relies on learners making sense of information from various sources and using it to enhance their learning strategies [2]. It also entails the ability of teachers to promote student interaction and foster relationships in socialization and learning [3-5]. Sustainable education is grounded in proactive processes that ensure educational problems are eliminated before they occur [6]. Learner-driven strategies are essential to sustainable education and so developing students’ abilities and skills demands engaging students through action [7]. Within the teaching-learning context, metacognitive theory emphasizes that students are self-regulating and responsible for their own learning as teachers guide them in the process. Feedback begins with students and teachers putting a continuous process of cyclical interaction in place. Meanwhile, the theory of social constructivism focuses on knowing how students actively participate when...
constructing their knowledge [8,9], i.e., from the perspective of students co-constructing through
dialogue and sense-making strategies [2,10]. The starting point of sustainable feedback is a student’s
pre-existing knowledge, especially in the sphere of peer interaction, as it is the student who becomes
the protagonist because feedback is no longer teacher controlled. Within this educational paradigm,
feedback is not an evaluative process, it does not judge but instead it is a balanced, constructive and
stimulating process of inherent interest for the students themselves.

Sustainable feedback is based on social constructivism approaches [11]. First, the quality of
student performance is fostered when students are involved in dual peer-to-peer dialogues either
through designed activities or learning. Second, a student’s capacity to monitor and evaluate their
own learning is developed along with the capacities for ongoing, lifelong learning, for goal setting
and for planning their own personal learning outcomes. Third, specific disciplines, curricula and
contextual assessment tasks are designed to facilitate student engagement over time. In this context,
feedback is generated from varied sources, processed and used to enhance performance on the
multiple stages of assignments. By fostering sustainable feedback, students are trained in decision-
making and initiative skills that lead to autonomy and critical thinking [12-14]. But at the same time,
students must understand the value feedback has and the active role they play in the process, either
as the provider or receiver of the feedback [2].

Sustainable feedback benefits all the agents involved in the learning process and can be observed
from the perspective of the feedback provider and/or that of the receiver [15-17]. When analyzing the
work of their peers, the student feedback providers must first reflect on their own work which will
contribute to improving the quality of what they themselves produce from the outset [18,19].
Likewise, this contributes to creating reflective knowledge because, during the process, peers must
produce evaluation appraisals not only on the work of others, but also on their own in relation to that
of the group [20-22]. Finally, reflection is reinforced because when issuing an evaluation appraisal,
the feedback provider must provide a coherent explanation. Although peer feedback is also mediated
by students’ perceptions of the peer feedback they receive [17,23], students usually perceive
providing, rather than receiving, peer feedback is more beneficial [17,24-25]. Generally, peer feedback
means that both the provider and the receiver are more motivated by the in-class activities when they
see themselves totally involved and implicated in the entire process [21].

Although research usually focuses on the understanding, capacity and disposition needed to
make sense of information and its use to enhance learning strategies [2], this paper focuses on peer
feedback research, specifically analyzing the perceptions that pre-service students attain in their role
as feedback provider or receiver. We are interested in defining categories that can describe the process
in terms of how developing peer feedback provides structure, autonomy and involvement, as well as
self-efficacy. We base our analysis on the (so far) not-yet-described need-supportive feedback
approach which aims to analyze students’ basic needs. Need-supportive feedback distinguishes three
basic needs: (i) feedback autonomy, (ii) structure for both provider and receiver involvement which,
together with (iii) self-efficacy, promote students’ self-regulated learning [26]. For students, cognitive
feedback (both provider and receiver) relates to how cognitively challenging the instructional
strategies and the selected learning tasks are and how thought-provoking the teacher’s instructional
strategies are [27]. Self-efficacy, in the context of peer feedback, can be defined as appraisals of
individual skills to bring about the desired outcomes of student engagement and learning [28]. In the
model we purpose, peer self-efficacy feedback has been operationalized as a dimension construct that
also includes efficacy for both the receiver and the provider’s self-regulation and instructional
strategies.

Therefore, this paper’s focus is twofold: i) engaging pre-service students from three bachelor’s
degrees through collaborative activities and peer feedback and ii) evaluating the ensuing peer
feedback using an analytical model of students’ basic needs categories. The needs categories were
divided into four blocks: received feedback, provider feedback, cognitive feedback and prior notions
of feedback. The first two were analyzed as a function of the pre-service students’ involvement,
autonomy support, structure and self-efficacy. We quantitatively analyzed the four blocks which
were further divided into ten categories supported by seventeen questions, all of which determine
the perceptions students had about the feedback processes they were involved in. By statistically analyzing the ten correlated categories we are able to determine the most significant interactions that define the co-construction knowledge of students working with supportive feedback. Although some research on the perceptions teachers and higher education students have about sustainability and sustainable education exists [7,29-31], there are very few studies that deal with student perceptions about learner-driven sustainable supportive feedback.

2. Methods

2.1. Context

The experiment was carried out with three groups of students taking one of three bachelor’s degrees in Education at the University of Girona: Bachelor’s degree in Early Childhood Education, Bachelor’s degree in Primary School Education, and the double degree in Early Childhood and Primary School Education. In the Spanish curriculum, teacher education is based on a four-year study program. Our experimental study was carried out during a 75-hour module for all three degrees at the Faculty of Education and Psychology (University of Girona, Spain).

2.2. Participants

There were one hundred and eighty-one participants in total, and the ages ranged between 18 and 37 years old; albeit the great majority (86%) being between 18 and 25 years old. The sample had a higher percentage of female (79%) to male students (21%). Of the students involved, 32% were doing their bachelor’s degree in Early Childhood Education, 53% were in Primary School Education, and 15% were doing the double degree.

2.3. Peer Feedback Activities

All the peer activities proposed to all the students involved in the study were designed around collaborative learning.

The pre-service students from the Bachelor in Primary School Education were initially put into groups of three and asked to produce a scientific graphical abstract based on an experimental scientific experience. Feedback was initiated through peer interaction within the groups of three. Dialogue between the feedback receiver and the two providers was centered on the changes the feedback providers proposed for improving the quality of the (receiver’s) initial abstract. All three students received feedback (one interaction) and provided feedback (two interactions). Next, each student replotted their graphical abstract by taking into consideration the feedback they had received from their groupmates. Thus, a second version was developed. The activity was repeated once a week for a total of six weeks, i.e., a total of six peer feedback interactions. The interaction between students was based on true peer collaborative learning [32]. True peer collaborative learning maximizes the supportive feedback between the provider and the receiver. Since the students from each group were all ‘in the same boat’ (i.e., completely unfamiliar with the new material), they developed the activity by following a (teacher provided) fixed and controlled script in order to improve their processing and retention of the learning tasks. Although this script can be applied to different types of tasks, such as reading or writing, we related it to the peer collaboration between the three members of the group on a task that summarized acquired knowledge [33].

Meanwhile, the pre-service students from the Double Bachelor’s degree in Early Childhood and Primary School Education were also put into groups of three and in a ‘jigsaw activity’ each member was given a piece of incomplete information. Thus, the need for reciprocal communication between all three members in each of the cooperative groups was generated [34]. The jigsaw technique considers each student in the group as a ‘piece of the puzzle’ and therefore essential to its completion. To this end students participating in each group were asked to integrate their piece of the puzzle into a final unique text. A jigsaw activity has four phases. In Phase 0, students are put into groups of (in our case) three. One example of a jigsaw activity is a text divided into three parts, (A, B and C), and each student is responsible for reading and understanding their given part. In our case, in Phase 1
the students met to discuss and share the information they had been given (i.e. their part of the text).

In Phase 2, the students then put the final text together. Once the final text from each group had been
put together, two base teams were asked to produce feedback, one group providing feedback and the
other receiving it. As with the students from the Bachelor in Primary School Education, the activity
was repeated once a week over six weeks, (i.e., a total of six peer feedback interactions), with groups
alternating their role as feedback provider or receiver. In other words, this activity employed
reciprocal peer feedback [35].

The Early Childhood Education degree students’ task was to carry out individual self-directed
research about a specific subject proposed by the teacher. This research would later be presented to
the rest of the members of a base team. This is a complex task because its main objective is to create
a debate between the students [36]. Students were left to organize themselves in groups of four or six.
As with the students from the other two bachelor’s degrees, these students also met once a week for
six weeks. Each week one member of the team presented their findings and the other team members
provided them with feedback, i.e., reciprocal plural peer feedback [4].

2.4. Peer Feedback Questionnaire and Conceptual Framework

The students were asked to answer the Peer Feedback Questionnaire (PeerFQuest) (Table 1).
PeerFQuest was designed and created following a detailed analysis of prospect models dealing with
introducing peer feedback processes into higher education. Once the questionnaire had been drawn
up it was piloted and then implemented. To optimize the quantification of learning strategies,
especially in terms of multi-method research [37], metacognitive aspects [38], and methodological
skills [39-41], questionnaires are typically used. According to Leenknecht et al. [42], using
questionnaires to complement tasks can give an accurate reflection of cognitive processing. Therefore,
PeerFQuest is not only designed around the interaction between peers in the feedback process, and
students’ roles as provider or receivers, but also around the previous experience of experimental
feedback and the cognitive processes inherent to supportive feedback.

As such, PeerFQuest was designed to obtain students’ opinions and views about various aspects
of supportive feedback. PeerFQuest was made up of four blocks. Block 1 had four categories
concerning receiver feedback: involvement, autonomy support, structure and self-efficacy. Meanwhile, Block 2 had four categories on provider feedback: involvement, autonomy support,
structure and self-efficacy. Finally, Block 3 had a single category on cognitive feedback and Block 4 a
single category on previous feedback experience. The questionnaire had seventeen questions. The
first two categories on either providing or receiving feedback are aligned with the teachers playing
an important role in motivating students by providing and demonstrating autonomy support,
structure (support of competence) and involvement (support of relatedness) [43,44]. Students who
are motivated to learn are more likely to engage in activities and to ask for feedback [43].

According to the theory of self-determination, a learning environment should support students’
basic psychological needs for autonomy, competence and involvement [43]. Indeed, an optimal
process of need-supportive feedback should be facilitated by the psychological need for autonomy
where students who provide and receive feedback feel that they are at the heart of their actions and
that their actions are concordant with their values, among which include responsibility, commitment,
criticism and perseverance [45]. Therefore, a high-quality feedback process must be autonomy-
supportive [46]. In addition, providing and receiving feedback may be conceptualized as a specific
aspect of structure [46] and is related to students’ experience of effectiveness. Teachers that involve
students in peer feedback, communicate the twofold expectations that feedback providers and
receivers may encounter in the dual process of receiving and providing explicit informational
feedback and support. The third category, involvement, aims to foster students’ feelings of
relatedness, i.e., the experience of close emotional bonds with significant others [43]. Feedback
providers and receivers may show understanding and that they are available to offer support during
the feedback process. Finally, self-efficacy in the feedback process means that both feedback
providers and receivers have individual capabilities to bring about desired outcomes, especially in
terms of student engagement and learning.
Table 1. The seventeen questions, divided into ten categories, that make up the Peer Feedback Questionnaire. The first eight categories are related to students’ perceptions about receiver and provider feedback, the ninth category is related to cognitive feedback and the tenth category to previously acquired experience in feedback processes.

<table>
<thead>
<tr>
<th>Peer Feedback Categories and PeerFQuest questions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Receiver feedback involvement:</strong></td>
</tr>
<tr>
<td>1. Did you like receiving feedback from your partners?</td>
</tr>
<tr>
<td>2. Was the feedback you received from your partners given in a kind and empathetic manner?</td>
</tr>
<tr>
<td><strong>2. Receiver feedback autonomy support:</strong></td>
</tr>
<tr>
<td>3. Do you think the feedback helped you improve your learning?</td>
</tr>
<tr>
<td><strong>3. Receiver structure:</strong></td>
</tr>
<tr>
<td>4. Was the feedback you received accurate and specific enough to improve your learning?</td>
</tr>
<tr>
<td><strong>4. Self-efficacy receiver feedback:</strong></td>
</tr>
<tr>
<td>5. Was the feedback you received helpful/beneficial for improving your learning?</td>
</tr>
<tr>
<td>6. Were you able to modify your work so that the feedback you received improved your learning?</td>
</tr>
<tr>
<td><strong>5. Provider feedback involvement:</strong></td>
</tr>
<tr>
<td>7. Did you like giving your partners feedback?</td>
</tr>
<tr>
<td><strong>6. Provider feedback autonomy support:</strong></td>
</tr>
<tr>
<td>8. Do you think the feedback you gave was well-received?</td>
</tr>
<tr>
<td><strong>7. Provider structure:</strong></td>
</tr>
<tr>
<td>9. Did you think about being kind and empathetic when you fed back to your partners?</td>
</tr>
<tr>
<td>10. To what extent did you use your previous knowledge of the topic to provide feedback?</td>
</tr>
<tr>
<td><strong>8. Self-efficacy provider feedback:</strong></td>
</tr>
<tr>
<td>11. Do you consider that your criticism of the work was precise/concrete and would improve your partners’ learning.</td>
</tr>
<tr>
<td>12. Do you think the feedback your partners received was useful and improved their learning?</td>
</tr>
<tr>
<td><strong>9. Cognitive feedback:</strong></td>
</tr>
<tr>
<td>13. Do you think providing and receiving feedback is useful for improving learning?</td>
</tr>
<tr>
<td>14. Do you think providing and receiving feedback has improved your motivation to learn?</td>
</tr>
<tr>
<td>15. Do you think that the feedback provided and received has improved your relationships with your partners?</td>
</tr>
<tr>
<td><strong>10. Previous feedback experience:</strong></td>
</tr>
<tr>
<td>16. Have you ever used feedback before as a teaching/learning strategy?</td>
</tr>
<tr>
<td>17. Did you have any previous information about feedback as a methodological strategy before carrying out the activity?</td>
</tr>
</tbody>
</table>

2.5. Statistical Analysis

Students’ answers to PeerFQuest (Table 1) were scaled on a Likert scale (1 = disagree, 5 = strongly agree) for questions 1 to 15 corresponding to Blocks 1, 2 and 3. Questions 16 and 17 were dichotomous questions requiring students to answer yes or no. A reliability analysis was conducted to ensure the dependability of the answers. This was done because good development procedures (usually) result in a reasonably reliable survey instrument [47-49]. For the whole set of the first three blocks, (i.e., the nine categories on peer feedback), Cronbach’s coefficient alpha was 0.93, which is higher than 0.9, therefore ensuring that the PeerFQuest presents an excellent internal-consistency reliability [50,51]. In addition, an analysis of the capability to discriminate the questions of the PeerFQuest (Table 1) was carried out. To reinforce the individual character of the test, the index of homogeneity of each question in Table 1, (i.e., the Pearson coefficient), was used. The Pearson coefficient measures the score of each question in relation to the sum of the scores in the remaining questions, and the degree of the questionnaire’s internal consistency. Thus, the Pearson coefficients for each question were calculated and, in all cases, the value of 0.3 was exceeded. There were minimum values for questions...
9 and 10 (provider structure) with Pearson coefficients of 0.3 and 0.4, respectively, and maximum values for questions 5 and 12, (self-efficacy feedback), with a Pearson coefficient of 0.8.

The analysis of the mean, standard deviation, asymmetry, kurtosis and correlation (Table 2), as well the analysis of the internal consistency based on the Cronbach’s and Pearson coefficients, were carried out with the IBM SPSS Statistics 19.0.x software. A logistic regression was also carried out using the same statistical program.

3. Results

Table 2 shows the main descriptive statistics from the nine categories used in this study and the correlation there is between them. Although all correlations are positive and with a statistically significant 99% confidence interval, we based our analysis on correlations larger than 0.65 which, according to the literature, may be accepted as good analysis predictors of category dependencies. The categories that were statistically significant were found between the cognitive feedback category and both the self-efficacy provider (0.68), and the self-efficacy receiver (0.65) feedback categories. In addition, the self-efficacy provider feedback category was highly correlated with both the self-efficacy receiver feedback (0.73, being the highest), the provider feedback involvement (0.66) and the provider structure (0.65) categories. Finally, self-efficacy receiver feedback was highly correlated with the receiver feedback involvement (0.69) and receiver structure (0.66) categories. An analysis of the correlation between the three blocks proved Pearson correlations higher than 0.71.

In terms of the descriptive statistics, one observes that most of the items have been completed in their entirety (181) and that the majority present responses grouped around two or three values on the scale (3, 4, 5), with the low values being practically unanswered. Hence, standard deviations are less than one and the asymmetry is negative (a higher concentration in the upper part of the scale). In relation to kurtosis, variability is observed within the same group. On the one hand there are items with positive values, indicating a leptokurtic distribution (values > 0), which means that there is a higher concentration of data around the mean. On the other hand, there are items with negative values, indicating a more flattened distribution, which is known as platykurtic distribution (values < 0) and indicates a lower concentration of data around the average. Finally, Block 3 (cognitive feedback) presents a kurtosis very close to 0, therefore its distribution is very similar to a Gaussian distribution.

Table 2. Number of answers (N), Mean (M), Standard Deviation (SD), Asymmetry (A), Kurtosis (K) and correlations between the categories. Note: All correlations were significant at level 0.01.

<table>
<thead>
<tr>
<th>N</th>
<th>M</th>
<th>SD</th>
<th>A</th>
<th>K</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>R. f. involvement</td>
<td>181</td>
<td>4.3</td>
<td>0.76</td>
<td>-1.2</td>
<td>1.7</td>
<td>0.38</td>
<td>0.58</td>
<td>0.69</td>
<td>0.50</td>
<td>0.58</td>
<td>0.38</td>
<td>0.61</td>
</tr>
<tr>
<td>R. f. autonomy support</td>
<td>177</td>
<td>3.8</td>
<td>0.96</td>
<td>-1.3</td>
<td>2.7</td>
<td>0.37</td>
<td>0.58</td>
<td>0.39</td>
<td>0.23</td>
<td>0.27</td>
<td>0.41</td>
<td>0.53</td>
</tr>
<tr>
<td>R. structure</td>
<td>181</td>
<td>3.6</td>
<td>0.88</td>
<td>-0.3</td>
<td>0.1</td>
<td>0.66</td>
<td>0.49</td>
<td>0.54</td>
<td>0.57</td>
<td>0.43</td>
<td>0.61</td>
<td></td>
</tr>
<tr>
<td>Self-efficacy R f.</td>
<td>181</td>
<td>3.9</td>
<td>0.80</td>
<td>-0.6</td>
<td>-0.3</td>
<td>0.58</td>
<td>0.44</td>
<td>0.41</td>
<td>0.73</td>
<td>0.68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P. f. involvement</td>
<td>181</td>
<td>4.0</td>
<td>0.92</td>
<td>-0.6</td>
<td>-0.3</td>
<td>0.45</td>
<td>0.38</td>
<td>0.66</td>
<td>0.58</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P. f. autonomy support</td>
<td>181</td>
<td>4.0</td>
<td>0.82</td>
<td>-0.6</td>
<td>0.4</td>
<td>0.37</td>
<td>0.60</td>
<td>0.47</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P. structure</td>
<td>181</td>
<td>4.2</td>
<td>0.59</td>
<td>-0.6</td>
<td>-0.2</td>
<td>0.65</td>
<td>0.49</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Self-efficacy P f.</td>
<td>178</td>
<td>4.0</td>
<td>0.73</td>
<td>-0.7</td>
<td>0.5</td>
<td>0.65</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Cognitive feedback</td>
<td>181</td>
<td>4.1</td>
<td>0.74</td>
<td>-0.8</td>
<td>-0.0</td>
<td>0.65</td>
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</table>

To analyze the relationship between the two dichotomous questions (PeerFQuest Q16 and Q17 previous feedback experience (Table 1)), a logistic regression analysis was carried out to determine the impact each of the three blocks had on the probability of responding assertively. Neither analysis yielded significant results. In any case, although there are no statistically significant estimators, certain trends in the values were observed. Block 1 (Receiver feedback) and Block 2 (Provider feedback) had a positive impact on Question 16, which asked about using feedback in previous activities. Higher scores in both groups indicate a greater probability of responding affirmatively to this question. On the other hand, unlike Blocks 1 and 2, higher scores in Block 3 presented a lower
probability of responding affirmatively to Question 16. For Question 17, (previously acquired information on feedback), Block 2 (provider feedback) had a positive impact, while Block 1, (receiver feedback), had very little impact (values very close to 1) and Block 3 tended to have a rather negative impact.

4. Discussion

Supportive peer feedback is a learner-driven strategy that is one of the basic elements of sustainable education; learning is promoted through interaction between students that, in a second stage, fosters students’ co-construction of knowledge and acquisition of intuitive skills [2]. This manuscript clearly shows that developing pre-service education students’ peer feedback literacy skills (especially on the levels of providing and receiving supportive feedback) enables them to put the feedback into effect. Our objective was to school the pre-service students’ education in decision-making and initiative skills so they can go on to develop self-regulated learning and achieve higher levels of cognitive development. From the perspective of the students’ perceptions of supportive feedback, we can deduce that there is an interplay between the dimensions involved in the supportive feedback processes and that learning depended on both self-reflection and the interaction between peers. The supportive peer feedback encouraged collaborative interaction not only on the level of the teacher developing collaborative activities, but also by asking students to reflect on the process of giving or receiving peer supportive feedback through the PeerFQuest questionnaire [2,14,20,52]. Providing opportunities for dialogue and promoting evaluative appraisals represent examples of the kind of feedback literacy that can strengthen social-relational aspects of peer interaction and reduce power differentials and negative emotional reactions which could arise in a more teacher-directed feedback process [2,53].

The three main blocks describing supportive peer feedback were (approximately) equally correlated. The cognitive, provider and receiver feedback groups from the PeerFQuest (Table 1) presented similar correlations. For students providing and receiving feedback and the cognitive feedback, (i.e., the extent to which the peers’ instructional strategies and the selected learning tasks were cognitively challenging [27]), correlated with both provider and receiver self-efficacy, in which students were aware of appraisals about their own abilities to bring about desired outcomes [28]. For instance, the students’ perceptions of the benefits of providing versus receiving peer feedback, were found to successfully rework and modify writing assignments and performance in content, structure and style [17]. Furthermore, feedback providers have been reported to have made substantial advances in their writing abilities [54]. In our experiments, producing cumulative feedback during single or multiple feedback sessions could favor the positive perceptions of students’ self-efficacy. Indeed, cumulative experience of multiple peer feedback events over time may positively affect students’ attitudes, beliefs and/or performance [17].

By defining nine subcategories within the three blocks, we were able to identify robust correlations on the levels of inter-group analysis and intragroup subcategory analysis. Therefore, the students’ answers to the peer feedback questionnaire determined the most correlated subcategories in the groups. We based our study on the students’ basic psychological needs, competences, autonomy, involvement and self-efficacy.

Although the theory of self-determination postulates that a learning environment should support students’ basic psychological needs for autonomy, competence and involvement, our findings showed that an optimal process of needs-supportive feedback was highly facilitated by the psychological needs of structure and involvement, correlating with self-efficacy, and summarized in the conceptual model in Fig. 1. That is, the students providing or receiving feedback (peer-to-peer feedback) improved their learning during the dual process of communicating/receiving feedback through dialogues [55]. These results are aligned with those of Yang and Carless [53] who described an enhancement of the dialogic feedback process using a feedback triangle formed by a cognitive dimension, the interpersonal negotiation of feedback and the feedback provision structure.
Furthermore, involvement, correlating to self-efficacy, aims to promote students’ feelings of relatedness, i.e., fostering and promoting interpersonal emotional bonds with peers while receiving or providing feedback [53,54]. In other words, feedback providers and receivers may show understanding and empathy, and that they are available to offer support during the feedback process, either individually or in groups. The significant correlation between provider and receiver involvement and structure with self-efficacy means that both feedback providers and receivers have the individual skills required to bring about the desired outcomes, especially in terms of student engagement and learning.

All in all, this manuscript has shown that the architecture of supportive peer feedback based on collaborative activities, relies on the correlation between cognitive feedback and both provider and receiver self-efficacy feedback. In addition, there is a correlation between students’ self-efficacy feedback and provider and receiver involvement and structure feedback. The inter and intra correlations between feedback dimensions on students’ perceptions define a relevant message for peer feedback: peer feedback activities and evaluation, when designed in terms of sustainability, should include cognitive, metacognitive and self-efficacy [56]. Further research could be done by incorporating longitudinal information on students’ efficacy at both receiving and providing feedback, or cognitive-verification of the activities that support the subsequent feedback process or on the accuracy of the types of activities that foster initiative skills for both the receivers and providers involved in sustainable feedback.


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