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Contribution of peer-feedback to the development of teamwork skills

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Abstract

Peer-feedback is a widely-used strategy at the university level for its positive impact on student learning and its multifaceted advantages encompassing social, cognitive, and metacognitive development. However, few studies have assessed its contribution to the development of teamwork skills. This study analyzes students' perception of how peer-feedback contributes to the development of teamwork skills by comparing the results of two class groups that have taken the same subject, though with different feedback experience designs (face-to-face and mixed feedback versus non-face-to-face and written feedback, with or without consensus among group members). At the end of the study, 82 participants completed a questionnaire to assess their perception of the peer-feedback experience and its impact on learning and the development of teamwork skills. The findings reveal that students perceive that giving and receiving feedback in face-to-face mixed modality contributes more to developing teamwork skills; however, the presence or absence of consensus among group members to give or receive feedback does not appear to exert a clear impact on the development of these skills. Additionally, the findings suggest that students perceive a greater development of teamwork skills by giving feedback rather than receiving it. These results highlight the importance for teachers to consider such aspects when designing peer-feedback experiences, aiming to maximize the impact on the development of teamwork skills.

Keywords: peer-feedback, teamwork skills, group work, feedback design, higher education

Introduction

Peer-feedback is a widely-used strategy in higher education owing to its potential to improve student learning and performance (Hattie & Timperley, 2007). Several studies explored the impact of feedback on cognitive and metacognitive development and social skills (Panadero et al., 2018), considering their different approaches and forms (Armengol et al., 2022). Despite the well-established benefits, many feedback experiences occur within group settings. Consequently, it is crucial to dissect and scrutinize the specific contribution of peer-feedback to the cultivation and refinement of teamwork skills. Notably, limited scholarly attention has been directed toward the comprehensive assessment of the acquisition and development of teamwork skills among university students (De Prada et al., 2022).

Teamwork is a highly valued skill that is in great demand by employers (Lovato & Shaw, 2021; Romero-Díaz et al., 2022). It is often included as a transversal competence in educational curricula. Thus far, teamwork has scarcely been considered a subject that must be learned, taught, and evaluated (Baird & Parayitam, 2019; García-Aracil et al., 2021; Planas-Lladó et al., 2020; Succi & Wieandt, 2019). Among other soft skills, teamwork can be developed by engaging students in tasks that help them to reflect not only on their individual task accomplishments but also on the achievements of their peers (Luca & McLoughlin, 2002).

Peer-feedback strategies create a favorable environment for students to interact, use their prior knowledge (AUTHOR, 2019), and develop these soft skills (Dochy & Mc Dowell, 1997). Thus, peer-feedback can contribute to developing and cultivating teamwork skills in higher education (Bayne et al., 2022; Lerchenfeldt et al., 2019; McCarthy, 2017). By engaging students in the process, peer-feedback compels them to exercise interpersonal abilities directly associated with effective teamwork, such as communication, empathy, and assertiveness.

Nevertheless, empirical research investigating the impact of feedback on the advancement of soft skills, including teamwork, remains limited (Lowell & Ashby, 2018; Sridharan & Boud, 2019). The present study explores the students' perceptions of the contribution of peer-feedback to learning and the development of teamwork skills, analyzing some of the skills that collectively contribute to teamwork: communication, confidence in others, acceptance by others, sense of belonging, and assertiveness. However, it examines whether the design of the feedback experience (face-to-face vs. mixed, and the consensus among group members) influences the students' perceptions when giving and receiving feedback.

Teamwork skills

Since the beginning of the 21st century, the ability to work in a team is considered among the most important generic skills to be developed by students (González & Wagenaar, 2003), as professional success greatly depends on the ability to collaborate effectively with colleagues. Although this skill is treated as transversal in numerous university degrees (González & Wagenaar, 2003), and most adopt teamwork as a teaching methodology, higher education institutions' attention to its development is lacking (García Aracil et al., 2021; Succi & Wieandt, 2019). For this, the lack of consensus regarding its characterization and implementation is among the possible reasons (Yan et al., 2018).

The existing literature on teamwork distinguishes two main trends—precisely, one that considers teamwork as a distinct skill (e.g., Jardim et al., 2022; Luca & McLoughlin, 2022; Succi & Wieandt, 2019) and another that emphasizes a series of individual skills that collectively contribute to being a good team member (e.g., Bonavia et al., 2015). The latter is commonly considered the dominant approach. Although authors differ in their level of specificity, several studies have identified and systematized the set of skills considered vital to developing the ability to work in a team.

Among these, communication skills hold a prominent position (Bayne et al., 2022; De Prada et al., 2022; Getha-Taylor, 2008), accompanied by closely related skills, including the capability to articulate one's perspective effectively and engage in attentive interpersonal listening (Baybe et al., 2022; Thompson et al., 2009), participate actively in discussions (Thompson et al., 2009) or negotiate (Romero-Díaz et al., 2022). Other skills considered instrumental to becoming a better team member are the aptitude for conflict resolution (Bayne et al., 2022; Getha-Taylor, 2008; Romero-Díaz et al., 2022) or conflict management (Hastie et al., 2014). Furthermore, the interpersonal skills essential for successful teamwork are the ability to understand perspectives beyond one's own (Getha-Taylor, 2008), a sense of belonging to the group (Torrelles et al., 2011), empathy (Romero-Díaz et al., 2022), the ability to build trust among team members (Lovato & Shaw, 2021) and effectively facilitate the contributions of others (Hastie et al., 2014).

In the study, we define "teamwork skills" as a set of competencies related to communication, listening, and assertiveness, and it contributes to building trust, favoring acceptance, and facilitating cooperation among group members.

Peer-feedback and teamwork skills

Peer-feedback is an increasingly frequent practice in higher education, involving students providing one another with comments and criticisms regarding their contributions to improve them (McCarthy, 2017). Its benefits have been widely documented, including the positive impact on learning, improvement of metacognitive and comprehension skills, self-regulation, and development of skills and competencies.

As defined by van Gennip et al. (2009), peer-feedback is fundamentally a social process that pertains to the exchange of feedback among individuals to improve the performance of each group member and/or the group as a whole. It is an interpersonal and interactive process that contributes to the development of the ability to work with others. As Tayem et al. (2015) state, peer-feedback increases respect for other group members, the desire to share information, and trust for others. Furthermore, peer-feedback improves interpersonal and communication skills, along with various teamwork-related competencies, such as listening, debating, sharing ideas, negotiating, understanding different perspectives, cultivating tolerance, developing patience, fostering collaboration, managing conflicts, building trust, delegating responsibilities, and creating an inclusive and supportive environment that encourages individuals to express their opinions freely (Schmulian & Coetzee, 2019).

Thus far, several studies have analyzed the impact of the various designs of the peer-feedback process on student performance and their perception of learning. Although results may vary in some cases, most studies agree that peer-feedback processes should provide opportunities for both in-person interactions and a mixed delivery channel to complement written comments with oral feedback (Liu et al., 2021; Zaccaron & Xhafai, 2020). Similarly, research suggests that peer-feedback processes conducted within a group setting yield greater improvements than those occurring between only two individuals (Huisman et al., 2019) -some studies, however, do not find significant differences based on the number of participants involved in the feedback process (Kusumaningrum et al., 2019). Likewise, the roles that the students adopt influence the perception of learning. Studies, such as that of Ion et al. (2019), conclude that, according to students, giving feedback is more advantageous for their learning than solely receiving it.

Although differences have been observed in student learning based on the feedback process design, no study explicitly analyzes how the attributes of peer-feedback experiences impact the perception of skill development—particularly in areas such as teamwork.

Objective and research hypotheses

This paper aims to explore students' perceptions of how peer-feedback contributes to the advancement of teamwork skills and to ascertain the extent to which the conditions under which feedback is given and received affect these perceptions. Specifically, we intend to investigate the following research hypotheses:

H1. Students acknowledge the impact of peer-feedback on learning and the development of teamwork skills, regardless of whether they are giving or receiving feedback.

H2. Students who engage in face-to-face feedback in a mixed modality and with consensus among group members perceive a greater development of teamwork skills.

H3. Students believe they develop greater teamwork skills by giving feedback rather than receiving it.

Method

Materials

In order to address the hypotheses mentioned above, we used the EAIF Questionnaire (in English, Assessment strategies between peers and feedback) (Sánchez-Martí et al., 2019) to assess the impact of the peer-feedback experience on the development of students' teamwork skills. This questionnaire was selected because it provides insights into students' perspectives regarding the impact of peer-feedback on skill development and students' learning.

In their globality, the questionnaire comprises 87 items that assess the perception of learning and competency development: 42 related to giving feedback, 42 related to receiving feedback, and 3 aimed at capturing the participants' general opinion of the feedback experience. The items are rated on a 7-point Likert-type scale, wherein 1 represents the lowest rating (totally disagree), and 7 denotes the highest rating (totally agree). Additionally, the questionnaire has incorporated sociodemographic inquiries, along with the characterization and design aspects of the feedback experience (including dedication hours, prior experience, training, type of feedback, and the level of consensus among team members). The assessment section encompasses both positive and negative aspects of the feedback experience. The configuration of the EAIF Questionnaire allows for analysis of cognitive and metacognitive development, interpersonal and interpersonal aspects, and competencies, intending to capture the complex nature of learning (AUTHOR). The questionnaire's reliability analysis yielded a Cronbach's alpha coefficient of 0.987, confirming its suitability for the intended purpose.

This study focused on analyzing the seven items related to teamwork skills in relation to both giving and receiving feedback, as well as the three items pertaining to the general opinion of the feedback experience. Moreover, it identified the variables associated with the design of the feedback experience that potentially influence the perception. The selected variables include the type of feedback (face-to-face and mixed versus non-face-to-face and written) and the level of

consensus among team members when giving and integrating feedback (with consensus versus without consensus).

Description of the experience

The study was conducted within the framework of a mandatory subject in the second year of the Pedagogy and Social Education degrees and involved two separate class groups with students of each degree: 59 students from Pedagogy (ID1) and 68 students from Social Education (ID2). The subject is taught annually and focuses on organizational and group-related topics, with an emphasis on developing teamwork skills as a learning objective. For the study, the students engaged in group work throughout the academic year, forming teams of four or five individuals randomly assigned by the teaching staff. Students were required to create a two-hour learning facilitation proposal for a seminar session focused on a specific topic (such as organizational structures, communication, leadership, and staff development), with the audience being the rest of their classmates. They had to compose a project detailing the design of the learning facilitation and the role assigned to each group member. The teachers assessed the written design proposal, the execution of the seminar session, and the group's ability to incorporate the feedback received.

Regarding the peer-feedback activity, both class groups participated in an initial orientation session on the appropriate methods for giving and integrating received feedback. During this session, the evaluation criteria set by the teaching staff for assessing the written work and the facilitation session were also discussed. The teachers randomly assigned the groups that had to provide feedback, avoiding situations wherein two groups would give and receive feedback from each other. The process of giving and receiving feedback was not anonymous, as the groups knew to whom they would provide feedback and from whom they received it. The conditions under which the peer-feedback activity was developed varied between the class groups (Table 1).

Table 1. Characteristics of the course design and peer-feedback experience of each class group

		Class group 1 (ID1)	Class group 2 (ID2)
Subject		Annual (12 ECTS-credits)	
Task		Annual group work (4–5 members, randomly selected) Facilitation design (written work) + Seminar facilitation session (2 hours)	
Number of students involved		59 students	68 students
Team establishment		Random, by teachers	
Training and support on the feedback process		One-hour training session; support provided during the process	One-hour training session
Feedback on		Facilitation session	Written work and facilitation session
Feedback weighting in the final grade		Weighting in the final grade of group work (20%)	Qualitative assessment
Feedback loops		No loop: reasoned reflection on the changes to introduce based on the feedback received (new document)	Single loop: integration of the feedback received into the written work
Feedback	Type	Mixed (oral and written)	Written
	Contact	Face-to-face	Non-face-to-face (remote)
	Location	In the classroom	Outside the classroom
	Directionality	Unidirectional	

In ID1, the students received feedback in the seminar facilitation session. The feedback was provided orally at the end of the seminar facilitation and, later, in writing, based on a rubric provided by the teacher that guided students on providing concrete and constructive feedback related to specific goals. Once all the facilitation sessions were completed, a class session was allocated for the group to seek clarifications by exchanging observations, assessments, and improvement guidelines on the facilitation proposals. Upon receiving the feedback, the group had a week to prepare a written document in response to the colleagues' comments and observations,

outlining the modifications they would make to the written work and seminar facilitation, the aspects they would maintain, and even the peer opinion. The document—along with the written work—was submitted for evaluation. The teacher assessed the feedback document provided by the sending group, which influenced its final grade, and the response document addressing the feedback comments, which influenced the receiving group's final grade.

ID2 students received only written feedback. Each group sent their work to another group a week before the facilitation session. The group that issued the feedback had to read the written proposal and attend the seminar. Subsequently, the group had to provide concrete and constructive feedback on the written document based on the evaluation criteria established by the teacher and return the document to the classmates one week after the facilitation seminar had occurred. After receiving the feedback, the groups had one more week to incorporate the feedback into the written work before submitting the final version for evaluation. In the final project grade, the teacher considered the group's capacity to integrate the feedback received from the peers.

At the end of the peer-feedback experience and before receiving the final grade, students from both groups were provided with a link to the EAIF Questionnaire through the university virtual platform. Participation in this process was voluntary. The students were previously informed regarding the purpose of data collection, which was conducted anonymously to avoid possible identification of the participants.

Data analysis

Univariate and bivariate statistical analyses were conducted using the IBM Statistical Package for the Social Sciences (SPSS v. 26.0.0.1). For the descriptive analysis, means, standard deviations, and percentages were examined. Considering the sample characteristics and variables, the Wilcoxon T test was employed to analyze the differences in means between giving and receiving feedback. The Mann-Whitney U test was used to compare the differences in the peer-feedback experience's instructional designs, specifically regarding the type of feedback and degree of consensus.

Sample

Overall, 127 students participated in the peer-feedback experience. Among them, 83 students completed the questionnaire (participation rate of 65.35%). The respondents were aged between 18 and 34, with a mean age of 22 (M = 21.80; SD = 2.94), and 83.1% of them were female participants and 16.9% were male. There were no participants from the "other" gender category.

Of the total sample, 73.5% of the participants participated in the experience wherein feedback was given and received in person in a mixed mode (both oral and written; ID1). The remaining 26.5% of the participants were involved in the experience wherein feedback was given and received remotely and in written form (ID2). Regarding the degree of consensus among the team members during the process of giving/receiving feedback, irrespective of the feedback activity's instructional design, 48.2% of the students indicated that the group members agreed on the feedback provided. Conversely, 28.9% indicated that the group members agreed with the feedback received before implementing changes to the proposal.

In both class groups, the group work required a commitment of eight–nine hours outside the classroom (M = 8.47; SD = 9.34). The students reported spending an average of four hours (M = 4.36; SD = 2.55) in the process of giving, receiving, reflecting on, and incorporating feedback. Some students indicated spending one hour, whereas others reported investing up to 12 hours in the feedback experience. Overall, 91.6% of the students reported having previously participated in similar peer-feedback activities, stating that the experience helped them carry out the feedback activity for the subject (M = 4.88; SD = 1.71).

Results

In this section, we present the study findings organized into two sub-themes. The first block analyzes the general perception of how feedback contributes to the development of learning and teamwork skills. The second block analyzes how the conditions under which feedback is provided and received impact such perceptions.

Perception of the contribution of feedback to the learning and development of teamwork skills

Students' responses to the items related to the general opinion of the feedback experience and development of teamwork skills are analyzed to investigate H1. First, students think that both giving (identified with G) and receiving feedback (identified with R) are useful learning strategies (M_G = 5.20; SD_G = 1.43 / M_R = 5.06; SD_R = 1.66) and essential for their learning (M_G = 5.66; SD_G = 1.42 / M_R = 5.34; SD_R = 1.58). Likewise, participants believe giving and receiving feedback are useful strategies for enhancing their group's tasks (M_G = 4.99; SD_G = 1.61 / M_R = 5.09; SD_R = 1.61). Overall, participants consider giving and receiving feedback necessary for learning (M = 5.69; SD = 1.51). However, they generally believe that they learn more by giving than by receiving feedback (M = 4.11; SD = 1.39).

Second, when analyzing the students' perceptions of the development of teamwork skills (Table 2), the findings indicate that the average ratings are significantly higher than four points. The students agree that both giving and receiving feedback have globally improved their competence to work in a team (M_G = 4.91; SD_G = 1.36 / M_R = 4.67; SD_R = 1.56), as well as the variables associated with communication and assertiveness, which have been positively correlated with an increase in trust, acceptance among group members, and a stronger sense of belonging to the team. All the scores are above 4.42 points on a 7-point scale. The highest-rated variables—both for giving and receiving feedback—are "Improving communication with group members" (M_G = 4.87; SD_G = 1.32 / M_R = 4.77; SD_R = 1.61) and "It has helped me to be more assertive" (M_G = 4.86; SD_G = 1.57 / M_R = 4.75; SD_R = 1.51).

Table 2. Comparison of the means of teamwork variables in the case of giving and receiving feedback

	Give		Receive			
Variable	*M*	*SD*	*M*	*SD*	*Z*	*P*
Improve my teamwork skills	4.91	1.36	4.67	1.56	-1.85	.064
Improve my communication skills	4.80	1.37	4.37	1.61	-2.58	.010*
Improve communication with group members	4.87	1.32	4.77	1.61	-0.33	.744
Increase my confidence in others	4.47	1.44	4.42	1.46	-0.33	.743
Improve my acceptance by others	4.42	1.59	4.44	1.58	-0.30	.763
It has made me feel part of the group	4.47	1.58	4.27	1.54	-1.36	.208
It has helped me be more assertive	4.86	1.57	4.75	1.51	-0.08	.499

Likert scale (1–7)
*$p < 0.05$

In all the variables, the results indicate differences in means between giving and receiving feedback, with higher scores observed for giving feedback compared to receiving feedback in nearly all cases. However, in the mean comparison test between both situations, a significant difference is observed only for the communicative ability variable (Z = -2.58, $p < .05$). This indicates that students perceive a more significant improvement in their communicative ability when giving feedback (M_G = 4.80; SD_G = 1.37) than when receiving feedback (M_R = 4.37; SD_R = 1.61).

Based on the high means and lack of significant differences between the process of giving and receiving feedback, H1— "Students acknowledge the impact of peer-feedback on learning and the development of teamwork skills, regardless of whether they are giving or receiving feedback."— is accepted.

Conditions for giving/receiving feedback in the perception of the development of teamwork skills

To analyze the effect of the conditions under which the peer-feedback activity has been developed on teamwork skills, the Mann-Whitney U test was employed to compare the cases of giving and receiving feedback (H2). Additionally, the perception between giving and receiving feedback was compared (H3), the results of which are presented in Table 3.

The results based on the type of feedback (mixed versus written) and interaction between participants (face-to-face versus not face-to-face or remote) indicate that the means are higher for ID1, in which the feedback was of a mixed type and the interaction between participants was in person, with an average score of 5.36. For ID2, the average score is 4.34. In the case of giving feedback, significant differences were observed in five of the seven variables analyzed, whereas, in the case of receiving feedback, significant differences were obtained for all the variables analyzed, including global teamwork competence:

- Improve my teamwork skills (Z_R = -3.108, p > 0.05)
- Improve my communication skills (Z_G = -2.936, p > 0.05; Z_R = -2.453, p > 0.05)
- Improve my communication with group members (Z_R = -2.406, p > 0.05)
- Increase my confidence in others (Z_G = -2.071, p > 0.05; Z_R = -2.315, p > 0.05)
- Improve my acceptance by others (Z_G = -2.868, p > 0.05; Z_R = -3.076, p > 0.05)
- It has made me feel part of the group (Z_G = -2.549, p > 0.05; Z_R = -2.415, p > 0.05)
- It has helped me be more assertive (Z_G = -3.213, p > 0.05; Z_R = -4.530, p > 0.05)

For the variable “degree of consensus among the group members when giving and incorporating the feedback received,” the mean scores are higher in six variables when the feedback provided has not been agreed upon among the members, except for “Improvement of teamwork skills.” In this case, the score is slightly higher when the students agree on the feedback issued (M = 4.98; SD = 1.405) than when they do not agree. For all the variables, the difference between the means is not statistically significant between the case of giving feedback agreed upon in the group or without the consensus of all the group members.

When receiving feedback, and for all the variables, the score is higher when the members agree upon the feedback received before integrating it into the group task. Notably, the variable “Improved my communication with group members” received the highest score (M = 5.27; SD = 1.49). Nevertheless, as in the previous case, the difference between the means is not significant for any of the variables.

Based on the conditions under which the peer-feedback activity has occurred, we found that only when consensus exists among the group members, is the average score of the variables higher in the case of receiving than that of giving feedback.

When considering the feedback condition “Face-to-face and mixed (oral and written)” (ID1), it is observed that a tendency exists to achieve higher scores in the variables related to the case of giving feedback. However, it is important to note that in both cases (giving and receiving), the average scores are high, with 5.39 for giving feedback and 5.33 for receiving feedback on a 7-point rating scale. Overall, the variable “Improve my teamwork skills” presents a higher score in the case of receiving feedback (M_R = 5.55; SD_R = 0.91) than that of giving feedback (M_G = 5.45; SD_G = 1.10), though the difference between means is not statistically significant. For the ID1 case, the variables with the highest scores in the case of giving feedback are communicative capacity (M = 5.50; SD = 1.30), acceptance (M = 5.27; SD = 1.32), and sense of belonging (M = 5.27; SD = 1.03). In the case of receiving feedback, the highest scores are assertiveness (M = 5.91; SD = 0.61) and communication with group members (M = 5.50; SD = 1.06). For all the variables, no significant mean difference exists between giving and receiving feedback.

In the “Remote and written” feedback case (ID2), there is a clear tendency for students to score higher on the variables when giving feedback than receiving feedback. The highest scores in both cases are “Improve my teamwork skills” (M_G = 4.78; SD_G = 1.43 / M_R = 4.33; SD_R = 1.63) and “Improve my communication with group members” (M_G = 4.75; SD_G = 1.37 / M_R = 4.49; SD_R = 1.70). However, significant differences are only observed in two of the seven variables—namely, teamwork (Z = -2.307, p < 0.05) and communication (Z = -2.307, p < 0.05)—indicating that by giving feedback, students perceive a greater development in these two skills.

In the case wherein consensus exists among the group members, the students tend to score higher on all the variables in the case of receiving feedback, except for the general variable “Improve my teamwork skills,” which presents a better score in the case of giving feedback (M_G = 4.98; SD_G = 1.41 / M_R = 4.91; SD_R = 1.51), though the difference between the means is not statistically significant. For the case under which no consensus exists among the group members, students tend to score better on the variables in the case of giving feedback than in the case of receiving it. However, the difference between means is not statistically significant for any of them. The variable “Improve my communication with group members” (M_G = 4.98; SD_G = 1.33) receives

the highest score in the case of giving feedback, whereas the variable “It has helped me to be more assertive” has the highest score in the case of receiving feedback (M_R = 4.67; SD_R = 1.48).

Table 3. Comparison of the means of the teamwork variables depending on the conditions under which the feedback activity was conducted

			Give feedback							Receive feedback						
Variable			TW	C	CwG	Cf	Ac	SoB	As	TW	C	CwG	Cf	Ac	SoB	As
Contact and type of feedback	Face-to-face and mixed (ID1)	*M* (*SD*)	5.45 (1.10)	5.50 (1.30)	5.36 (1.18)	5.05 (1.17)	5.27 (1.32)	5.27 (1.03)	5.82 (1.01)	5.55 (0.91)	5.09 (1.48)	5.50 (1.06)	5.05 (0.99)	5.32 (1.17)	4.91 (1.27)	5.91 (0.61)
	Non-face-to-face (Remote) and written (ID2)	*M* (*SD*)	4.78 (1.43)	4.57 (1.32)	4.75 (1.37)	4.27 (1.47)	4.12 (1.57)	4.25 (1.69)	4.55 (1.63)	4.33 (1.63)	4.09 (1.58)	4.49 (1.70)	4.18 (1.55)	4.11 (1.59)	4.00 (1.57)	4.30 (1.51)
		Sig.	.051	.003*	.072	.038*	.004*	.011*	.001*	.002*	.014*	.016*	.021*	.002*	.016*	.000*
Consensus	Yes	*M* (*SD*)	4.98 (1.41)	4.78 (1.39)	4.85 (1.37)	4.38 (1.35)	4.23 (1.61)	4.41 (1.63)	4.88 (1.70)	4.91 (1.51)	4.82 (1.65)	5.27 (1.49)	4.55 (1.37)	4.77 (1.57)	4.64 (1.56)	4.95 (1.59)
	No	*M* (*SD*)	4.95 (1.36)	4.86 (1.34)	4.98 (1.33)	4.57 (1.52)	4.62 (1.56)	4.64 (1.58)	4.90 (1.49)	4.58 (1.58)	4.19 (1.58)	4.58 (1.63)	4.37 (1.51)	4.32 (1.57)	4.11 (1.52)	4.67 (1.48)
		Sig.	.996	.747	.620	.505	.226	.497	.959	.362	.118	.073	.569	.199	.145	.312

TW = Teamwork; C = Communication; CwG = Communication with group members; Cf = Confidence; Ac = Acceptance; SoB = Sense of belonging; As = Assertiveness
Likert scale (1–7)
*$p \leq 0.05$

Based on these findings, we reject H2— “Students who engage in face-to-face feedback in a mixed modality and with consensus among group members perceive a greater development of teamwork skills”. The scores obtained clearly indicate that students perceive that participating in peer-feedback experiences in a face-to-face-mixed modality contributes to a greater extent to the development of teamwork skills, both when giving and receiving feedback. However, the presence or absence of consensus among group members when giving or receiving feedback does not appear to exert a clear influence on the development of teamwork skills. Conversely, we accept H3— “Students believe they develop greater teamwork skills by giving feedback rather than receiving it.” The study’s findings demonstrate the tendency for students to perceive that they develop more teamwork skills by giving—than by receiving—feedback.

Discussion and conclusion

In our study, we started with the premise that peer-feedback is an effective learning strategy capable of enhancing academic performance and student satisfaction. Additionally, when conducted in a group, it can contribute to the development of teamwork skills. To evaluate its benefits, we administered a survey to capture the students’ perception of how peer-feedback contributes to their learning and the development of teamwork skills. We focused on identifying whether the type of feedback (face-to-face and mixed vs non-face-to-face and written) and degree of consensus among group members when providing and incorporating received feedback influence this perception.

The study results indicate that students perceived participating in peer-feedback processes as beneficial for teamwork skills, particularly in face-to-face and mixed modalities. Students agree that both giving and receiving feedback contribute to the improvement of teamwork skills, particularly in the areas of communication and assertiveness. Likewise, they perceived an improvement in the teamwork experience, which is reflected in an increase in trust, acceptance, and a sense of belonging to the group. Through peer-feedback group activities, students can enrich their learning experiences (Minosky et al., 2022) and cultivate essential interpersonal skills (Schmulian & Coetzee, 2019). In this context, our data align with the socio-cognitive approach, emphasizing the pivotal role of interpersonal relationships as catalysts for enhanced learning in the peer-feedback process. Consequently, we contribute valuable insights regarding the significance of factors such as active participation, group commitment, trust in classmates, and shared knowledge in shaping and enriching the learning processes, aligning with the work of Panadero (2017).

In the case of the design of the feedback experience, we conclude that these influence the perception of the extent of learning and development of teamwork experience, as previous studies have already demonstrated (Armengol et al., 2022). Thus, mixed-type feedback, wherein written and oral comments are combined, indicates a greater potential for learning and also for the development of teamwork skills, as it compels feedback providers to engage with the recipients, thus presenting an intriguing challenge for students who struggle with delivering criticism (McCarthy, 2017).

Regarding reaching a consensus, our analysis does not definitively establish that consensus among group members during the feedback exchange distinctly influences the perception of teamwork skill development. Nevertheless, we have discerned that when students receive feedback rather than providing it, they perceive a more pronounced impact on their teamwork skills. This observation may be attributed to the collaborative nature of the task, where reaching a consensus about which aspects of the feedback should be incorporated and how to do so effectively, necessitates the exercise of essential teamwork skills.

It is also essential to underscore that reaching a consensus regarding the feedback provided and the subsequent effective integration of received feedback to enhance group tasks compels students to draw upon their communication skills and assertiveness. These abilities are integral components of teamwork skills, as corroborated by the findings of Lovato and Shaw (2021) and Romero-Díaz et al. (2022), who have similarly highlighted the pivotal role of these skills in the context of effective teamwork. Furthermore, a noteworthy outcome of our investigation is that the absence of anonymity in both feedback experiences heightens students' sense of responsibility, corroborating the findings of Schillings et al. (2020).

In the case of the group role (giving or receiving feedback), our findings are consistent with those of Ion et al. (2019) and McCarthy (2017). That is, when students make an effort to provide feedback, they perceive a significant improvement in their teamwork skills and experience an increase in trust, acceptance, and a sense of belonging among group members as they actively engage their communication skills and assertiveness when working together to reach an agreement on comments, assessments, and proposals for improvement. This is because improved individual communication skills are closely linked to more effective teamwork (O'Neil et al., 1999).

Consequently, our findings lead us to conclude that peer-feedback is a fitting practice to cultivate teamwork skills within the university setting. This is primarily due to its capacity to facilitate meaningful dialogues, thereby fortifying the social and relational dimensions, as emphasized by Carless and Boud (2018).

The outcomes of our research furnish valuable insights that can serve as guiding principles for teachers when designing peer-feedback experiences that are conducive to the enhanced development of teamwork skills. Furthermore, these insights extend to the promotion of associated skills, such as effective communication, assertiveness, and empathy, collectively bolstering the capacity of students to excel in collaborative academic environments.

To this end, teachers should consider various factors and address specific issues. First, it is recommended to design face-to-face and mixed peer-feedback experiences that incorporate both written and oral feedback such that the team giving the feedback can express and argue their comments, whereas the receiving team can actively engage by asking questions and seeking clarifications. Second, planning the feedback activity such that sufficient time is allocated for the teams to reach a consensus on the feedback to provide and assess how to integrate the feedback. Third, consider the quality of the feedback given in the evaluation and assess to what extent the group integrates and improves the task based on the feedback received. Fourth, ensuring students' proficiency in peer-feedback processes is crucial, as highlighted by several previous studies (e.g., Lowel & Ashby, 2018; Planas-Lladó et al., 2020). Students must know how to provide concrete and constructive feedback based on assessment criteria. Five, designing processes whereby students fully engage and focus on the development of group activities can increase the awareness of the teamwork skills employed and their evolution throughout the project, as opined by Daniel and Jordan (2017).

The integration of peer-feedback activities with proactive monitoring of the group process can further enhance the development of teamwork skills among students. However, it is imperative to consider pedagogical decisions regarding the design of peer-feedback experiences carefully. This entails a comprehensive assessment of research evidence, as well as a thoughtful evaluation of the specific subject matter and class characteristics. Crafting the optimal context to achieve the highest impact is a responsibility that squarely rests on the teacher's professionalism.

Despite the limitations of the sample configuration, this study yields data in an area that has not been previously studied. Peer-feedback practices are uncommon in university settings, and this study strengthens the notion that they are valuable for learning and skill development, particularly in areas such as teamwork. Future research should focus on larger sample sizes to reinforce the conclusions. Additionally, incorporating qualitative data to provide explanations for the obtained results should also be considered. Another line of research would be replicating the peer-feedback experience in subjects wherein teamwork competence is considered a transversal skill rather than a core competency to be developed.

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Supplementary Material: Please find the complete statistical analysis in Figshare: https://figshare.com/s/e966d72e7ca0ca9be0c8 Contact the authors for further details about the assignment instructions and peer-feedback procedure.

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