Collaborative peer-feedback practices in hybrid learning environments

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Abstract
The article describes a technology-mediated collaborative peer-feedback experience. 125 students took part into the activity during the delivery of a 3-months teaching in "Methodology of Action Research", within a 3-year Degree Course in Psychological, Social and Occupational Sciences. The activity was based on a 4-phases cycle of collaborative output production, structured peer-feedback, collaborative output improvement, individual reflection. The aim of the exploratory case-study here presented is to observe if and how the peer-feedback activity supported the development of collaborative, meta-cognitive and digital skills, other than knowledge acquisition. To answer our research questions, we used a mixed system, able to provide both objective data with respect to the activity carried out and the skills put in place, and subjective data related to the students' personal experience and the perceived impact on their learning. Results show a good appropriation of metacognitive skills and offer numerous hints on the design aspects which have been found to be effective in supporting students' learning.
Key words: collaborative peer-feedback; assessment as learning; trialogical learning and assessment approach; hybrid learning; higher education.

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1. Introduction

Facilitating effective active learning can be complex because academic achievement should involve not only knowledge acquisition, but also meaningful and lasting learning in which learners construct new knowledge and actively participate in learning episodes Sansone, Cesareni, Bortolotti and McLay, 2021) with the aim to sustain learners' development of knowledge-work skills (Ilomäki, Lakkala and Kosonen, 2013); that is, individual capabilities (e.g., metacognition, creativity, ITC skills) that are linked both to the community (e.g., collaboration, communication, team-work) and to epistemic knowledge and skills (e.g., critical thinking, information management, networking). The socio-constructivist approach combines technology and educational contexts to promote collaborative, constructive, and meaningful learning through students' active role (Jonassen, 2006; Scardamalia and Bereiter, 2006), both in face-to-face as well as in online or mixed educational settings.

Enhancing Higher Education implies a different conception of assessment, with students directly involved as responsible actors and which is able able to consider the combination of the different dimensions that now come into play: processes and products, individual and group, mediation tools and actors. The article describes a university experience of hybrid teaching and learning in which, through active methodologies supported by a diversified and flexible management of digital tools and environments, students mixed remote and face-to-face participation, being at the center of the learning process, thanks to an accurate macro and micro-planning of the activities proposed to students (Sansone, 2020), inspired by the Trialogical Learning & Assessment Approach (TL&AA; Sansone and Grion, 2022).

2. The frameworks inspiring the learning experience

The exceptional historical period we have experienced since 2020 has made evident the need to rethink university teaching through a thoughtful integration of in-presence and online activities, in which to enhance participatory learning practices able to promote students' agency, responsibility, and a broader long-life learner attitude (Bereiter and Sansone, 2022). Digital technologies flexibly mediate the development of these processes, leaving to the teacher the configuration of technological settings. Technology, however, can only be fruitfully integrated into educational contexts through a thoughtful transformation of practices and a consequent re-elaboration of knowledge (Ritella and Sansone, 2020). To this aim, the Trialogical Learning Approach

(TLA; Paavola and Hakkarainen, 2005) provides solid and well-based guidelines to plan meaningful learning activities, by the means of the so-called Design Principles (DPs). DPs are six theoretically oriented "hints" that guide the planning of the teaching and learning activities, leading to the orchestration of an articulated experience aimed at the shared production of meaningful objects, useful for the community, through a consistent technological mediation. This kind of educational setting obviously calls for a shift in the evaluation paradigm, on one hand being able to consider the complexity of the learning experience, on the other hand putting the student at the center of the process. An appropriate assessment approach, in fact, can have a much more positive effect on learning if it is deeply aligned with and integrated into the teaching/learning process (Biggs and Tang, 2011), and it fully engages and involves students (Sambell, Brown and Race, 2019). Re-reading numerous TLA university teaching practices through these lens, Sansone and Grion (2022) have highlighted just how each of the 6 DPs of the original model implicitly integrate and combine both learning as well as assessment processes, thus theorizing a unified model, the Trialogical Learning and Assessment Approach (TL&AA) (Tab. 1).

Tab. 1 - The Design Principles of TL&AA (Sansone and Grion, 2022)

TLA Design Principle	Sustainable Assessment features
1. Organising activities around shared 'objects'	Shared definition, implementation, and evaluation of the learning product/object informing the overall didactic experience and representing the *"authentic task"* which embodies students' skills and knowledge.
2. Supporting interaction between personal and social levels and eliciting individual and collective agency	Individual and collaborative assessment and learning activities: "monitoring" group-roles, balanced evaluation, shared definition of assessment criteria.
3. Fostering long-term processes of knowledge advancement	Framing and re-framing knowledge through long-term processes of reciprocal feedback and revisions of the collaborative knowledge artifacts.
4. Emphasizing development through transformation and reflection between various forms of knowledge and practices	Offering many stimuli/comparators to promote self-feedback generation: digital portfolios, learning diaries, expert advice and peer discussions.
5. Cross fertilisation of various knowledge practices across communities and institutions	Introducing professional practices and/or tools to support hybridization of acquisition of different ways of operating and reasoning: exemplars and comparators as well as external experts and final users providing students with feedback and/or requests

6. Providing flexible tool mediation	From digital tools and environments sustaining evalutative process to the teacher ensuring the development of mature students' *assessment literacy*

As emerges from the synoptic table of TL&AA DPs, specific features of this model are: a) a strong focus on collaboration and critical thinking, b) a rightful mediation of digital technologies, and c) a widespread use of *in itinere* assessment practices and devices. Within a qualitative approach to evaluation, peer-assessment is conceived as a meta-reflective educational device, that could enhance critical skills. When going beyond a hollow attribution of scores, in fact, (providing and receiving) constructive feedbacks play as tools through which the learners reflect on their own learning process and output, while simultaneously build new knowledge through their own evaluative acts. Providing and receiving feedbacks, however, is not as simple as it could seem, mainly because there is no cultural habit in this sense, with the consequence of performing both actions with discomfort and/or ineffectiveness. To overcome these limitations, teachers should – on one hand – provide students with many structured opportunities to generate and receive feedback; on the other hand, peer-assessment practices should be supported by introducing a variety of resources, both material (e.g., exemplars, artifacts, videos) and dialogical (e.g., from peers and teachers) to maximize self-feedback generative learning (Serbati, Grion, Li, Doria, 2022), thanks to the continuous comparison between the learner's knowledge and a set of external *stimuli*. As another crucial requirement of a well-designed peer-feedback experience, teachers must foresee a final phase in which to solicit individual reflection on the activity just carried out, the way in which it was performed and the possible impact on one's own learning of knowledge and skills (Sansone, Bortolotti and Fabbri, 2021). Indeed, it is precisely in the moment of a subsequent reflection that a learner can appreciate the value of the experience (Dewey, 1961) and also recognize his/her attitude as long-life learner (Boud, 2000). To reach this aim, several diversified tools and procedures can be introduced (e.g., self-report questionnaires, learning diaries, peer discussions). Through these devices, reflective processes are supported in a double direction: towards the "outside", which is represented by the product that is being created, and/or towards the "inside", that is to say one's own learning path and participation in the class and group activities (Sansone and Grion, 2022).

Just as we do not carry a positive culture of providing and receiving feedback, neither we are innately able to collaborate. The possibilities of real collaborative learning reside in highly structured intra-group interactions which are strictly designated around well-defined scripts assigned to students and anchored to

specific pedagogical models, such as the role-taking (Dillenbourg and Hong, 2008; Ligorio and Sansone, 2009). Consistently with what is indicated by the trialogical approach, both in the original model and in the expanded one, collaborative peer-feedback practices can be enhanced and facilitated by using appropriate digital tools. Platforms, responders, virtual whiteboards, quiz systems, allow students to easily work in groups, without time and space constraints, mitigating character limits, negotiating solutions and choices, while learning a constructive and professional use of technology, and expanding their digital literacy.

This article describes a technology-mediated collaborative peer-feedback experience, having the general didactic goal of enhancing content learning and soliciting collaborative, meta-cognitive and digital skills.

3. The case-study

1.1 Contest

The context of this study is that of the "Methodology of Action Research" teaching, within the 3-year Degree Course in Psychological, Social and Occupational Sciences (University of Padua, IT; academic year 2021-2022). During the delivery period, the frontal teaching was accompanied by two activities, each lasting 3 weeks. Both the lessons and the activities have been held in a dual mode, by alternating face-to-face and online presence. The online lessons were held via Zoom, whereas the online activities were hosted in the LMS Moodle and supported by a set of diversified tools (Padlet, Google Docs and Modules, Jamboards, Mentimeter).

To support active learning and collaboration, the students participating to the activities (N = 125; avg age = 22; F = 87,18%, M = 12,82%) were divided into spontaneously formed groups (about 8 members) and covered specific roles (e.g., coordinator, observer, researcher) while carrying out the actions envisaged by the activities (brainstorming, in-depth thematic discussions, collaborative construction and presentation of outputs, peer-feedback). The performance of each activity was supported by specific assignments in which the teacher defined times, outputs, tools, and guidelines.

1.2 Objectives

The objective of the exploratory case-study is to observe if and how the peer-feedback activity performed by the students supported the development of collaborative, meta-cognitive and digital skills, other than knowledge acquisition.

Our Research Questions (RQs) were:

- RQ1: when students are called upon to collaboratively provide feedback to their colleagues, did they manage to produce effective and valuable suggestions and/or appreciation?
- RQ2: is the peer-feedback activity perceived as a learning device able to enhance skills and knowledge acquisition?

1.3 Methods

For the aims of this study, we focus on the peer-feedback session activated in the second activity, which was devoted to the collaborative analysis of scientific articles on the action research methodology. The activity was based on a 4-phases cycle (Fig.1):

1) Each group reads the scientific article assigned by the teacher with the aim to identify its main features, writing them down on a specific template. Each article is assigned to two "twin" groups.
2) The teacher assigns each group the analysis of the twin group's template. Guided by specific *stimuli*, students collaborate to offer feedback on the most appreciated aspects and related reasons, as well as suggestions for improvement based on their previous analysis.
3) Each group examines their peers' feedback, compares them with those of the teacher and revise the original template.
4) Everyone reflects on the experience, through a semi-structured self-report questionnaire.

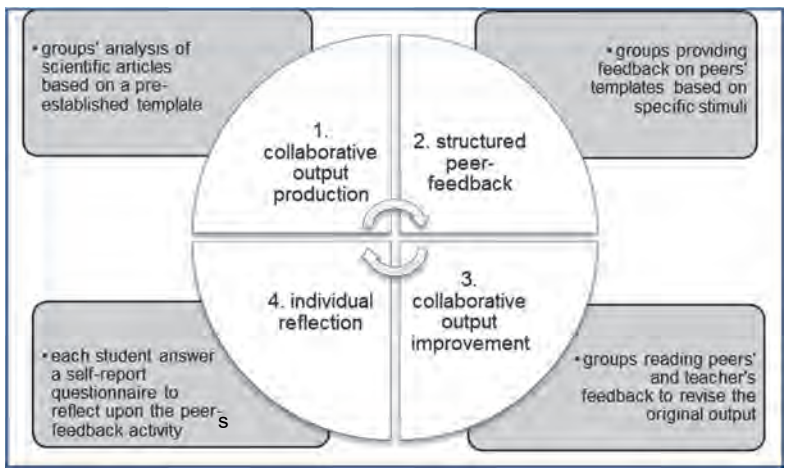

Fig. 1 - The activity cycle

To answer our research questions, we used a mixed system, able to offer us both objective data with respect to the activity carried out and the skills put in place, and subjective data related to the students' personal experience and the perceived impact on their learning. Specifically, the data corpus includes:

- 16 peer-feedback grids compiled during the activity (phase 2);
- 78 semi-structured self-report questionnaires compiled at the end of the activity (phase 4).

Considering the nature of the data and of the overall case-study, mainly qualitative analysis have been performed, based on content analysis systems specifically developed for the study. Two judges worked independently reaching an agreement measured by Cohen's Kappa index of 0.93 (RQ1) and 0.98 (RQ2).

4. Results and discussion

RQ1: when students are called upon to collaboratively provide feedback to their colleagues, did they manage to produce effective and valuable suggestions and/or appreciation?

The in-depth content analysis of the 16 peer-feedback grids led the researchers to the definition of a category system made-up of three categories and six subcategories able to reflect the nature of both the feedback that the students were asked to provide to their peers: appreciated aspects as well as suggestions for improvement.

The category system is given below together with examples and percentage frequencies traced for each category and sub-category (Tab. 2).

Tab. 2 - The peer-feedback grid category system and analysis

Category	**Subcategory**	**Percentage frequencies and examples "Appreciated aspects"**	**Percentage frequencies and examples "Suggestions for improvement"**
Narrative /content aspects	Consistency and clarity	F %: 11,63% *«We appreciated the structure of the responses, as each paragraph is linked to the previous and to the following one providing an almost cause-and-effect linearity».*	F %: 8,69% *«We noticed the frequent repetition of topics between the questions, which made reading the analysis less fluid».*

	Synthesis and analysis	F%: 32,56% *«Throughout the analysis the answers are [...] concise but at the same time elaborate and explanatory».*	F%: 34,78% *«We would advise not to summarize too much so as not to affect the completeness of some answers such as, for example, the answers to points A, D and F»*
	Theoretical anchoring	F%:16,28% *«We appreciated the strong connection with the theoretical contents we studied from the textbook»*	F%:15,22% *«We recommend verifying the correctness of the answer to question K»*
Total "Narrative /content aspects"		F%: 60,46	F%: 58,69
Formal aspects	Form and lexicon	F%: 16,28% *«The use of a technical language combined with terms that are easy to understand»*	F%:15,22% *«We could suggest to our colleagues to use the bullet point list when the question makes it necessary»*
Total "Formal aspects"		F%: 16,28%	F%:15,22%
Metacognitive reflection	Self-feedback	F%: 4,65% *«The answers provided are in line with those of our group and were therefore useful as a benchmark for our work»*	F%: 6,52% *«In some cases, the answers were not incisive compared to the analysis we carried out, but focus more on the theoretical and general aspects of the question»*
	Peers' work strategies	F%: 18,60% *«Group 9 had the excellent intuition to define the catalytic validity of the research»*	F%:17,39% *«We suggest to put greater attention in the interpretation of some questions»*
Total "Metacognitive reflection"		F%: 23,25%	F%: 23,91%

The richness of the category system represents itself a first answer to our question about the effectiveness of the students' collaborative feedback. Students, in fact, did not limit themselves to consider superficial – and "easy" - aspects like the formal ones, instead they were able to go deep and analyze logic and structure of the overall output realized from the "twin" group, especially taking into account the theoretical foundations of it. Moreover, they used the peer-feedback session as a chance to reflect upon their own work, making it explicit and tangible their generation of inner feedback (Nicol, 2021).

As for the students' ability to analytically observe their colleagues' template, we registered a total of 43 appreciations (M = 2,7 per group) and of

46 suggestions (M = 2,9 per group). Interesting to note, both the appreciations (60,4%) and the suggestions (58,7%) focus mainly on "narrative-content aspects" (e.g., appreciation: «The analysis of the article is very punctual and articulated, complete with details that can be inferred from the research, such as the phases in which the event took place and the tools and methodologies used»; suggestion: «we suggest anchoring first the answers to the contents of the article and then moving on to theoretical reflections»), followed – again in both cases – by "metacognitive reflection" (23,2% and 23,9%; e.g. appreciation: «Although the issue of validity was not directly dealt with in the article, group 11 managed to gather, between the lines, sufficient elements for the completeness of the answer»; suggestion: «Despite the good analysis of the article, we believe that in several points a critical reflection was not carried out with respect to theories, orientations and peculiar characteristics of an action research»*)* and, only to a residual extent, by the "formal aspects" (16,3% and 17,4%; e.g. appreciation: «The analysis reveals a particular attention to the form and to the vocabulary used in the answers»; suggestion: «the answers are very impersonal and too schematic»).

Moving from the macros to the sub-categories (Fig.2), we find confirmation of how the students carried out the activity by putting good analytical and critical skills into play, as shown by the two most frequent sub-categories: synthesis and analysis (32,56%), and peers' work strategy (18,60%).

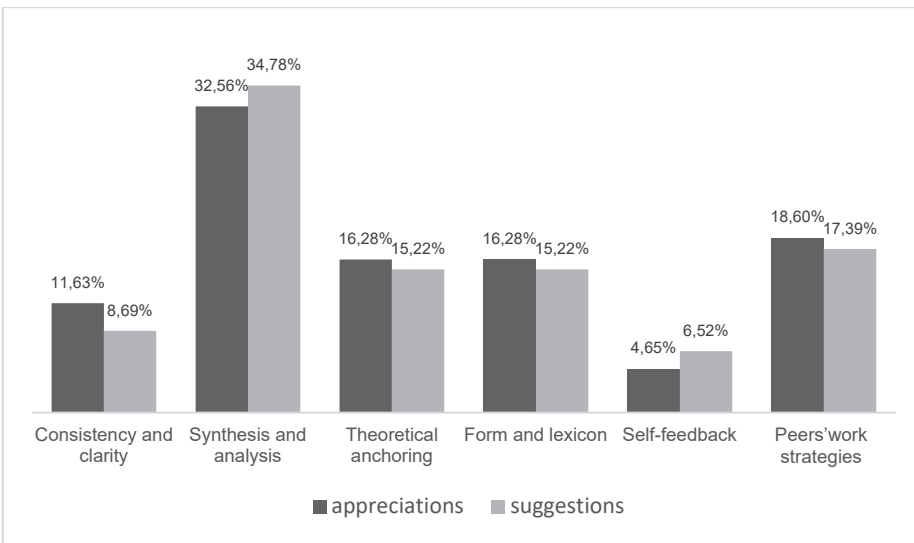

Fig. 2 - The focus of students' feedback as it appears from the subcategories' percentage frequencies

RQ2: is the peer-feedback activity perceived as a learning device able to enhance skills and knowledge acquisition?

The in-depth content analysis of the self-report questionnaire investigating students' perceptions led the researchers to the definition of a category system made-up of three categories and 10 subcategories. The system is given below together with examples and percentage frequencies traced for each category and sub-category (Tab. 3).

Tab. 3 - The self-questionnaire category system and analysis

Category	**Subcategory And percentage frequencies**	**Example**
Skills acquisition or improvement (SAI)	Management F%: 3,54%	*«Having participated in this work has helped me to better understand how to organize group work, respecting the timing negotiated by the members»*
	Cognitive and metacognitive F%: 30,09%	*«It allowed me to understand many aspects of the work we did and to open up to new way of observing a problem»*
	Assessment and self-assessment F%: 15,04%	*«I believe that having provided feedback on our "twin" group's template was useful to understand and evaluate how we ourselves conducted the analysis compared to them, pointing out strengths and weaknesses»*
	Collaborative % Fr: 7,08	*"Thanks to the activities carried out, I feel that I have gained more confidence in collaborative work»*
	Digital % Fr: 0,89	*«I've learnt how to use different platforms»*
Total SAI	% Fr: 56,64	
Knowledge acquisition or consolidation (KAC)	Understanding of theoretical contents F%: 10,62%	*«It was a very useful job for understanding the subject and it also made me grow personally»*
	Knowledge consolidation F%: 6,19%	*«The teachers' feedback was fundamental for understanding the correctness of the answers given»*

Total KAC	F%: 16,81%	
Nonspecific	Utility	*«Utility»*
	F%: 11,50%	
	Interest	*«It was interesting to receive an evaluation also from colleagues at my same level»*
	F%: 15,04%	
Total Nonspecific	F%: 26,55%	

As shown in the table, when asked to reflect on the impact of the peer-feedback activity on their learning, the students spontaneously identified a variety of effects, going from skills to knowledge acquisition and consolidation. The frequency counting shows a total of 113 impacts retrieved from the students (M = 2,3 for student). Over a half of these impacts (56,6%) belong to the category "skills acquisition or consolidation" (e.g.: «The activity of mutual feedback was very useful to me and my group to better understand aspects that we had not grasped well, and to see the different points of view that people may have on the analyzed article»; «The evaluation was agreed with the other members of the group, which therefore unified the views of all of us»), followed – at distance – by the "knowledge acquisition or consolidation" (16,81%) (e.g., «The activity was useful for understanding the various fields of action research and the many tools used»).

Overall, of all the sub-categories identified, metacognitive competences (30,09%) is the area that students believe has gained the most from this experience (Fig. 3):

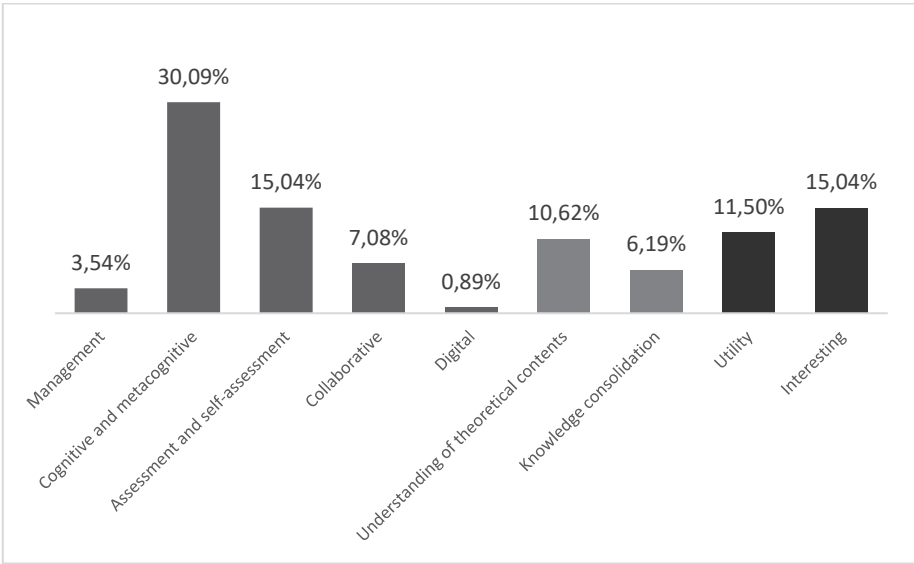

Fig. 3 - The perceived impact on learning as it appears from the subcategories' percentage frequencies

By analyzing the students' answers that the researchers coded as cognitive and metacognitive, we can grasp a comprehensive picture of how and what they consider as most valuable of the entire feedback experience. They value the peer-feedback activity most since «receiving feedback from colleagues is significant as it allows us to obtain a different point of view from someone who is approaching this type of work for the first time with a very basic level of preparation». Moreover, students have been able to consider together and also distinguish the different impact of providing and receiving feedback: «Giving feedback to our classmates was useful for developing critical skills and self-evaluate one's own work. Receiving feedback has been useful for better understanding the strengths and weaknesses of our work», and of peers' and teacher's feedback: «Finally, the teachers' feedback has allowed me to understand if I had followed the right line of work with my group and made it possible to further consolidate what was learned both during the activity and during the theoretical lessons». In the end, it seems to us that the peer-feedback activity as it was structured has confirmed the necessity to provide students with many exemplars and comparison in order to stimulate inner feedbacks: «Having a term of comparison allowed me to self-evaluate my output by better identifying its strengths and weaknesses»; «I believe that, in this case, giving feedback is almost more useful than receiving it as it makes you think about your work and then make a comparison».

5. Conclusions

When involving students in collaborative peer assessment activities, it is of the utmost importance to take full care of the design details necessary to maximize the learning outcome, as well as to mitigate critical issues - an example for all being students' experiences of discomfort and reluctance in making judgments towards peers (Hanrahan and Isaacs, 2001). In this article we described a collaborative peer-feedback session based on a 4-phases cycle of collaborative output production, structured peer-feedback, collaborative output improvement, individual reflection. The activity was enhanced by using digital tools and environments and the peer-feedback was followed by the teachers' feedback.

Though we acknowledge the study limitations, mainly due to the local and limited nature of the analyzed data, we consider the intervention model as well as the data collection and analysis as a valuable contribution to those teachers and scholars who want to implement trialogical learning and assessment activities with their students and then analyze their possible impacts in order to re-design the subsequent learning units. Our findings, in fact, seems to be a promising starting point in order to better understand the impact of technology mediated collaborative peer-feedback practices on students' perceptions and willingness to be actively involved in similar activities, as active participants in their learning and assessment path. In this way collaborative peer-feedback could strengthen a positive culture of the assessment, understood both as awareness and acceptance of one's own limit, as well as a form of collaboration for the improvement of the peers' processes and products (Sansone, Bortolotti, and Fabbri, 2021).

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