



Article Collaborative Learning: A Design Challenge for Teachers

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Abstract: This study, focused on collaborative learning approaches, aims to contribute to our understanding of whether and how teachers propose these kinds of activities in their daily practice. Particularly, this study aims to explore teachers' behaviour when designing such activities for their learners with respect to different learning settings (i.e., face-to-face and/or blended settings vs. fully online settings). With reference to fully online settings, the Emergency Remote Teaching that took place during the COVID-19 outbreak is used as a reference case. The results of a self-reported survey of Italian teachers (N = 268) are presented. Our conclusions indicate that Italian teachers do propose collaborative learning activities to some extent in face-to-face and/or blended settings as well as in fully online settings, with statistically significant differences both in reference to the approaches adopted and to the (technological) tools used. Nonetheless, the data also indicate that teachers' design decisions are not always in line with recommendations widely proposed by the collaborative learning research community.

Keywords: collaborative learning; computer supported collaborative learning; learning design; Italian schools; teaching practice; COVID-19; emergency remote teaching

1. Introduction

For a couple of decades, research in the Technology Enhanced Learning (TEL) field has been advocating a shift in pedagogical perspectives in school, from transmissive approaches to learner centred and collaborative approaches, based on socio-constructivist learning theories. This shift is happening to some extent, even if it seems collaborative teaching and learning are not yet commonplace in schools across Europe and "teaching about or through collaboration remains uncommon in schools" [1], p. 8.

While the research community has devoted a lot of attention to the design, orchestration and evaluation of collaborative learning activities to maximize their effectiveness and take advantage of mediated communication when they go online [1–5], it seems the teachers' community is scarcely considering this approach in daily practice. If this is true for face-to-face settings, it applies probably even more to online settings: as a matter of fact, it is not completely clear whether and to what extent technologies are fully exploited to support collaborative learning in schools [6] and this is usually blamed on the fact that, on average, less than 40% of teachers across the EU feel ready to use digital technologies in teaching [7]. Moreover, some recent studies have pointed out even students, especially those demonstrating unfavourable collaboration profiles, might turn reluctant to collaborative approaches [8–10]. This hinders even more adoption of these approaches, thus widening the gap between what is recommended in research and what is actually implemented in real settings [1].

The everyday teaching practice has been put under the lens during the recent lockdown imposed by many governments due to the COVID-19 pandemic, which affected about 1.5 million learners—that is, 89.4% of total enrolled students globally [11]. This unprecedented scenario, and the resulting so-called Emergency Remote Teaching (ERT), gave the opportunity to the Technology Enhanced Learning research community to observe and analyse the teaching practice and reflect on actual teachers' learning design capacity in



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Copyright: © 2023 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https:// creativecommons.org/licenses/by/ 4.0/). general, and about their habits in terms of design for learning in 'normal conditions' (i.e., in f2f or blended settings), compared to online contexts. A common, preliminary conclusion reached was that the urgency with which many educational institutions were forced to adopt online education did not allow teachers to adequately plan how to take advantage of the inherent strengths of online learning, nor deal with its limitations. Basically, most schools were caught unprepared by the COVID-19 pandemic and the measures taken were quite unsystematic and insufficiently coordinated. The same holds true for individual teachers. It seems that, in most cases, online teaching took the form of a simple replication in online environments of traditional, synchronous teaching approaches, often transmissive in nature [12–15]. Moreover, we should consider in some countries, especially beyond Europe, not only teachers' learning design capacity hindered efficacy, but the poor availability of technologies and limited access to Internet for teachers and/or students represented a barrier [16].

The scenario of the ERT thus presented itself also as a good observatory to focus on teachers' habits as far as designing and proposing collaborative learning activities; to determine whether and how they design and propose these activities in their daily practice (i.e., in face-to-face settings); and to establish whether and to what extent—when going online—their behaviours are affected in any way. The main aim of the study is to determine if there are aspects of the current collaborative teaching proposals that can be improved to make them effective and, ultimately, to widen their adoption in schools.

With this purpose in mind, we have conducted a study in Italy, where the habitual use of technologies by teachers is still limited [17] and which was one the most seriously affected countries during the first wave of the emergency.

Theoretical Background

According to socio-constructivist theories of learning, collaborative learning favours the negotiation of shared meanings and the co-construction of new knowledge among peers [18]. The basic assumption underlying collaborative learning approaches is that discussion and negotiation among learners supports the learning process because, by interacting and sharing points of view, they develop a better understanding of things: "participants do not go off to do things individually but remain engaged with a shared task that is constructed and maintained by and for the groups as such." [19]. Thus, knowledge can be constructed through social negotiation because it encourages critical thinking, understanding and, ultimately, group meaning making. Moreover, there is strong evidence that the nature of online settings makes them ideal for supporting collaborative learning approaches [19,20]. Starting from the 1990s, the Computer Supported Collaborative Learning (CSCL) research field has been very productive, with the focus being how to take the most from the mediated communication to maximize the effectiveness of collaborative learning activities [2–5]. In fact, the persistent (and often asynchronous) nature of written exchanges in CSCL makes reflection and understanding of peers' points of view easier than in verbal communication. However, given that written communication can be less spontaneous and natural than verbal communication, and somewhat intimidating (going on the record), the role of the teacher in collaborative activities changes and becomes, perhaps, even more important.

While there is still a lively debate in this research field regarding whether and to what extent collaborative activities should be scaffolded and structured [21–26], the research community seems to agree on several features that should characterize a collaborative learning activity.

For example, it is widely acknowledged that learners might fail to spontaneously engage in discussion and collaboration [23,27,28]. For this reason, it is agreed that groups of students need to have a common task to accomplish during the activity, such as the production of a concrete artefact [29,30]. Having a shared and concrete purpose sustains group discussion, and the need to reach common ground facilitates the sharing of opinions and building of new knowledge.

The social structure of the community (i.e., the way the teacher organizes learners in teams) is obviously another important feature that might impact on the effectiveness of a collaborative activity. Participants in an activity can be aggregated according to different criteria, especially by group size (dyads, small groups, medium-sized groups, plenary), and the granularity and/or composition of these can change throughout the activity [31].

When it comes to CSCL, the technologies used as the main means of communication are also an important component, as they are related to the modes of interaction among learners; i.e., synchronous communication vs. asynchronous communication [19].

Thus, prior to conducting a collaborative activity, there are a number of decisions a teacher needs to make concerning all these features and their relations. Even if there are no one-solution-suits-all recipes, to support teachers in this delicate process of decision making, researchers have proposed subject area-independent patterns of collaborative activities that may guide choices for some of the variables in advance. These patterns—which can be applied in face-to-face, blended or online settings—have been labelled in various ways: '(competitive or cooperative) structures' [32], 'instructional methods' [3], 'collaborative techniques' [33]), and 'Collaborative Learning Flow Patterns' [34], just to mention a few. In this paper, we use the term 'collaborative techniques' [28]. Among the most well-known techniques are: Peer Review, Case Study, Jigsaw, Role Play, Pyramid and Debate. These can be selected by the teacher and adapted to the specific situation at hand, taking into consideration learning objectives and contents and the characteristics of the context, such as type and size of the target population, available time, and possible constraints, such as technology availability and school regulations.

In an attempt to understand what the current attitudes and behaviours of school teachers are in respect to the design and application of collaborative learning we have conducted a study targeting school teachers. Particularly, we have analysed the self-reported behaviours of Italian teachers in terms of their adoption of collaborative techniques, as well as their design decisions in terms of learner teams, technologies adopted, etc., both in face-to-face and online settings (i.e., prior to and during the pandemic). Specifically, our research questions were:

- (RQ1) What approaches do Italian teachers use to design collaborative activities? Can any significant difference be identified between approaches adopted for face-to-face and online settings?
- (RQ2) What is the frequency and duration of collaborative activities proposed by Italian teachers? Can any significant difference be identified in these factors in face-to-face and online settings?
- (RQ3) What is the nature of proposed collaborative activities? Can any significant difference be identified in the nature of collaborative activities in face-to-face and online settings?
- (RQ4) What social structures (teams) are adopted in the proposed collaborative activities? Can any significant difference be identified in this factor in face-to-face and online settings?
- (RQ5) What technologies are used in the collaborative activities proposed? Can any significant difference be identified in this factor in face-to-face and online settings?

These research questions were formulated starting from the main features that, according to the research community, should characterize a collaborative learning activity. By investigating these research questions, we want to understand whether and to what extent the current proposals in terms of collaborative learning are actually in line with what the research community is recommending. The final aim is to highlight the aspects that could be improved by teachers to make their collaborative teaching proposals effective and ultimately to widen their adoption in every practice.

2. Methods

2.1. Data Collection

In the endeavour to find answers to the above RQs, we opted to adopt a qualiquantitative method, and collected the data through a survey tool consisting of questions purposedly built to investigate the above RQs. The survey was collaboratively produced by two of the authors, while the third carried out a member-checking role to improve both the accuracy and validity of the tool. In line with Taber [35], the reason why no use was made of commonplace tools such as Cronbach's Alpha is that the survey was not intended to measure a psychological construct, but rather to elicit from respondents their habitual design and teaching behaviours. Thus, Cronbach Alpha would only provide a measure of the survey redundancy—which the authors tried to avoid while building the tool—to minimize the burden on respondents. The survey was implemented using Google Forms and comprised a total of 27 questions designed for collecting quantitative data from teachers. The questionnaire was structured in sections, as follows:

- Section A—Information about the respondent (age, school, school level(s) taught, teaching experience).
- Section B –Behaviours as far as designing collaborative learning activities, in face-toface and online settings (design approach, main variables considered for design).
- Section C—Behaviours as far as running collaborative learning activities, in face-to-face and online settings (frequency and duration of proposed collaborative learning activities).
- Section D—Behaviours as far as running collaborative learning activities, in face-toface and online settings (collaborative techniques adopted, if any).
- Section E—Behaviours as far as running collaborative learning activities, in face-toface and online settings (team formation(s) foreseen in the proposed collaborative learning activities).
- Section F—Behaviours as far as running collaborative activities, in face-to-face and online settings (technologies used in the proposed learning collaborative activities).

The questionnaire also contained a consent form covering the management of personal data in compliance with GDPR provisions. According to the rules of the authors' institution, a formal approval by the ethics committee was not required due to the type of data collected.

2.2. Context of the Study

The opportunity to respond to the questionnaire was promoted in a number of online training activities organized by ITD-CNR in Spring 2020. These had been established in response to the urgent need to provide Italian schools with specific teacher training on how to deal with the fully online learning settings of the ERT during the COVID-19 pandemic. Participation in these training initiatives was on a voluntary basis.

A convenience sampling technique was adopted, as the survey was presented at the end of the training for voluntary completion. Participants were invited to fill it in as soon after the training as possible.

2.3. Participants

Overall, 268 participants responded to the call to complete the survey: 196 women (73.13%), 66 men (24.63%) and 6 of undisclosed gender (2.23%). This unbalanced gender ratio reflects that of the general teacher population in Italy [36].

Regarding school level, our sample population was composed as follows: pre-school = 12 (4.48%); primary school = 60 (22.39%); lower secondary school = 48 (17.91%); upper secondary school = 145 (54.1%); other (not specified) = 3 (1.12%).

In terms of teaching experience, on average our respondents had 19.56 years of teaching experience (SD = 9.40; Min = 1, Max = 40), which is in line with the profile of the general teaching population nationally (OECD, 2021).

2.4. Data Analysis

We conducted a statistical analysis using SPSS (version 22.0, SPSS Inc., Chicago, IL, USA). Means and standard deviations were calculated to describe continuous variables. The categorical variables were presented as absolute (n) and relative frequencies (%). To test associations among categorial variables, we used the Chi-Square test of independence. The analysis is presented with contingency tables, the Chi-Square test, and Cramer's V values. To test the significance of the change in the same subjects, we used McNemar's Test on paired nominal data. To test for equal proportions in more than two dichotomous dependent variables, we used Cochran's Q Test as an extension of McNemar's Test, with Dunn's Test for post hoc testing. For variables taking on more than two categories, we used the marginal homogeneity test. The level of significance was set at *p*-value ≤ 0.05 .

3. Results

3.1. Approaches Used to Design Collaborative Learning Activities (RQ1)

First, we asked teachers how much time they usually dedicate to the design of collaborative activities. Most of the participants reported that they usually dedicate a few hours (52.6%) or some days (25%) to design one activity. Table 1 shows the complete picture of their responses. It is worth noting that a small percentage (26 participants, 9.7%) reported that they do not usually design collaborative activities at all. More precisely, 17 teachers declared they do not design or deliver any collaborative activities at all, while 9 teachers do deliver them, but without engaging in any design phase. Thus, later on (i.e., Table 2) the reported data will refer only to responses from teachers who undertake design (N = 242).

Table 1. Time dedicated to the design of collaborative learning activities (frequency and percentage).

	Frequency (Percentage)
Some minutes	19 (7.1)
Some hours	141 (52.6)
Some days	67 (25.0)
Some weeks	15 (5.6)
Usually not designing collaborative activities	26 (9.7)
Total	268 (100.0)

Table 2. Aspect of design considered most relevant in face-to-face and online settings (i.e., before and during the COVID-19 emergency)—frequency and percentage.

	f2f Frequency (Percentage)	Online Frequency (Percentage)
Task (i.e., task to be performed)	130 (53.7)	83 (34.3)
Time (i.e., time available to carry out the activity)	36 (14.9)	32 (13.2)
Team (i.e., composition of student teams involved)	47 (19.4)	28 (11.6)
Technology (i.e., technology to be used) Not responding	22 (9.1) 7 (2.9)	65 (26.9) 34 (14.0)

Then, we asked what aspect teachers regard as most relevant during the design process, and in posing the question we asked them to differentiate their behavior between face to-face settings (i.e., usually) and online ones (i.e., during the pandemic). Table 2 shows the results regarding the aspect considered most relevant in the design of collaborative activities in teachers' usual design practice and during the pandemic. The choice of the elements is based on the 4Ts model [27] that posits the importance and reciprocal influence of task (i.e., tasks to be performed), time (i.e., time schedule of the activity), team (i.e., teams of students to be involved) and technology (i.e., technology to be used) in the design of collaborative learning.

The data in Table 2 show that, although Task is the main consideration in the design of collaborative learning activities in both settings, its importance in virtual conditions seems to be lower, while the importance of technology increases. A marginal homogeneity test determined that there was a statistically significant difference in the frequencies in f2f and online settings, p < 0.001 (2 sided).

3.2. Frequency and Duration of Proposed Collaborative Learning Activities (RQ2)

Then we asked respondents to state how frequently they propose collaborative learning activities and what their expected duration is. Table 3 shows the results regarding the frequency of proposed collaborative learning activities in normal conditions (i.e., before the pandemic) and in online settings during the emergency. The table refers to responses from all the teachers (n = 268).

	f2f Frequency (Percentage)	Online Frequency (Percentage)
Daily	37 (13.8)	43 (16.0)
Weekly	73 (27.2)	80 (29.9)
Monthly	66 (24.6)	61 (22.8)
Quarterly	53 (19.8)	16 (6.0)
Never	39 (14.6)	68 (25.4)

Table 3. Frequency of proposed collaborative learning activities in f2f and online settings (i.e., before and during the COVID-19 emergency)—frequency and percentage.

These data reveal some variations between f2f and online settings, especially a marked increase between the number of teachers who never proposed collaborative activities in 'normal' circumstances and those who did not do so during the pandemic. At the same time, those who proposed such activities during the lockdown increased their frequency of use. As a matter of fact, there is an association between the frequency with which the collaborative activities were proposed before and during the COVID-19 emergency ($x^2 = 93.518$; Cramer's V = 0.295; *p* < 0.001). See Table 4 for details.

Table 4. Contingency table of frequency with which the collaborative activities are proposed.

					Online			
			Daily	Weekly	Monthly	Quarterly	Never	TOTAL
		Count	13	19	2	0	3	37
	Daily	Expected frequency	5.9	11.0	8.4	2.2	9.4	37.0
		Count	16	26	8	4	19	73
	Weekly	Expected frequency	11.7	21.8	16.6	4.4	18.5	73.0
faf		Count	3	19	30	2	12	66
121	Monthly	Expected frequency	10.6	19.7	15.0	3.9	16.7	66.0
		Count	4	7	17	10	15	53
	Quarterly	Expected frequency	8.5	15.8	12.1	3.2	13.4	53.0
		Count	7	9	4	0	19	39
	Never	Expected frequency	6.3	11.6	8.9	2.3	9.9	39.0
		Count	43	80	61	16	68	268
TOTAL		Expected frequency	43.0	80.0	61.0	16.0	68.0	268.0

5 cells (20.0%) have an expected frequency <5. Minimum expected frequency: 2.21.

As to the duration of the collaborative activities proposed, Table 5 shows the results for activities run in face-to-face and online settings.

Table 5. Duration of collaborative learning activities run f2f and online (i.e., before and during the COVID-19 emergency)—frequency and percentage.

	f2f Frequency (Percentage)	Online Frequency (Percentage)
Lasting a few hours	157 (58.6)	108 (40.3)
	111 (41.4)	160 (59.7)
Lasting for a few days	94 (35.1)	76 (28.4)
	174 (64.9)	192 (71.6)
Lasting for a few weeks	62 (76.9)	99 (25.7)
	206 (23.1)	199 (74.3)
Lasting for a few months	34 (12.7)	14 (5.2)
	234 (87.3)	254 (94.8)

McNemar's test determined that, when comparing the activity duration in f2f and online mode, there was a statistically significant difference in the proportion of respondents who proposed collaborative activities lasting a few hours (p < 0.001), a few days (p = 0.0459) and a few months (p < 0.001).

3.3. Nature of Collaborative Activities (RQ3)

Table 6 shows the results regarding the use of seven quite well-known collaborative techniques (Discussion, Case Study, Jigsaw, Brainstorming, Peer Review, Pyramid, Role Play) [27] in three different conditions:

- 1. Face to face only (before the COVID-19 emergency);
- 2. Blended (before the COVID-19 emergency);
- 3. Online only (during the COVID-19 emergency).

Each participant could indicate more than one option.

Table 6. Nature of the proposed collaborative activities (frequency and percentage).

		Frequency (Percentage)
	A. Before (face to face only)	199 (74.3)
Discussion	B. Before (blended)	74 (27.6)
	C. During (online only)	134 (50.0)
	A. Before (face to face only)	82 (30.6)
Case study	B. Before (blended)	48 (17.9)
	C. During (online only)	62 (23.1)
	A. Before (face to face only)	32 (11.9)
Jigsaw	B. Before (blended)	18 (6.7)
	C. During (online only)	24 (9.0)
	A. Before (face to face only)	150 (56.0)
Brainstorming	B. Before (blended)	57 (21.3)
	C. During (online only)	95 (35.4)
	A. Before (face to face only)	71 (26.5)
Peer review	B. Before (blended)	34 (12.7)
	C. During (online only)	48 (17.9)
	A. Before (face to face only)	11 (4.1)
Pyramid	B. Before (blended)	10 (3.7)
	C. During (online only)	14 (5.2)
	A. Before (face to face only)	80 (29.9)
Role Play	B. Before (blended)	27 (10.1)
,	C. During (online only)	37 (13.8)

- Discussion Cochran's Q test indicated that there were differences between the proportions among the three points, x2(2, N = 268) = 130.28, p < 0.001. A pairwise post-hoc Dunn test with Bonferroni adjustments was significant for AB (p < 0.001), BC (p < 0.001) and AC (p < 0.001).
- Case study. Cochran's Q test indicated that there were differences between the proportions among the three points, $x^2(2, N = 268) = 20.14$, p < 0.001. A pairwise post-hoc Dunn test with Bonferroni adjustments was significant for AB (p < 0.001) and AC (p = 0.026).
- Jigsaw. Cochran's Q test indicated that there were differences between the proportions among the three points, $x^2(2, N = 268) = 6.30$, p = 0.043. A pairwise post-hoc Dunn test with Bonferroni adjustments was significant for AB only (p = 0.037).
- Brainstorming. Cochran's Q test indicated that there were differences between the proportions among the three points, $x^2(2, N = 268) = 97.17$, p < 0.001. A pairwise post-hoc Dunn test with Bonferroni adjustments was significant for AB (p < 0.001), BC (p < 0.001) and AC (p < 0.001).
- Peer Review. Cochran's Q test indicated that there were differences between the proportions among the three points, $x^2(2, N = 268) = 24.07$, p < 0.001. A pairwise post-hoc Dunn test with Bonferroni adjustments was significant for AB (p < 0.001) and AC (p = 0.008).
- Pyramid. Results not statistically significant.
- Role Play. Cochran's Q test indicated that there were differences between the proportions among the three points, $x^2(2, N = 268) = 19.86$, p < 0.001. A pairwise post-hoc Dunn test with Bonferroni adjustments was significant for AB (p < 0.001) and AC (p < 0.001).

3.4. Social Structures (RQ4)

Table 7 shows the results regarding the social structures (i.e., team configuration) of the collaborative activities proposed in f2f settings and online. In this case, only 242 of the total 268 participants are considered, excluding the 26 who previously stated that they do not usually design collaborative activities. Each participant could indicate more than one option.

Table 7. Team configurations adopted for collaborative learning activities run by respondents in f2f/blended and fully online settings (before and during the COVID-19 emergency)—frequency and percentage.

	f2f/Blended Frequency (Percentage)	Fully Online Frequency (Percentage)
Individual	34 (14.0)	69 (28.5)
Dyad	101 (41.7)	75 (31.0)
Small group (3–8 members)	206 (85.1)	130 (53.7)
Medium-sized group (9–19 members)	10 (4.1)	13 (5.4)
Large group (more than 20 members)	8 (3.3)	10 (4.1)
Whole class	43 (17.8)	31 (12.8)

McNemar's test determined that there was a statistically significant difference in the proportion of f2f and online for individual activities (p < 0.001), dyad activities (p = 0.002), small group activities (p < 0.001) and for whole class activities (p = 0.008).

3.5. Technologies (RQ5)

Table 8 shows the results regarding the technologies used in the collaborative activities proposed in f2f and online settings. Again, in this case, only 242 of the total 268 participants

are considered, excluding the 26 who previously stated that they do not usually design collaborative activities. Each participant could indicate more than one option.

Table 8. Technologies used for collaborative learning activities run by respondents in f2f/blended and fully online settings (i.e., before and during the COVID-19 emergency)—frequency and percentage.

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	Frequency (Percentage)	Fully Online Frequency (Percentage)
Forum	30 (12.4)	28 (11.6)
Web conferencing (e.g., Meet, Zoom, Skype)	13 (5.4)	189 (78.1)
Social network (e.g., Whatsapp, Facebook, Instagram)	45 (18.6)	74 (30.6)
Interactive Whiteboard	151 (62.4)	11 (4.5)
Text editor (e.g., MS Word, GoogleDocs, Wiki)	121 (50.0)	110 (45.5)
Presentation editor (e.g., MS PowerPoint, Google Presentation, Prezi)	151 (62.4)	144 (59.5)
Instructional software, digital games, simulations	75 (31.0)	66 (27.3)

McNemar's test determined that there was a statistically significant difference in the proportion before and during the COVID-19 emergency for Web conferencing tools (p < 0.001), social network tools (p < 0.001) and for the interactive whiteboard (p < 0.001).

4. Discussion

In the following we discuss the results presented in Section 4 in the endeavour to answer the five research questions listed in Section 2.

4.1. Approaches Used to Design Collaborative Activities (RQ1)

Firstly, respondents were asked to indicate how much time they habitually dedicate to the design of collaborative activities. The majority stated they usually devote some hours or even days to this task, while a minority do not dedicate any time to it at all. Interestingly, among this last group, some teachers actually deliver collaborative activities without designing them. This is in stark contrast with the empirical evidence from research showing that collaborative learning does not happen serendipitously; teachers need to design and create the conditions to foster effective group interactions [37,38].

Regarding the aspect of design teachers consider most relevant, it seems that in usual (pre-pandemic) practice the design process is rather task-oriented, while during ERT (i.e., online) it became more technology-driven. This is hardly surprising, as during the lock-down teachers were forced to use technological tools (to communicate with students, assign tasks, collect assignments, etc.) that were previously available to them but not mandatory to use. It is worth mentioning here that, while the Italian government has invested considerable resources in a number of wide-scale national programmes devoted to equipping the country's schools with adequate ICT infrastructure, the adoption of technologies by teachers in Italy is still limited. This is clearly affirmed in a recent OECD report: ' ... in Italy teachers use technology well below other high-skilled workers. Additionally, 3 out of 4 teachers report needing further training in ICT for teaching' [17]. For this reason, most teachers in Italy were caught unprepared by the lockdown scenario, as in this situation—for the first time—ICTs played an unprecedented central role in their teaching practice. In this case, willingly or not, teachers were forced to rethink, at least partially, their teaching

activities, starting from the adoption of the technologies offered to them by their school or, more likely, the technologies they were mostly familiar with.

4.2. Frequency and Duration of the Proposed Collaborative Activities (RQ2)

Teachers seem to propose collaborative activities predominantly on a weekly or monthly basis. Looking at the data, it is possible to detect significant changes in frequency before and during the pandemic. This is especially true of teachers who declared they did not propose any online collaborative activities at all: during the ERT period, the respondents who fall in this category increased. This seems to imply that some teachers perceived technology mediation as a barrier to, rather than a facilitator of, the implementation of collaborative learning; instead of leveraging the affordances ICTs offer in this regard, they preferred to adopt other teaching approaches. Additionally, teachers who rarely use collaborative approaches (quarterly use) dropped. In this sense, these teachers seem unaware of what is affirmed in the scientific literature, i.e., that online settings are very well suited to collaborative learning approaches [19,20,39]. On the other hand, the degree of daily and weekly use slightly increased during the ERT from pre-pandemic levels, as if respondents who already strongly believed in the effectiveness of the approach were not undaunted by the prospect of implementing it through technological means. This indicates ICT played a positive role in further encouraging the adoption of collaborative learning activities for those teachers who are more familiar with them.

Regarding the duration of proposed collaborative activities, apart from a general tendency to propose shorter activities (lasting a few hours or days) rather than longer ones (lasting a few weeks or months), respondents indicate they propose longer online collaborative activities during the ERT than in f2f/blended settings (before the pandemic). Specifically, data show a higher number of respondents stating they run short collaborative activities (lasting a few hours or a few days) before the pandemic than during it, and the same holds for activities lasting months. The only exception to this trend is the number of respondents stating they run collaborative activities lasting a few weeks, whose number increased during the pandemic. This could have two possible interpretations: a) online collaborative activities relied on asynchronous communication, which by its nature has a longer timespan than synchronous communication; or b) the same activities that tended to take hours or days in face-to-face settings took longer to be managed, possibly due to the increased complexity of mediated communication. Given that, as explained later in this paper (see section on RQ5), it seems our respondents largely disregarded asynchronous communication, we think the latter interpretation is more plausible. In any case, collaborative activities lasting a period of months were kept to a minimum in the ERT conditions.

4.3. Nature of Collaborative Activities (RQ3)

To understand the nature of the collaborative activities proposed, we investigated the use of a number of collaborative techniques in normal circumstances (face-to-face or blended) and online (during the pandemic). In general, it appears that the number of respondents using these techniques in face-to-face mode is higher than those who did so online during the ERT; this held for all techniques examined, except for Pyramid. All of these differences were statistically significant, except for Jigsaw. The discrepancy is especially evident for Role Play, the technique for which the frequency gap is greatest.

Among the examined techniques, Discussion and Brainstorming are the most commonly used generally; Pyramid and Jigsaw far less so. Case Study, Peer Review and Role Play are moderately common techniques, especially in face-to-face conditions.

This seems to confirm what we already pointed out for RQ1; i.e., that some teachers tend to perceive the online environments more as a barrier than as a driver for the implementation of collaborative learning approaches, in contrast with positions expressed (and evidence produced) by the research community [19,20].

Moreover, the added value of more structured techniques, such as the Pyramid or the Jigsaw—where the social structure (i.e., the team composition) evolves during the activity—still seem to be overlooked in favour of 'flatter' techniques. Although the debate about the effects of different degrees of structuredness of collaborative techniques is still ongoing in the CSCL community [21,26,28,38], there is evidence of the benefits brought about by structured techniques and scripts [27,31,40,41]. Thus, again in this case, it seems teachers' design choices do not fully resonate with research results.

4.4. Social Structures (RQ4)

Grouping students for collaborative learning activities can be challenging, and group composition is one of the most debated issues in the CSCL field [37]. Moreover, when designing group work and team composition in collaborative learning, it is critical to properly take into consideration students' social interactions to ensure successful outcomes [42].

As far as team composition is concerned, in our study it seems small groups are the configurations that teachers favour the most. Interestingly, the percentage of teachers who indicated individual activities as the ones they most frequently used actually doubled when teaching went online during the ERT. Again, this confirms that teachers opted for activities in which they could interact one-to-one with students, even if pairs and small groups remained the most popular team configurations.

The fact that the organization of collaborative learning in dyads, small-sized groups and whole class significantly decreased during the ERT does not take account of the features that ICTs offer specifically for managing groups of different sizes, such as break-out rooms or group-based forums available in many web conferencing systems [31].

4.5. Technologies (RQ5)

We can observe from the data that during the ERT there was a drastic increase in the use of synchronous online communication tools (especially in videoconferencing systems, but also social networking tools), and a decrease in the use of the interactive whiteboards. These results are not surprising: while videoconferencing systems are hardly used at all in 'traditional' teaching when classes work mainly (if not exclusively) face-to-face, ERT was obviously based on the use of these tools to mediate communication between students and teachers. At the same time, classroom-based interactive whiteboards became totally inaccessible during the lockdown. Social networking tools, already used to some extent by teachers in class, became a more important channel of communication between teachers and students for the ERT.

Perhaps a more interesting finding is that the use of forums was not significantly affected by the ERT. This suggests the advantages of asynchronous communication for mediating online collaborative activities that have been promoted for so long and with such conviction in the scientific literature [20,43,44] are not in line with teacher practice. The non-volatile nature of asynchronous interactions allows for more reflection and critical thinking and permits students to proceed at their own pace. Last but certainly not least, it can mitigate digital inequalities [45,46] in that it limits issues of technological accessibility and connectivity that frequently hinder synchronous online activities. However, it seems these features cannot be easily taken advantage of by teachers.

Moreover, consideration should be given to the reported lower use of production software (such as text editors or presentation programs) in online settings. Even if not statistically significant, the decrease is somewhat surprising because it might imply that online group work, when proposed, was not always dedicated to artefact production—an aspect that is highly recommended by the scientific community [29,30].

5. Conclusions

This paper reports the results of a study based on the collection of self-reported data by Italian teachers regarding their behaviours when designing collaborative learning activities. In the same study, we have juxtaposed teachers' behaviours in two different conditions: when they design activities intended for f2f settings (i.e., the typical condition for school teaching) and when they design activities intended for online settings (as a reference case we focused particularly on the ERT scenarios 'forced' by the recent pandemic).

Overall, the results indicate that collaborative learning approaches are applied to some extent by the Italian teachers surveyed, but it seems some of their design choices do not align with the strategies and practices that the research community recommends.

In particular, this study has highlighted that the design phase, in a few cases, is completely skipped. Even more importantly, when teachers design collaborative learning activities for their students, there seem to be aspects related to the effective design and implementation of collaborative activities that—although well acknowledged by the research community—cannot be taken for granted by practitioners. These aspects include, but are not limited to, the importance of using structured techniques and the essential role of artefacts as catalysers of collaboration. In addition, the role that technologies can play to support effective collaborative processes is often overlooked, and the key features of asynchronous communication that can be used to promote positive exchange and fruitful dialogue are underestimated. These aspects that are so essential to designing and implementing an effective collaborative pedagogy need to become recommendations, and should be offered as guidelines for teachers in the context of training initiatives.

In this sense, this study has highlighted the need for evidence-based teacher training in the field of collaborative learning approaches, as well as further research concerning the reasons why research results do not impact teacher practice. This is quite in line with [39,47,48], who state that teacher training and support are crucial to the design and implementation of quality learning environments in general, and of collaborative learning in particular.

In terms of the limitations of this study, we would like to remind that our study participants were recruited from among people who, during the pandemic, decided to attend a training initiative on a voluntary basis. This might imply they were somehow biased, in comparison to colleagues who did not feel the need to attend any training in those critical circumstances.

Moreover, we would like to point out that other interesting perspectives could be gained by conducting further research with a larger, international sample to compare results in different countries. Last but not least, additional inputs could come from complementary analyses where the influence of the variable "school level" is studied.

Another aspect that deserves further investigation is the extent to which the different approaches adopted in face-to-face or online settings remain once the teachers are free to choose between the two delivery modes and to carefully design their teaching. Given that for online learning we used the ERT as a reference case, it is recommended to collect data in non-emergency conditions—where teachers are in principle free to opt for technology-mediated teaching when this has added pedagogical value—and face-to-face or blended settings, when their advantages overcome their disadvantages.

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