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Distance Learning: Rethinking learning design in higher education during the Covid-19 pandemic

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Abstract

During the second semester of the 2019/2020 academic year, due to the regulatory restrictions arising from the Covid-19 pandemic, Bologna University, like many others, was compelled to stop delivering its face-to-face offering and to switch, in a very short time, to the creation of a technological architecture that would enable students to continue their education through teaching via Distance Learning. After illustrating the active teaching model adopted in two courses offered by the University of Bologna Department of Education Studies, this paper addresses future educators by focusing on the main findings from a semi-structured online questionnaire completed by 84 students. The first part of the paper considers a rethinking of educational planning at the time of Covid-19, while the second and final part analyses student perceptions (using the questionnaire's open questions) of their Distance Learning experience in the initial phases of the pandemic scenario.

Keywords: *Distance Learning; Learning Design; Higher Education.*

Introduction

Numerous national and international research projects are currently underway in schools and universities, which aim to delineate Distance Learning outcomes from the experience gained during the Covid-19 pandemic, while recording and bringing changes in teachers' teaching practices to light (Mishra et al., 2020; Niemczyk, 2021; Vijayan, 2021).

It should be noted, as stated by Doucet et al. (2020), when considering 'opportunities', that teachers and researchers have been actively cooperating at a local level to improve online teaching methods. Since educators, parents and students have all been sharing similar experiences, there are unequaled opportunities for cooperation, for the development of creative solutions and the willingness to learn from others and try out new tools.

As regards 'barriers', it cannot be denied that, in educational and training contexts, the sudden spread of these online environments used as solutions for Distance Learning during the emergency has further highlighted the deep cultural and digital differences and divides that are still very much present in Italy.

As far as didactics is concerned, 'the sudden and generalized transformation from the prevailing "face-to-face" teaching model to online modes, which were introduced under "less than ideal circumstances" … was welcomed in university contexts, several of which had already been applying an integrated model for some time' (Areghini et al., 2020, p. 50). Furthermore, according to the authors, this rapid change left little time for reflection, and in many cases, distance teaching became simply the online projection of the conventional 'face-to-face' lecture.

Teachers have to deal with two challenges (SIREM, 2020). On the one hand, not all of them are trained in the technologies to be used and, on the other, not all of them are familiar with the teaching methods required for online lessons. The

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question facing a university professor forced to deliver their courses online comes down to, 'How can I provide an educationally valid, sustainable lesson, compatible with my technical knowledge and in line with my teaching philosophy?'

1. Theoretical background

To answer the above question, the teachers involved in the teaching experiences described below tried to respond to this rapid change, first by redefining the organisational (times and activities) and didactic methods of the two courses exemplified, while attempting to maintain a model of active learning as the foundation of the teaching–learning paths as far as they possibly could.

Active learning is a way of engaging students in the social construction of knowledge. Dewey's words were apt when he said, all human experience is ultimately social involving contact and communication: '[experience] is the basis for the construction of knowledge. As such, the creation of opportunities for students to have educational experiences that are based on social contact and communication is the foundation for active learning and active learning classrooms' (Dewey, 1938, as cited in Holec et al., 2020, p. 141).

Naitani (2008) points out that active learning implies the design, implementation, maintenance and promotion - inside and outside the classroom - of a learning environment, through the creation of opportunities for active engagement related to the subject and content being taught. Active learning endeavours to activate teaching methods able (also) to sustain higher-level and divergent learning processes. To foster this method, teachers may choose from several teaching strategies that view students as active protagonists in their learning. To be actively involved, 'students must engage in such higher-order thinking tasks as analysis, synthesis, and evaluation … that strategies promoting active learning … defined as instructional activities involving students in doing things and in thinking about what they are doing' (Bonwell & James, 1991, p. iii).

Harasim (1997, as cited in Ferrari, 2015, p. 33) pointed out that 'conversations generated during interactions among members, different perspectives that emerge during discussions, and topics that arise within groups, may explain why collaborative groups facilitate greater cognitive development in the same individuals than when engaged in individual activities. Both students and teachers should be encouraged to raise new topics, ask questions to the class, and reply to contributions from others'. Along the same line, the teachers of the two courses tried using the digital tools available (Microsoft Teams and Moodle) to transform the environments engendered by those devices into settings that support the ways in which groups collaborate. These platforms were modelled to support cooperative learning processes among students who, working in small groups and assuming different roles, cooperate (also through comparing different opinions, sustaining different points of view and mediating) to achieve a common goal.

According to some international studies, the pandemic has represented an opportunity to experiment with student-centred approaches to online learning that are primarily focused on collaboration. Specifically, the research done on computer-supported collaborative learning (CSCL) indicates that 'CSCL has been one of the most important learning methods, which has been used effectively in all educational institutions, particularly in higher education, with the number of CSCL applications increasing each passing day' (Talan, 2021, p. 427).

CSCL is an educational approach where learning is pursued through interaction by 'promoting several active teaching intervention strategies, which have completely opened up new ideas for the strategic design of face-to-face cooperative learning in the classroom' (Yu & Yuizono, 2021, p. 15). As Stahl et al. (2006) have highlighted, this type of learning is based on the sharing and construction of knowledge among participants, who are using technology as their main communication tool or shared resource. CSCL focuses on how cooperative learning, supported by technology, can enhance peer interaction and group work, and how collaboration and technology can facilitate the sharing and distribution of knowledge and skills among members of a community. Collaboration in CSCL is seen as a process of constructing shared meaning; the resulting learning allows divergent meanings to be brought together. In addition, CSCL 'also draws on learning theories which focus on the social aspect of learning and building knowledge as a group, including: distributed cognition, problem-based learning, group cognition and cognitive apprenticeship' (Resta & Laferrière, 2007, in Vega et al., 2020, p. 1574). The key benefits of CSCL are primarily about developing motivation and critical thinking (Knutas et al., 2015).

The impact of these experiences, based on collaborative learning, on students' learning, is reinforced when the learning environment resembles a role-taking game (Ertuk, 2015). As Stark et al. (2010, as cited in Friedrich, 2019, p. 4) affirm, 'a sequential order of instructional and problem-based teaching units in semester lectures is less effective than a purely Problem Based Learning (PBL) environment'. In a problem-based learning (PBL) model, tasks from reality are identified as activities that students will be performing to solve new and complex problematic situations, which resemble real-world circumstances as closely as possible: students will use knowledge and skills already acquired and will transfer the cognitive procedures and behaviours into contexts and areas of reference that are somewhat different from those made familiar during teaching practice. The solution to the situation/problem (authentic task) will be the students' final work product on which the teacher's evaluation will be based (MIUR, 2017, p. 8).

An 'authentic' assessment, according to Wiggins (1993), will measure not only what the student knows, but also what they can do with what they know. One of the limitations of an authentic task might be that it focuses too much on assessing the 'product' produced by the student at the expense of the 'process' by which he or she resolved and/or came up with the hypotheses for dealing with the situation–problem (Ciani et al., 2020).

Moreover, Kaye (1994) highlights a highly significant issue to be considered in the design phase. When students are organised in groups and are engaged in discussion or communication activities, this does not constitute cooperative learning. Clearly, to promote effective collaboration or cooperation among the members of a group, it is necessary to create 'a real interdependence … in the performance of a task, a commitment to mutual assistance, and a sense of responsibility for the group and its objectives, and attention must be paid to social and interpersonal skills in the development of group processes' (Kaye, 1994, p. 11). One way of creating this interdependence, for example, is to involve the students in a collaboration script (King, 2007).

Dillenbourg (2002, 2009) adds to this line of thought by defining a collaboration script as a set of instructions on how the members of a group should interact, cooperate and solve problems. These instructions are usually produced with the implicit expectation that by complying with these guidelines, students should work together. If the teacher classifies cooperative work this way, the implicit contract is reinforced. In other words, a script is a more detailed, more explicit contract between the teacher and a group of students on how they are to collaborate. This contract may be contained in initial instructions or included in the CSCL environment. In Dillenbourg's view, therefore, the script's concept creates a detailed and explicit contract between the teacher and the groups of students on how they are to collaborate within the environments provided for social interaction.

2. Pre and post design of teaching and learning paths: research context

The context of this didactic experience was provided by two in-person courses offered by the Department of Education Studies, 'Technologies of Education' in the 'first cycle degree programme (L) in Expert Social and Cultural Education' (48 h, 8 weeks, eight ECTS - European Credit Transfer and Accumulation System) and 'Models of Educational Design and Teaching Methodology' (48 h, eight ECTS) in the 'single cycle degree programme (LMCU) in Primary Teacher Education'.

The two professors holding these courses, which were specifically intended for future educators and teachers, co-designed a determined activity that would create a teaching scenario (Table 1) based on an experiential education model, methodologically founded on the principles of the trialogical approach to learning (Sansone et al., 2016, 2021).

Table 1. Proposed teaching activities in the two courses.

Course	Delivery	Artefact	Materials and stimuli	'Peer feedback'
Technologies of knowledge	Construction of a learning scenario in an extracurricular context	Instructional design aimed at a specific user group chosen by the group in which a critical use of a digital instrument is proposed with transversal purposes	• Dialogic lesson • Examples of instructional design • Instructional design outline	Presentation of the artefact in plenary and reciprocal comment by colleagues
Models of instructional and didactic design	Construction of a learning scenario in an intracurricular context	Instructional design for a specific elementary school class chosen by the group where critical use of the digital instrument is proposed for disciplinary purposes	• Dialogic lesson • Examples of instructional design • Instructional design outline	Presentation of the artefact in plenary and reciprocal comment by colleagues

According to this approach (Paavola & Hakkareinen, 2005; Paavola et al., 2012), students were asked to develop an instructional design of an authentic and meaningful educational scenario together, also through the mediation of digital instruments. This activity was proposing to reflect, analyse and apply the knowledge learned, from an individual and social standpoint, during the lessons in a simulated but realistic context, wherein complex problems were solved by experimenting with new solutions and creating new knowledge (Scardamalia & Bereiter, 2006). Through critical reflection on issues related to real-life situations and the review of theories in discussions and work product during the course – with a view towards improvement – this activity was intended to stimulate metareflection on one's own practice and on that of the group members. At the same time, the idea was to foster those disciplinary and transversal skills (European Council, 2018) in line with the key capabilities required of citizens in the 21st century.

The collaboration script adopted within the two courses included both individual and group work for the construction of learning artefacts in which the teachers played the role of guides and facilitators through regular monitoring of students' activities. In addition to this individual and collective dimension, role-taking simulation was also used as one of the teaching model's fundamental components. During these activities, students, who had been spontaneously organised into groups of seven to eight members, took and simulated various roles and functions (Cesareni et al., 2018). Some were more focused on the learning process, others on the work product to be co-constructed, while others worked on the social dynamics or the documentation of the educational experience. The specific roles, listed below (Spadaro et al., 2009), shifted throughout the activity (Strijbos et al., 2004):

- observer: fills in the observation grid for his/her group;
- artefact manager: responsible for finalising and presenting the group work product;
- researcher: in charge of seeking additional resources to be used by the group;
- sceptic: undermines predictable statements, asks for clarifications and explanations;
- synthesiser: draws up a weekly summary of the group discussion, highlighting the key issues;
- social tutor: favours group cohesion by encouraging the participation of each member and
- free role: student who freely chooses which role to fill during the activities.

These types of simulation work were conducted entirely through face-to-face classwork sessions as well as asynchronously, with the mediation of the Moodle eLearning platform.

With the start of Distance Learning after only 2 weeks from the beginning of the in-person classes (12 h for each course), the initial micro-planning of the lessons had to be rethought from both the methodology/organisation and the relational points of view (Laurillard, 2009).

The active learning model was implemented differently: lesson planning and preparation, teaching sequences and materials and group tasks were all redesigned using new feasibility and sustainability criteria. Scheduling was optimised in view of, for example, the longer time needed for online collaboration or the issue of attentiveness while on synchronous online lessons. Hence, work times were extended and some activities involving student attendance at local educational institutions or meetings with stakeholders were cancelled.

Lectures became more interactive through the introduction of additional questioning and presentation tools such as Kahoot, Mentimeter and Padlet, together with the use of other multimedia materials.

Several group activity tasks designed for face-to-face learning were initially revised and simplified for clarification by providing informative material and examples of several planning activities in preparation for the creation of significant extracurricular and intracurricular artefacts. Role taking and role rotation (Fabbri, 2020; Sansone et al., 2011; Strijbos et al., 2004) among the group members was retained, as the teachers considered this methodological strategy extremely useful for both the learning process and socialisation. Moreover, role taking, particularly in Distance Learning situations, was deemed a useful scaffolding tool for effective collaborative learning (De Wever et al., 2008; Ligorio & Sansone, 2016; Strijbos & De Laat, 2010). This is because role taking is based on the provision of *collaboration scripts* (Dillenbourg, 2002) that guide and aid students in taking on tasks and responsibilities, while optimising and supporting their cognitive and social construction of knowledge, through the activation of different forms of reasoning and interaction at the same time.

To enable online collaborative learning (OCL) activities, the university's digital instruments for teacher–student and student–student interaction (Microsoft Teams and the Ateneo Virtual platform) had to be supplemented with additional communication channels and spaces useful for sharing. Specifically, group work was mediated by asynchronous and synchronous instruments and environments able to sustain interaction and learning processes, diversified according to the phases and objectives of the work: Web Forum, WhatsApp, Google Drive (collaborative writing sheet, material storage folder), Padlet and audiovisual materials produced by the teachers and selected from the network. More attention and time were devoted to the ongoing review of collaborative activities: teachers entered each group's virtual classroom to monitor the process of negotiation and knowledge co-construction and provide instructional feedback aiding the scaffolding function of the content and methodology. Learning assessment was intensified through continual feedbacks, which were more structured and timelier than with face-to-face teaching (Grion et al., 2020). Plenty of space was also provided for each individual group to present and explain their artefacts in front of the entire class.

Last, it was considered appropriate to provide an overall assessment of the skills acquired by students. The decision was made to do this by an exam comprising the completion of individual project work, rather than a final test assessing the students' knowledge alone.

3. Purpose of the study and data collection instrument

This paper aims to reflect on how undergraduate students, enrolled in the two courses examined, perceived Distance Learning. Precisely, the objective was to investigate, on the one hand, any possible issues encountered by students at an individual, socio-relational, technological and didactic level with respect to the sudden transition from face-to-face classroom teaching to Distance Learning and, on the other hand, the potentials of the *Distance Learning experience*, which had just ended. The focus of the study was then expanded, compared to the situation of pre-Covid 19 in-person coursework. Specifically, in this study, it shifted from the measurement of digital and soft skills developed by students through participation in collaborative *in-person* activities to the identification of students' voices and their considerations about the problems encountered along with the added value of their Distance Learning experience through the following research queries:

- What worked in your Distance Learning experience?
- What were the strong points of your Distance Learning experience?
- What did not work in your Distance Learning experience?
- What were the weak points of your Distance Learning experience?

Using a semi-structured anonymous online qualitative and quantitative questionnaire, created using the *Modules* format found in the *Google Suite*, which was administered before and after, responses from 84 attending students (73 females, 11 males, average age: 22 years) were collected and analysed. Originally, the instrument comprised two scales (24-item Likert scale 1:5) on students' self-assessment of soft skills (Fabbri, 2020) and digital skills (Redecker & Punie, 2017). Subsequent to the Covid-19 restrictions and the start of the widespread use of Distance Learning, the instrument was supplemented by four open questions, wherein the potentials and issues of the students' educational experience using Distance Learning were surveyed.

The open questions were analysed by two independent evaluators, who, by applying ad hoc-created categorical systems (Tables 2 and 3), would discuss the responses until common agreement was reached on the doubtful cases.

Table 2. Categories and subcategories of responses to queries: *What worked in Distance Learning/What were the strong points of your Distance Learning experience?*

Categories	Subcategories
Individual dimension	Acquisition and consolidation of digital and technological skills
	Active participation of the shyest students
	More time for private study and group activities
Social dimension	Creation of an 'unlimited' space for interaction and participation
Teaching methodology dimension	The Online Collaborative Learning method
	Workshop and multimedia structuring of the course and in-progress redesign
	Increased opportunities for assessment of the work done, and importance of a democratic style on the part of teachers

Table 3. Categories and subcategories of responses to queries: *What did not work in Distance Learning/What were the weak points of your Distance Learning experience?*

Categories	Subcategories
Individual dimension	Personal involvement and concentration
	Using your own device
Social dimension	Socialisation and quality interactions
Methodological and didactic dimensions	Collaborative and constructive participation
	Collaboration with local stakeholders and educational agencies

Moreover, in this paper, the replies to research queries 1 and 2 were analysed jointly, as were the replies to questions 3 and 4.

4. Students' opinions of their Distance Learning experience

This section presents the qualitative data obtained from a semi-structured anonymous online qualitative–quantitative questionnaire, which set out to investigate the students' perceptions and opinions on their educational experience using Distance Learning, which had just ended.

4.1 Strong points

The first two open questions students asked were 'What worked in your Distance Learning experience?' and 'What were the strong points of your Distance Learning experience?'

Analysis of the answers enabled identification of the categories and their descriptive subcategories shown in Table 2, with the aim of reflecting the students' opinions on the variety of potentials found in the Distance Learning experience.

4.2 Individual dimension

Acquisition and consolidation of digital and technological skills

To an extent clearly greater than during in-person teaching, the students stated that they acquired technological skills, some of which were already familiar, while others were new, with regard to a greater variety of teaching tools. In particular, during the lessons and the organised individual and group activity sessions, students were able to become familiar with and use several online teaching platforms, questioning tools and online sharing environments such as Google Suite,

and customised synchronous messaging channels created by teachers in digital environments, such as Microsoft Teams: 'We were forced to learn to use technological systems to connect to our classmates and to cooperate'.

Active participation of the shyest students

Interactions mediated by technological apps – promoted through teacher-prepared scripts, which were then simulated by the students (collaboration scripts) – seem to have encouraged greater active participation by students who were generally the most reserved in face-to-face classroom learning situations. For example, this environment seemed to help these students share their opinions and views on topics discussed during the lessons using the Teams chat and/or by activating their microphones during lessons and OCL activities: 'I'm shy and usually I never speak in class, but thanks to the chat I was able to put my views forward. Compared to face-to-face lessons, Distance Learning helped me to overcome my fear of speaking in public, so I began to participate more, for example reading the work my group and I had done to the rest of the class'.

More time for private study and group activities

Due to the stoppage of travel from home to work or the university classroom during the months in lockdown, students found they had more time for individual study and OCL activities: 'We were able to use all our time and avoid all the difficulties of getting from place to place'. 'Staying at home made it easier for us to see each other and/or discuss things and it gave us more time to complete group tasks in less of a rush, outside lesson times'.

4.3 Social dimension

Creation of an 'unlimited' space for interaction and participation

The provision of new, alternative communication channels - general and/or customised - that enabled lessons to continue and facilitated interaction with students together with their active participation during the lockdown helped to create an 'unlimited' space for interaction and simultaneous discussion in a space–time dimension reaching far beyond the lesson times because that space also extended into leisure time, personal relations and private life: 'In spite of the distance, we were able to interact with each other and with the teachers in a different, more informal way, and at different times'. 'I did not expect this, but the online lessons developed a kind of online socialization and solidarity, both within the class and with the teachers'.

4.4 Teaching methodology dimension

The OCL method

Students considered OCL to be a good teaching method because it was effective and efficient from the point of view of content, organisation and socialisation: 'I think the group work was very constructive and enriching: as well as helping us to understand the course topics, it is a good alternative to the socialization that would otherwise be lacking due to the distance between us'.

Furthermore, the OCL experience was seen as an opportunity for developing both individual and social skills, along with the acquisition of surprisingly large amounts of content: 'It helped me both from the point of view of learning the subject - an approach to learning which I have built myself and which will stay with me, not just for the purposes of the exam - and from the social point of view, helping me to build relationships, to learn to manage conflicts, and to integrate people's different opinions'. 'It's an activity that gives you an idea of the job you'll be doing in the future. It's very interesting and useful for our future professions'.

Finally, but not less significant, although students encountered some initial difficulties, they found both role taking and role rotation stimulating and useful for the management of their activities: 'I had to take the role of the teacher, and I really felt aware of my responsibility in relation to my imaginary pupils'.

Workshop and multimedia structuring of the course and in-progress redesign

The specific course structure, which alternated between more traditional teaching - supported by multimedia and interactive elements - and group work, preceded by the presentation of authentic problematic situations and case studies, benefited the students' learning: 'The presentation of authentic situations and projects enabled more effective learning'.

The design of the two courses was changed while they were in progress by adapting to teaching rhythms and activities offered in response to student feedback. This permitted customised teaching for individual groups to be offered, which was in line with the design concept itself, as it was 'not so much the construction of a compulsory pathway as the definition of an idea which could dialog with the action and be modulated during the course, through the realization and adjustment of the action itself' (Rossi, 2014).

Finally, the students liked the fact that the OCL activities had 'real' aims, that is, the co-creation of an educational scenario and a specific, authentic planning artefact (Sansone et al., 2016) (the construction of a 3-year curriculum, a teaching unit and a teaching project) rooted in educational contexts linked to their professional skills: 'Naturally, the most interesting thing is to be able to get to grips with planning the teaching unit and drafting the curriculum: I felt that the concepts

actually took on shape and substance, so I was able to learn them and put them into practice quite easily. The support this provided was fundamental for studying, understanding and applying the theoretical side'.

Increased opportunities for assessment of the work done, and importance of a democratic style on the part of teachers

When teachers changed the activity design and the times required for OCL with respect to face-to-face collaborative group work, they were able to provide more opportunities for individual and group assessment of the co-created artefacts, encouraging students to evaluate the work done overall (Grion et al., 2020): 'With the teacher, we discussed the mistakes we had made, with the aid of examples from the work we had produced, and this gave us a fuller understanding of the theoretical topics explained during the lessons'.

The students also considered the use of an inclusive, democratic style on the part of teachers to be another essential ingredient for optimal Distance Learning. Students similarly appreciated the teachers' technological skills.

Weak points

To conclude, some student comments highlighting the main weak points in the students' Distance Learning experiences are gathered below. The descriptive categories identified, based on their replies, were the aspects concerning the individual, social and teaching methodology.

First, one of the problems concerning the individual dimension of Distance Learning that students highlighted was the diminished degree of personal engagement during lessons. Then, they indicated a loss of concentration also due to being distracted when attending lessons from the home environment because of, for example, inappropriate locations, noise, overcrowding, the presence of family members to be looked after and the difficulty of managing extended study time. Another issue reported concerned the digital divide: several students did not have a device or a suitable Internet connection that enabled them to follow lessons remotely. Some students reported technical problems caused by obsolete PCs and technologies. Others followed the lessons and participated in group activities using their smartphones. Still others had unstable connections or did not have devices such as cameras and smartphones. All these deficiencies negatively impacted both their learning and their interactions.

Second, regarding the social dimension, some students complained of a lack of truly significant communication exchanges with classmates and teachers. Some aspects of communications that are only possible face to face seem to be very important to all teaching relationships, especially for future primary school teachers and childcare workers. Students also felt that they were missing the chance to interact informally with classmates and students as well as direct contact with the physical spaces seen as defining, educational and social environments: 'We lost the nice things about the daily routine, from the train journey to the university to our coffee with friends before class'.

Third, students felt that their interactions with classmates during collaborative work were another critical factor in terms of teaching methodology. For example, some issues reported concerned the difficulty and complexity, also in light of the time required, of discussing topics and co-building knowledge using digital instruments. Other problems included the loss of relational and interactive dimensions and real-time feedback with classmates regarding the lessons and the artefacts co-constructed by each group: 'We missed the direct discussion with classmates and between groups on the work done, as well as the chance to share issues relating to the subject with the rest of the class'.

Conclusions

Considering the results of some experiments conducted internationally over the last 2 years, created with the aim of testing models of active teaching mediated by digital technologies, we have ascertained that student engagement in online courses can be more ambiguous and complex to assess than what can be achieved in face-to-face learning contexts (Andrew et al., 2021). Aside from these potential 'limitations' that require the teacher to achieve more timely monitoring of the teaching–learning experience, as has been shown in other studies (Khurshid, 2020), online collaboration in groups can not only enhance students' self-regulated learning abilities by making them more independent in the virtual learning environment, but also foster multimodal accessibility, interactive communications and improved learning processes (Almusharraf & Bailey, 2021). In addition, supporting social interactions through role taking seems to aid in the acquisition of individual and social agency, allowing each member of the group to participate and grow (Ligorio & Sansone, 2016).

It is no coincidence, then, that interest in networked collaborative learning practices is growing in schools and academia: 'The belief that collaboration is beneficial, a necessary part and parcel of work, personal life, and citizenship, especially in a digital age, is in the air' (Sobko et al., 2020).

Nevertheless, in the face of these important strengths, there are still some critical issues noted in the literature. For example, Wise and Schwarz (2017) pointed out that the construction of overly structured scripts can undermine students' autonomy and self-determination. The risk seems to arise from a reduction of intrinsic forms of motivation to fully engage in collaborative learning activities. Other authors address the issue related to what is called 'scripting mismatch', which is a situation wherein students cannot see the sense of either the script or the collaborative task. Therefore, they refuse to follow the script provided by the teacher: '[following] the script theory of guidance ..., it could be argued that students' internal scripts conflict with the external script provided, and to keep going, students need a certain level of alignment between internal and external scripts' (Heinonen et al., 2020, pp. 17–18).

Still, with respect to critical issues, students participating in collaborative online experiences may experience different types of difficulties (Capdeferro & Romero, 2012; Ferrari, 2015), which may relate to group organisation, lack of shared goals among members, lack of social skills in participants, imbalance with respect to levels of engagement and the quality of individual contributions. Other factors include the technical design of digital instruments, which can be a major barrier to cooperative online learning experiences (Kirschner et al., 2004). Studies similar to our contribution note that OCL 'requires careful planning of what to do before, to set the stage, during, to facilitate the process, and after, to assess the learning process and the outcomes' (Altowairiki, 2021, p. 423). In other words, OCL is a complex process because it requires thoughtful, pedagogical considerations regarding design, implementation and assessment (Altowairiki, 2021).

In conclusion, with regard to the active learning models and digital tools and environments made available during the two teaching experiences, we can assert that while the efficacy of group work and student involvement in collaborative activities may be a given, well documented by the literature, one factor to be considered in the planning step is the quality of the technical tools used for the delivery of an OCL experience (Ferrari & Reggiani, 2020). Moreover, other authors have 'found that most of the proposed platforms do not support some of the social factors that should be used to facilitate social interaction among learners and consequently enhance collaborative knowledge transfer. Time management, task division and individual motivation are among the most neglected features in the analyzed platforms' (Shawky et al., 2014, p. 14). Within any online learning experience, these tools may be a facilitator, if the tool in the digital environment is able to support teaching strategies and collaboration scripts, working methods and meta-reflective and knowledge co-construction activities. Or they may be a barrier, if the tool in the digital environment simply replicates traditional teaching models merely focused on the 'transmission' of knowledge.

On the other hand, inclusive digital environments, appropriately designed at didactic level (Laurillard 2009, 2012; Rossi, 2014) according to the methodological approach of CSCL (Dillenbourg, 2002; Dillenbourg et al., 2009; Lipponen, 2002), can sustain and implement students' collaborative learning at cognitive, metacognitive and creative levels (Scardamalia & Bereiter, 1992, 2003; Mukkonen et al., 1999). In view of this, it is strategically important to have a flexible learning design - because of the possible need to provide for changes while in progress - and to make an appropriate choice of accessible and sustainable digital environments wherein students can collaborate, share knowledge, discuss and work together on specific educational problems (Cacciamani et al., 2013; Fabbri, 2018; Panciroli et al., 2021).

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