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Teaching and Learning Centers and Coordinated Technologies for an Effective Transition at COVID-19 Pandemic Time to Massive Distance Learning and Online Exams

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Abstract

In higher education two key factors for achieving resilience during an emergency are the presence of a teaching and learning center, in charge of supervising all the switchover activities and providing daily assistance to lecturers and students, and the adoption of a variety of technological tools, each with a specific purpose but used in a coordinated way. In this paper we illustrate the rapid transition in the second half of the academic year 2019/2020 to massive distance learning and online exams guided by the teaching and learning center of the University of Urbino. The toolset featured the learning management system Moodle and the webconference tool Blackboard Collaborate, both employed for online lectures and oral exams, together with the e-proctoring tool Smowl for computer monitoring and the webconference tool Google Meet used on students smartphones for environmental monitoring, additionally employed for online written exams. We finally present the outcome of a survey of students opinions on massive distance learning.

KEYWORDS: Online Teaching, Online Exams, Learning Management Systems, Webconference Tools, e-Proctoring Tools.

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1. Introduction

During the second half of the academic year 2019/2020, i.e., from March to September 2020, the COVID-19 pandemic imposed an unexpected reorganization of lectures and exams within universities in order not to stop students careers. The second semester had commenced a few weeks before when on March 8 the lockdown period was decreed in Italy, thus forcing a massive conversion of face-to-face lectures into online ones. According to data collected by MUR, the Italian Ministry for University and Research, and Fondazione CRUI, the Conference of the Rectors of the Italian Universities, the reaction of the Italian university system was extremely rapid, at least technologically. Within one month from the beginning of the lockdown, more than 90% of the teaching activities of undergraduate courses ("corsi di laurea") had been moved online.

In mid May several restrictions about traveling as well as interpersonal distance were still active, so that also exams and thesis defenses had to be supported by digital technologies. This opened a passionate debate on how exams, especially written ones, had to take place online. Actually, the discussion about massive distance learning had already started in March, with an increasing number of webinars organized by both Fondazione CRUI and CODAU, the Conference of the Directors of the Italian University Administrations, in which a few universities presented their experiences and several vendors illustrated their products. Those webinars were

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important occasions for all the Italian universities, which participated through their delegates to digital transformation and innovative teaching as well as their technical staff, to share information about digital technologies and teaching methodologies so as to improve resilience to the pandemic.

The objective of this paper is to report on our experience at the University of Urbino in facing the transition to massive distance learning and online exams due to the COVID-19 outbreak. The main lesson learnt is that two key factors for achieving a quick and successful change from face-to-face to online didactics are the presence of a teaching and learning center, in charge of supervising all the switchover activities and providing daily assistance to lecturers and students during the pandemic, and the choice of a variety of tools, each serving a specific purpose but used in a coordinated way.

The paper is organized as follows. In Section 2 we discuss the role of teaching and learning centers, especially in an emergency period, and the use of coordinated technologies. In Section 3 we recall the activities of the teaching and learning center at the University of Urbino along with the organization of its Moodle platforms. In Section 4 we illustrate the rapid transition to massive distance learning, online thesis defenses, and online oral exams via Moodle and the webconference tool Blackboard Collaborate under the guidance of our teaching and learning center. In Section 5 we address online written exams conducted through a combination of the e-proctoring tool Smowl on students computers and videosurveillance via Google Meet on students smartphones. In Section 6 we present a survey of students opinions on massive distance learning and online exams. Finally, in Section 7 we provide some concluding remarks.

2. Teaching & Learning Centers and Coordinated Technologies

Teaching and learning centers (T&LCs) serve as crucial support systems for lecturers and students by fostering effective teaching and learning practices. They have become integral to modern higher education institutions, aiming to improve teaching quality and students learning outcomes. They provide lecturers and students with a range of resources, training, and support to enhance their educational experience. Simultaneously, the rapid advances in technology have led to the integration of online solutions, such as learning management systems (LMSs) and massive open online courses (MOOCs), to address the growing demand for flexible and accessible education.

In general, T&LCs in higher education institutions have the following functions:

- Lecturers development by offering workshops, seminars, and one-to-one counseling to cover pedagogical strategies, technology integration, and innovative teaching methodologies. T&LCs encourage a reflective teaching approach and foster continuous improvement in instructional practice (Baker et al., 2017).
- Students support for improving their learning skills, such as time management, note taking, and study techniques. T&LCs also provide tutoring services, writing centers, and peer-assisted learning programs to enhance students success and retention rates.
- Instructional design by collaborating with lecturers to (re)design courses to align with learning objectives and engage students effectively. T&LCs promote the use of active learning strategies, technology tools, and multimedia resources to create engaging learning experiences (Nilson and Goodson, 2021).
- Assessment and evaluation by assisting lecturers in developing appropriate methods and rubrics to measure students learning outcomes. T&LCs also offer support in analyzing assessment data to improve course effectiveness and identify areas for enhancement (Walvoord and Anderson, 2011).

Information and communication technology is at the core of T&LCs for enabling distance learning and online exams. It provides digital tools like LMSs, webconference platforms, virtual classrooms, and content sharing utilities, which facilitate the creation and delivery of interactive, multimedia-rich online courses. It also supports online examination systems, ensuring secure test administration, plagiarism detection, and efficient grading. Features like automated evaluation, instant feedback, and data analytics assist lecturers in assessing students performance and identifying areas for improvement. T&LCs should instruct and guide lecturers and students in the use of all these technologies, by clarifying which tool should be employed for which purpose as well as providing a coordinated view of all the tools made available by the institution.

How does the role of T&LCs and coordinated technologies change in the case of emergencies such as pandemics, floodings, and earthquakes? Their role becomes even more important, as was realized worldwide with the advent of the COVID-19 outbreak, which caused a rapid replacement of all in-person activities related to course delivery and examinations by transitioning to online mode.

In these situations, a T&LC should assist the education institution in maintaining a high level of quality during the shift from face-to-face or blended teaching to massive distance learning. The initial step in this direction involves using virtual classrooms and webconference tools to reproduce face-to-face lectures. However, when the emergency persists, it becomes necessary to harness multiple available technologies to propose alternative synchronous and asynchronous activities, with the aim of compensating for the inevitable decrease of human interaction that the situation of distancing entails. Regarding examinations,

they should be conducted in a manner that ensures formal integrity of exam tests and verifies students identity (Rodchua, 2017; Bawarith et al., 2017; Butakov et al., 2019; Sanchez-Cabrero et al., 2021; Muzaffar et al., 2021). At the same time, measures must be adopted to safeguard the privacy and data of those connecting from their homes within various virtual environments (GDPR, 2023).

3. Teaching & Learning Center and Blended/Distance Learning at Urbino

Since the academic year 2004/2005, at the University of Urbino a very limited number of undergraduate programs offer online activities. From the academic year 2004/2005 to the academic year 2013/2014, they used different LMSs: Land of Learning (Pigliapoco & Bogliolo, 2008; Pigliapoco & Lattanzi, 2009), ItsLearning (2023), and Moodle (2023).

At the beginning of 2015, a big investment was made to create a T&LC called CISDEL – *Centro Integrato Servizi Didattici ed E-Learning* (Sisti, 2019). The center coordinates and provides support for face-to-face and online activities dedicated to undergraduate and graduate students as well as all lecturers and their collaborators. The aforementioned activities focus on methological issues and consist of courses and seminars about teaching and learning strategies, paper writing, bibliographic search, content-and-language integrated learning, and intercultural laboratories.

Furthermore, after one year of experimentation in 2014/2015, with the advent of CISDEL all the distance learning activities were integrated into three Moodle platforms, each one having a different purpose and accessible in single sign-on by all lecturers and students, which are hosted by the local server farm since the academic year 2015/2016. At the beginning of every academic semester, CISDEL organizes seminars to instruct lecturers about how to set up and use Moodle resources and activities. Moreover, it maintains a web page where plenty of short textual notes and videotutorials are available to help using Moodle.

The first platform, *Moodle blended*, is structured by automatically importing the whole undergraduate offer from the software system U-Gov Didattica (Cineca, 2023) via the Moodle plug-in Course Fisher (Course Fisher, 2023). It provides a virtual room for each course of every undergraduate program, which in the academic year 2019/2020 were 34 divided into 15 “laurea triennale”, 5 “laurea magistrale a ciclo unico”, and 14 “laurea magistrale biennale”. These programs were overall composed of almost 1,000 courses, taught by more than 300 professors and researchers and 400 external lecturers – assisted by 40 foreign language experts – and attended by slightly more than 14,000 students.

Every room is accessible only by the lecturer teaching that course, who has to register via Course Fisher, and all students enrolled on that course, who have to register via the Moodle plug-in AutoEnrol (AutoEnrol, 2023) based on data extracted from the students career management system Esse3 (Cineca, 2023). Moreover, the room is automatically equipped with a link to the web page of the course and a forum. In each of the academic years from 2015/2016 to 2018/2019, more than 80% of the aforementioned virtual rooms were used for discussing on the forum, sharing teaching material in the form of lecture notes, slides, or multimedia resources, and organizing activities such as quizzes and assignments by means of which students can assess their preparation before taking exams.

The second platform, *Moodle elearning*, is structured in the same way, but is devoted to the undergraduate programs that offer part of their lectures online, which were 5 in the academic year 2019/2020. These programs, mainly related to computer science, social science, and communication science, started using in the academic year 2004/2005 the very rich textual chat of Land of Learning, which we subsequently implemented in Moodle to overcome the limitations of its native textual chat (Bontà et al., 2016). Between 2014 and 2016 the open-source webconference tool BigBlueButton (BigBlueButton, 2023) was experimented to move from a message-based interaction to a more friendly, audiovisual interaction. At the beginning of the academic year 2016/2017, CISDEL decided to adopt the proprietary webconference tool Blackboard Collaborate (henceforth BBCollab) (Blackboard Collaborate, 2023) for all distance learning synchronous activities within all Moodle platforms. BBCollab allows lecturers to plan and give their audiovisual lectures directly inside Moodle and students to find the recordings again inside Moodle. In addition to features available in most webconference tools like a textual chat, document presentation, and screen sharing, BBCollab already provided a button for raising a hand, an integrated whiteboard, a polling mechanism, support for breakout groups, and dynamic management of roles and permissions, which are quite effective in a teaching context. Till February 2020, it was used only inside the Moodle elearning platform for the audiovisual lectures of the 5 aforementioned programs.

The third platform, *Moodle education*, contains virtual rooms for all the other teaching activities like CISDEL services, foreign language courses, contamination labs, summer/winter schools, postgraduate masters, PhD programs, and lifelong learning for university personnel, school teachers, professionals, companies, and institutions, including courses on safety in work places as well as personal data protection regulations.

4. Switching to Massive Distance Learning and Online Oral Exams

The University of Urbino had to stop its on-site teaching activities already on March 2, one week in advance with

respect to the national lockdown. A couple of days before, lecturers and students were informed via e-mail, social networks, and the official website. Till the end of May, all face-to-face lectures were substituted for by online ones, taking place according to the same timetable, on the Moodle blended platform via BBCollab. To cope with connectivity problems or lack of adequate devices, CISDEL invited lecturers to record their online lectures – some of them uploaded pre-recorded activities – and students to keep their microphones and webcams disabled except when asking questions.

The University of Urbino was ready for this quick and broad switchover, so as not to stop students careers, for two reasons. The former was the presence of a T&LC – CISDEL – that had periodically trained users and to which users were accustomed to ask for assistance. The latter was the availability of an LMS for all the undergraduate programs – the Moodle blended platform – with which the vast majority of lecturers and students were familiar since the end of 2015.

The aforementioned switchover had to be accompanied by a number of additional measures, though. Firstly, CISDEL assistance, mostly taking place via e-mail, was enhanced by introducing a phone help desk responding Monday to Friday from 9 am to 6 pm. Secondly, the web page maintained by CISDEL was enriched with additional notes and videotutorials about distance learning because only the lecturers and students of 5 undergraduate programs out of 34 were used to meet via BBCollab. Thirdly, a higher number of computational resources had to be reserved in our server farm to the Moodle blended platform to satisfy the increased workload. The platform architecture was also optimized in terms of caching and parallelism and entirely revisited by decoupling the application from its database for achieving better performance.

From the beginning of March to the beginning of May, we were able to manage every workday around 10,000 users accessing our Moodle blended platform and using BBCollab in it, with peaks of 3,000 users in the same hour, especially in the morning. By the end of March, more than 90% of our almost 1,000 courses within the 34 undergraduate programs were delivered online. A positive side effect was that also the 4 PhD programs started using Moodle and BBCollab systematically. The undergraduate and PhD theses defenses scheduled on March and April were moved to BBCollab as well and broadcast via the official web channel to allow relatives and friends of graduating students to attend.

Starting from mid April, oral exams took place – like distance lectures – within course rooms in the Moodle blended platform via BBCollab. According to a precise protocol, before starting each exam the lecturer had to make sure of the student identity. Moreover, the lecturer had to verify – via the student webcam – that no other person was in the student room and that no teaching material was near the student computer – except for the case of a student with special needs – with the verification being repeatable at any time during the exam. The protocol allowed all students enrolled on a course to follow online exams of that course, with their microphones and webcams off.

It is interesting to revisit the decision made by CISDEL in 2016 of adopting BBCollab in the light of the extraordinary development of webconference tools that was observed during the first half of 2020, witnessed by the success of Zoom (Zoom, 2023), the enhancement of Cisco Webex (Cisco Webex, 2023) and Adobe Connect (Adobe Connect, 2023), and the transition from Skype to Microsoft Teams (Microsoft Teams, 2023) and from Google Hangouts to Google Meet (Google Meet, 2023). All those tools have been empowered in general terms, for instance by supporting higher numbers of simultaneous participants, most of whom visible in a grid layout, but not in specific terms for distance learning. Being adequate in a teaching context means satisfying requirements ranging from integrability with the major LMSs – for a distance learning experience as complete as possible – to ease of use in the most widespread operating systems and browsers – as the audience is wide and variegated – and presence of functionalities typical of a teaching environment – distinction of roles and permissions, integrated whiteboard, button for raising a hand, polling mechanism, etc.

Despite the mentioned advances, which made the considered webconference tools well suited for smart working, we believe that the choice of BBCollab was still fully adequate in the second half of the academic year 2019/2020 for the didactic needs of lecturers and students. To the best of our knowledge, at that time BBCollab was the only webconference tool possessing all the following features together:

SETTINGS, ROLES, PERMISSIONS:

- usable on the operating systems Linux, MacOS, Windows, Android, IOS via the browsers Firefox, Chrome, Safari without having to install any additional software component;
- supporting up to 250 participants in normal mode and 500 participants in webinar mode;
- establishing audiovisual connection subject to prior consent to share microphone and webcam;
- multiple roles: moderator, speaker, caption creator, participant;
- multiple permissions: audio, video, messages, drawings;
- dynamic management of roles and permissions, including expulsion.

FUNCTIONALITIES:

- visibility of the full list of participants and their status in textual format;
- possibility to record audiovisual chats;
- buttons immediately accessible for activating/deactivating microphone and webcam;
- button immediately accessible for raising a hand with audio and popup notification;

- integrated textual chat with emoji and audio and popup notifications;
- integrated whiteboard usable in a shared way;
- sharing the entire screen, an application in a single window, or a document;
- sharing a further webcam (to frame a text, an object, or a physical board);
- live manual caption creation;
- live polling mechanism;
- breakout groups.

INTEGRATION IN MOODLE:

- planning and joining audiovisual chats within Moodle;
- guest link for the participation of those who have no Moodle access;
- availability of audiovisual chat recordings within Moodle;
- keeping user identity when moving from Moodle to an audiovisual chat;
- coordination between Moodle roles (lecturer, collaborator, student) and audiovisual chat roles.

5. Online Written Exams: Proctoring + Videosurveillance

The organization of an online written exam is more complex because of multiple students taking the exam simultaneously, instead of one at a time like in an oral exam. Many lecturers thus decided to convert their written exams into oral ones during the second half of the academic year 2019/2020. However, there are disciplines like sciences, economics, and foreign languages for which this is not always appropriate or feasible.

Similar to traditional written exams, online ones can be computer based or take place by pen and paper. In the former case, the Moodle activities quiz and assignment naturally lend themselves to be used for setting up a written exam, provided that the lecturer can monitor the correct behavior on each student computer. In the latter case, Moodle can still be useful for delivering the text of the exam to all students, with the lecturer checking what is going on via each student webcam. In both cases, a webconference tool is necessary to establish a communication channel between the lecturer and the students throughout the exam, so that students can pose questions and the lecturer can answer them or warn students in case of misbehavior.

In March a big debate started within the Italian universities about how to guarantee the correctness of online written exams, also known as academic integrity. One option is to adopt an e-proctoring system, which is a mechanism for controlling what is happening on students computers. These systems range from lockdown browsers, which prevent students from launching programs different from the allowed ones, to applications performing facial recognition and monitoring all computer activities, which let students use any program. A different option is to set up a videosurveillance system for environmental monitoring by taking advantage on the lecturer side of the grid or carousel view available in many webconference tools like Zoom, Google Meet, and Microsoft Teams. Every position in the grid corresponds to a student smartphone, located in the student room in such a way that the lecturer can see both the student and the student computer or the paper on which the student is writing.

The debate was motivated by the fact that e-proctoring systems seem to be more effective – even in the case of pen-and-paper exams as students may cheat by looking for answers on computers – but they are more expensive, usually require students to install additional software components on their computers, and should guarantee a full compliance with regulations about students privacy. On the other hand, the videosurveillance option does not incur the aforementioned problems, but is less effective as it does not really permit to observe what is happening on students computers, especially when there are many students taking the exam.

While most universities considered the two options as alternative to each other, we viewed them as complementary, so that the strategy adopted by CISDEL was to combine an e-proctoring system with videosurveillance. As for e-proctoring, we avoided resorting to lockdown browsers like, e.g., Safe Exam Browser (Safe Exam Browser, 2023). Although they constitute the most adequate option for computer-based exams taking place on-site, in which computers are used by students only during the exams, in the case of online written exams these tools may not be able to detect (and close) programs opened by a student before the exam commences, thus the student may keep sharing the computer screen with a third party who may suggest the right answers. Among the remaining systems, we focused on European solutions, for a higher confidence in privacy regulation adherence, that could be used within LMSs, in particular Moodle.

We adopted the GDPR-compliant, Moodle-integrated, e-proctoring tool Smowl (Smowl, 2023), also because it allows several Moodle activities to be monitored – not only quizzes – and from May to September it was offered at a discounted price depending only on the number of students using the tool – instead of the number of exams taken by those students. Smowl performs facial recognition without resorting to videos. In contrast, it takes one picture per minute on average via the student webcam and highlights with a red frame those in which the student is not in front of the screen or some other person replaces or gets close to the student during the exam. In addition to that, through the Smowl CM component it monitors all the applications that are open on the student computer – including those launched before the exam, possibly automatically by the operating system – by periodically taking screenshots. Videosurveillance was instead realized via Google Meet on student smartphones with the grid view active on the lecturer computer, thanks to the free educational license available at the University of Urbino.

The precise protocol to be followed in the case of written exams was established in mid May. More than 100 courses jointly used Smowl and Google Meet till the end of September, with almost 4,000 students involved in online written exams. In that period, the University of Urbino was among the very few ones that handled online written exams by a combination of tools each serving a specific purpose:

- Moodle for delivering exam tests and receiving students answers via quiz or assignment activities, as well as for hosting the BBCollab activity, the Smowl proctoring, and the Google Meet url.
- BBCollab for the initial phase of the exam and audio monitoring afterwards, with the latter allowing students to pose questions and the lecturer to provide clarifications and warn misbehaving students.
- Smowl for e-proctoring consisting of students facial recognition via students computer webcams and application monitoring on students computers.
- Google Meet for environmental monitoring via students smartphones – with the grid view active on the lecturer computer – which can also be considered as a secondary channel to communicate with students.

The Smowl plug-in for Moodle originates a Smowl block inside Moodle that has different functionalities for lecturers and students. Prior to the first online written exam, a lecturer has to activate the Smowl block inside the Moodle room of the course; in this way, the Smowl block becomes available also to all students enrolled on that course. On the other hand, regardless of the specific course, at least 72 hours before the first online written exam a student has to register once and for all with Smowl, by following a link available in the Smowl block of the course. Smowl registration is accomplished by taking three facial pictures – for facial recognition at exam time – and installing the Smowl CM component on the computer – for monitoring applications at exam time. In 2020 the Smowl CM component was available for Windows and MacOS, but not for Linux, and the recommended browsers when using Smowl at exam time were Firefox and Chrome.

From the Smowl block of the course, the lecturer sees which students successfully registered to Smowl and decides which quiz or assignment activities should undergo to Smowl monitoring. At the beginning of the exam, the lecturer and the students virtually meet on the Moodle blended platform via BBCollab. For each student, the lecturer performs the same verifications mentioned in the case of online oral exams and additionally checks that no HDMI cable is attached to the student computer, so as to avoid hardware connections with nearby people which could not be detected by Smowl. The student is then invited to join Google Meet via the smartphone, to be located in a proper position as already described.

After this initial phase, the online written exam can start. When entering the Moodle quiz or assignment, every student is informed that the Smowl monitoring is about to start and is asked consent to proceed. Then the image captured by the student webcam is displayed within Moodle to the student and a small window reminding the student that Smowl CM is active stays open until the end of the online written exam. Computer monitoring through Smowl CM is in use only during the online written exam and the student is free to install it just before the exam and remove it as soon as the exam is over.

On the lecturer side, the Smowl CM monitoring outcome can be immediately looked up from the Smowl block as screenshots are made available in real time. In this way, the lecturer can promptly warn students who are using, intentionally or because launched in background by the operating system, applications that are not permitted, especially those allowing for screen sharing as well as search engines. In contrast, the facial recognition outcome is available within 24 hours, i.e., pictures are not immediately ready. This delay can be mitigated thanks to the use of the environmental monitoring via Google Meet, as the lecturer can see in real time all students taking the exam and may notice inappropriate situations, even if not systematically as Smowl would do.

6. Student Opinions on Massive Distance Learning and Online Exams

All the 14,372 undergraduate students of the University of Urbino were invited via e-mail to participate in a survey on massive distance learning and online exams that took place from July 25 to September 7. The survey was administered as a computer-assisted telephone interview by an external company and supervised by an internal committee not involving CISDEL. The overall number of returned questionnaires was 1,901. The question set was divided into three parts: attendance, connectivity, devices, BBCollab (13 questions); distance learning assessment (18 questions); future of distance learning (5 questions).

The first part pointed out that, between March and May, 86% of students participated in at least two online courses, 84% attended at least half of the lectures, 80% of lecturers recorded their online lectures, and recordings of at least half of the lectures were downloaded by 70% of students. As far as connectivity is concerned, 45% of students used an ADSL connection, 38% a fiber connection, and 14% a mobile connection, in 87% of cases from a room not shared with other people. The most frequently used devices for online lectures were laptop computers (70%), followed by desktop computers (16%), smartphones (10%), and tablets (4%) – with smartphones being the most used as secondary devices (52%) – where those devices where shared with other people in 20% of cases – with sharing yielding attendance problems in 28% of cases. Apart from 30% of students who did not experience any problem during online lectures, 50% encountered connectivity problems, 13% problems with BBCollab,

and 4% problems related to obsolete devices or scarce familiarity with technology. With respect to the use of BBCollab, 11% of students never had connectivity problems, 34% rarely, 50% sometimes, and 4% always, with 92% of students rating BBCollab at least 6/10.

The second part revealed that 72% of students preferred that the lecturer kept the webcam on - while in 16% of cases it was on and in 66% of cases it was sometimes on and sometimes off – and 83% of students always kept their webcams off. The use of webcams was viewed as rather intrusive by 57% of students and a high source of distraction by 57%, whereas it was considered to foster a good interaction level with the lecturer by 54% and a high sense of community by 35%. According to 87% of students, most lecturers left enough time for students questions and interventions, with the latter taking place in all online lectures in 50% of cases and in some online lectures in 37% of cases, with a frequency higher than, comparable to, or lower than the one of face-to-face lectures in 28%, 41%, or 24% of cases, respectively, and a higher ease of intervention ascribed to the textual chat in 46% of cases and the microphone in 29%. The impact of distance learning was rated at least 6/10 by 75% of students with respect to what they learnt, 70% with respect to oral exams, 63% with respect to the interaction with the lecturer at teaching time, 58% with respect to keeping attention during lectures, 55% with respect to the interaction with the lecturer before or after teaching, 46% with respect to written exams, 45% with respect to the interaction with the lecturer at reception time, and 32% with respect to the interaction with coursemates.

The third part showed that in the future distance learning should be integrated with face-to-face lectures according to 61% of students, be used only in emergency or specific situations according to 28%, and replace traditional lectures according to 10%. The major strengths of distance learning emerging from the survey were higher flexibility and accessibility due to lectures recording, reduction of traveling time and costs, and elimination of teaching room overcrowding, whilst the major weaknesses were connectivity problems, distraction, difficulties with online exams, poor interaction with coursemates, and the need of improving online teaching material and methodologies. For the first semester of the academic year 2020/2021, the possibility of following lectures both on-site and online was selected by 49% of students, while attending only on-site or only online was chosen by 18% and 32%, respectively.

7. Conclusions

The pandemic accelerated the exploration of distance learning, which is thus expected to be adopted more frequently in the future as a natural complement to traditional teaching. A large body of literature (see, e.g., Seechaliao, 2017) shows how the relationships among pedagogical methodologies, disciplinary contents, and technological applications impact on the transformative nature of learning and teaching processes. In particular, the effective use of technologies in educational contexts depends on its acceptance, which represents a prerequisite and at the same time a critical factor for the improvement of the aforementioned processes (El-Gayar et al., 2011; Birch and Irvine, 2009; Radovan and Kristl, 2017). As indicated by the survey, the current generation of students is definitely ready for a higher education that integrates face-to-face activities with online ones and audiovisual material (Ghilay, 2016).

Our experience in tackling the COVID-19 pandemic emphasizes the importance of an LMS already in place for all the major teaching activities, along with a T&LC in charge of supervising the transition and assisting lecturers and students every day. In case of health, weather, hydrogeological, and seismic emergencies, both factors contribute to reduce enormously the switchover time and increase consequently the institution resilience. Furthermore, having good educational tools is as important as receiving suitable guidelines, so as to avoid a chaotic use of technology arising from a multitude of similar digital platforms made available to lecturers and students without explaining when to use them and how to exploit their strengths and cope with their weaknesses.

As for massive distance learning, our experience shows that it is fundamental to have not only a mature LMS like Moodle, but also an integrated webconference tool like BBCollab that is teaching oriented, i.e., possesses features that are strictly necessary in a teaching context. If we consider instead online written exams, it turns out that using an e-proctoring tool alone is not fully satisfactory from a timing viewpoint, while resorting to videosurveillance alone is even risky as it provides no systematic feedback about what is happening on students computers. To set up an effective anti-cheating system, we firmly believe that the right solution is a GDPR-compliant combination of e-proctoring and videosurveillance. On the other hand, we noticed that, on average, lecturers are not ready yet for the adoption of advanced e-proctoring tools like Smowl that offer a wide gamut of functionalities. Rather, they seem to prefer simpler tools like lockdown browsers, even if these tools cannot guarantee the same level of academic integrity.

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