Evaluation of emergency remote teaching during covid-19 lockdown in a Spanish university

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Abstract

The lockdown caused by the pandemic resulted in the closure of schools and universities. Professors had to adapt their subjects to be taught remotely to continue their classes, and students had to cope with various personal situations such as isolation, and returning to their countries. Ensuring that the quality of teaching was maintained would usually have required months of planning and design. In contrast, these changes had to be made in a few days, which is why this situation could be considered as Emergency Remote Teaching (ERT). The objective of this article is to evaluate the teaching of our faculty during this period using the CIPP model (Context, Input, Procedure and Product), which is especially focused on educational projects among others. The university was able to maintain teaching during this period despite the difficulties of the transition. In addition, evaluation surveys show that the satisfaction of professors and students was also maintained. This was possible thanks to the order and clarity transmitted from university authorities and the commitment of the professors, despite their increased workload. This knowledge is important to ensure a better response by universities in future emergencies.

Practitioner Notes

1. The lockdown produced by the Covid-19 pandemic forced universities to design and develop Emergency Remote Teaching (ERT) responses.
2. Emergency Remote Teaching (ERT) and policies should be evaluated.
3. The creation of a committee to manage and organise the transition to ERT releases professors from these tasks.
4. Online assessment is the biggest barrier during ERT due to the different concerns of professors and students.

Keywords

Lockdown, Covid-19, Emergency Remote Teaching, CIPP model

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Introduction

The sudden lockdown imposed by the Covid-19 viral pandemic led to the closure of schools and universities around the world. Educators had to adapt all their teaching to distance learning in few days, in most cases without experience on online teaching and without training or preparation. The resulting teaching modality is what Hodges et al. (2020) define as emergency remote teaching (ERT): "A temporary shift of instructional delivery to an alternate delivery mode due to crisis circumstances. It involves the use of fully remote teaching solutions for instruction or education that would otherwise be delivered face-to-face or as blended or hybrid courses and that will return to that format once the crisis or emergency has abated." In this case, emphasizing that the switch to online teaching should be done in a very few days, we could refer to it as *immediate* emergency remote teaching. Bozkurt et al. (2020) remarked the difference between emergency remote education and distance education: the latter is an option while the former is an obligation. Distance education is a planned activity and its implementation is grounded in theoretical and practical knowledge, which is specific to the field and its nature while emergency remote education is about surviving in a time of crisis with all resources available, including offline and/or online. They argued that emergency remote education could be considered as a branch of distance education.

Certainly, recent technologies such as web conferencing and video platforms were an immense help, and without them it would have been impossible to go on with the academic course. However, both professors and students had to face numerous challenges (Adedoyin & Soykan, 2020).

In the case of professors, they had to tackle technological challenges. Despite some of the professors already had some experience with distance learning, it had been necessary to prepare and support educators for teaching remotely (Bozkurt et al., 2020; Trust & Whalen, 2020) and most of them had to learn how to use effectively video conferencing and other e-learning tools (DeVaney et al., 2020; Gacs et al., 2020). Likewise, the pedagogical challenges were not minor (Rapanta et al., 2020). Teaching face-to-face and teaching online require a different set of skills as the student-professor interaction is very different (Castañeda & Selwyn, 2018; Goodyear et al., 2001; Schoenfeld-Tacher & Persichitte, 2000). Physical classrooms allow communication before, during and after the class in which the professor can read the body language of students. Achieving this in an online environment is difficult, and even impossible in the case of asynchronous teaching (Chen et al., 2020; Radha et al., 2020). Lecturers had to adapt their materials, create online content, and redesign activities. A key problem was the organization of laboratory activities without access to laboratories in degree programs such as chemistry, physics or engineering (Ametepe et al., 2021; Campari et al., 2020; Carli et al., 2021; Feisel et al., 2005). The most challenging part of the transition to remote learning was designing new suitable assessment and evaluation methods for an online environment (Munoz & Mackay, 2019). In addition, personal and family circumstances made conciliation difficult. Derndorfer et al. (2021) refer that working from home during the lockdown was particularly challenging, especially for mothers with children under 15 years.

In the case of students, although some studies show that they remained motivated despite the difficulties during the Covid-19 pandemic (Rahiem, 2021), it was not easy for them either. Personal circumstances of each student could have been entirely different. From families without good Internet access, IT equipment or suitable spaces to study online, to students that were left alone in their students' apartment or who returned to their countries and had different time zones (Rahiem, 2020). In that new scenario, their habits of study and routines were broken, and they had to get

familiar with digital tools and adopt new learning methodologies (Vermunt & Donche, 2017). Another source of concern was the uncertainty regarding assessments and final evaluations until the faculty took decisions and communicated them (Schiff et al., 2021). They were also stressed for the lack of social contact and interaction with their classmates, which is a strong factor of engagement and motivation for them (Ryan & Deci, 2000). Schiff et al. (2021) warned of the risk that repeated exposure to media coverage of the community threat could lead to increased anxiety and stress, affecting students' learning.

The purpose of this paper is to evaluate the different teaching and assessment methods adopted by professors at Tecnun, the Engineering School of the University of Navarra, during the lockdown caused by the Covid-19 pandemic. According to this objective, and considering the characteristics and the environment in which online teaching is implemented, we can specify the following research questions:

RQ1. What has been the effectiveness of the different methodologies and tools used during the ERT period?

RQ2. What is the degree of satisfaction of professors and students with the information transmitted, and with the measures and decisions taken during this period by the University?

RQ3. Is it possible to improve the performance in case a similar emergency occurs?

The rest of the paper is structured as follows. The following section explains the methodology used for the evaluation of the ERT. In the next section, the sources considered for the evaluation are described. The fourth section summarizes the transition in the teaching model during the confinement. The fifth section presents the results obtained according to the chosen methodology. Finally, the conclusion discusses the answers to the research questions formulated in this section and their usefulness for dealing with other emergencies in the future.

Methodology

For teaching to be effective and of high quality, both in the face-to-face and online modalities, the planning and design of the learning process is key. First of all, different aspects must be analyzed: the context in which the process is going to be developed, the characteristics of the students, the material means available, the contents and learning objectives, etc. Based on this analysis, the teaching method, the general structure of the course, the most appropriate activities to achieve the learning outcomes, the evaluation method to be implemented, etc. are decided.

In the month of March, the confinement caused by the Covid-19 pandemic totally changed the circumstances. Faculty were forced to move from face-to-face teaching to fully online learning solutions. As the environment where learning and teaching took place was altered, all elements within the learning context were impacted. The careful design process, which might normally take months (Hodges et al., 2020), in this emergency situation had to be completed in two days. The courses should be evaluated according to what the circumstances of the course reveal. For that reason, the questions to be ask to students and teachers in course evaluations will be different for those designed online versus designed for face-to-face but delivered online due to the need for emergency remote teaching and learning, although they should still relate to the key learning design parameters.

Following the suggestion of Hodges et al. (2020), we used the CIPP model for the evaluation of the ERT carried out at our faculty. The CIPP evaluation model is configured specially to enable and guide comprehensive, systematic examination of social and educational projects. The name of the CIPP model corresponds to the acronym CIPP, which refers to its four core concepts: context, input, process and product evaluation. "Context evaluations assess needs, problems, and opportunities as bases for defining goals and priorities and judging the significance of outcomes. Input evaluations assess alternative approaches to meeting needs as a means of planning programs and allocating resources. Process evaluations assess the implementation of plans to guide activities and later to help explain outcomes. Product evaluations identify intended and unintended outcomes both to help keep the process on track and determine effectiveness" (Stufflebeam, 2002).

We asked ourselves 10 questions that appear in the following table according to the CIPP evaluation model:

Table 1

Evaluation questions integrated in the CIPP model concepts

Context	1	How many students not residing with their families during the course returned home and how many remained in their colleges, residences or student apartments?
	2	How widespread was the use of technological tools for teaching among Tecnun professors?
Input	3	What means has our faculty and the University put in place to support professors in the transition to remote teaching?
Procedure	4	How effective was the communication between students, professors, School of Engineering and University of Navarra?
	5	What percentage of subjects were adapted to remote teaching?
	6	Was the design of the subjects adapted to the new circumstances? (Workload, evaluation...)
	7	Which tools have been mainly used during remote teaching?
	8	What were the main difficulties encountered by professors in adapting their online teaching?
Product	9	How satisfied are professors and students with remote teaching?
	10	What conclusions can be drawn about online teaching methods for the future?

Participants and measurements

In accordance with the CIPP methodology, we have compiled the various data collected during the confinement period in order to conduct the assessment. These data include various surveys and interviews, which are described below.

University-wide students survey

The University conducted a questionnaire to all its students in May 2020. It asked students about their studies, and their places of residence, both usual and during confinement. The questionnaire also included 11 questions, to be rated according to a Likert scale, about teaching, and three free-response questions about their experience at the University during this time: strengths and positive aspects, weaknesses and negative aspects, and other suggestions or comments. The questionnaire was answered by 160 Tecnun students (a response rate of 16% percent).

University-wide professors survey

Another University-wide survey was conducted also in May 2020 on the type of teaching done during the confinement, the degree of satisfaction and the effort required to teach. All of them to be rated according to a Likert scale. The survey was answered by 53 Tecnun professors (a response rate of 36% percent).

Faculty-wide professors survey

We conducted a survey of Tecnun professors on tools used before, during and after the confinement in order to assess the impact it had on the use of ICT in their teaching. The survey was answered by 59 professors (a response rate of 40% percent).

Online Teaching Committee

Faced with the prospect of the cessation of face-to-face activity at our faculty with students attending classes, but with the staff preparing material and teaching online at the facilities, an Online Teaching Committee was set up consisting of a member of the Board of the School, a professor from each of the four departments, a technician from the IT service and two professors with previous online teaching experience. The overall objective of the Committee was to provide guidelines to facilitate the work of professors in adapting their face-to-face teaching to distance learning and to give them the necessary support, as well as to be a link for communication and exchange of experiences among professors.

The following section describes the process of adapting face-to-face teaching to remote teaching. For this purpose, the members of the committee were interviewed and the documentation produced by the committee was consulted.

Transition to remote teaching

The lockdown occurred on March 16th of 2020 (Real Decreto 463/2020, 2020), during the second semester held between January and June. Professors taught 87 different subjects at that time, some of them common to several degrees. The teaching methodologies used before the confinement were lecture-based classes, flipped learning, laboratory classes and case method. In the case of lecture-based classes, we can also distinguish between the theoretical classes with blackboard or slides and the problem focused classes.

The Online Teaching Committee during that time was to worked in parallel on three critical aspects to keep the teaching of all the subjects active:

1. Internal organization of the calendar and of the teaching activities planned for those three weeks (handing in assignments, practices and mid-term exams). They worked with the secretary's office to design a schedule that reduced the number of groups to one group per subject, adapt the calendar to the teaching needs, and identify the possible needs of students who had returned to their country.
2. Technology needed in the classrooms to be able to record or retransmit the classes.
3. Training on the use of online teaching technologies. In collaboration with the Quality and Innovation service of the University, the aim was to identify the needs of professors to:

develop their teaching, train with the tools (90% of the professors had never taught online before), and establish mechanisms to share good practices and experiences.

The creation of the committee was a good decision as professors need guidance. If they have guidelines on planning education, they can invest more time in other aspects of the education process (Lauret & Bayram-Jacobs, 2021).

Table 2

Example of a Subject's Needs to Perform Remote Teaching

Machine theory	Methodology	Panopto videos of theory (PPT, PDF or similar), Panopto videos of exercises (Whiteboard, PPT, notebook or similar), Schedule of doubts via Google Meet or Zoom, Book and documents in PPT/PDF format.
	Practices	For the computer exercises, students will be asked to install the free versions of the programs used in the subject.
	Online assessment	Students could take the test on paper and scan it, as long as there was a way to make sure they didn't copy.

Before the end of March, the committee already had the basic information on the teaching of each subject and adapted to the online situation, grouped by department. This information included the teaching methodology used, the practices and the online evaluation method if the confinement was maintained. Table 2 shows an example of such information for one subject.

Between March 12th and 18th, the largest deployment of training actions, virtual meetings and internal communications to faculty members and students was carried out, with the aim of streamlining the teaching system and reassuring all agents.

A faculty meeting was held on 12 March at which the general outline of the work plan for the next 3 weeks was presented (initially it was thought that this would be the duration of the lock-in). One teacher from each department was elected as a member of the committee, through which all professors were able to discuss how they will adapt their teaching. In this way, it was also possible to centralize specific needs and evaluate new resources.

The good foresight of the Quality and Innovation Service made it possible that on March 12th, training courses for professors and live online sessions were available so that all professors were ready to teach their subjects online from Tuesday 17th, the date on which teaching resumed. In that sense, the Quality and Innovation Service prepared a guide for professors, if necessary, to enable them to teach their classes online. The guide included:

- Recommendations for professors to optimize or correctly plan their online classes.
- A calendar with the training sessions planned, so that our professors can register.
- Tutorials on how to record classes with the different tools available.

During the initial three weeks of online activity, the first tests of the evaluation systems were also carried out in partial liberator tests. These experiences would later be extended to the examination period, which will be explained in a later subsection of this article. Once it was confirmed that the confinement would be extended, the Office of the Executive Council of the University decided to continue with remote teaching until the end of the course. That included the exams period to calm students and their families, especially those who had already returned home, so they would not be

obliged to return. As this period included the exams, the Online Teaching Committee included the organization of the remote assessment as a fourth task.

The collected information on the needs of the professors showed that there were four different types of classes apart from the laboratories:

- Synchronous lecture-based classes: follow the same dynamics as face-to-face classes, but online through videoconferencing programs such as Zoom or Google Meet. The necessary equipment includes a microphone to record the professor's voice. And, to show the content to the students, the professor can opt for different options: a camera to record what he writes on a whiteboard, a digital tablet on which he writes and draws what he wants to teach, or sharing his computer screen when using a PowerPoint presentation.
- Asynchronous lecture-based classes: The same equipment is required as in synchronous classes, but in this case, the professor records and edits videos with the topics he/she wants to teach the students. He then uploads them to the video platform used at the University (Panopto), so that students have access to this content.
- Doubt solving classes: The same programs and hardware are required as in the case of synchronous classes. The difference lies in the structure of the class. Instead of the professor explaining the content for most of the time, it is the students who ask questions and the professor answers them one by one.
- Class discussions and defenses/presentations: In this case only a videoconferencing program is required through which students can share the content they have on screen.

During this period, classes were recorded and uploaded to the platform to make them available to students who were unable to attend the class on the regular schedule. This was the case for many of the international students who had returned to their home country. In some subjects, it was even decided not to give live classes, directly uploading them to the platform.

The situation prevented the realization of face-to-face practices in laboratories. In the second semester, a total of 14 laboratory practices were planned involving classes with 14 to 230 students. Professors decided to substitute them by a project in 5 cases. The rest of them decided to carry out an online simulation of such practices through videos recorded by them.

In addition, the University enabled a VPN to allow the access of professors and students to the computers in the University rooms. In this way they would have access to the professional software that was only available in the classrooms.

The willingness and involvement of professors to face this challenge contributed to encourage many of them to share teaching experiences and student comments, so that they did not make mistakes already suffered by others. For example, an email sent by the Online Teaching Committee with the subject "Recommendations for recording classes" on the same day was forwarded 26 times by different teachers adding their experiences. The teachers who conducted an online test first with their students wrote a report on their experience which they sent to the Committee in case it was of interest to send it to the rest of the faculty, etc. In fact, content generation was accelerated and the fear of putting into practice experiences already successfully lived by other colleagues was lost.

Regarding the evaluation during the confinement, the first instructions given by the University were to avoid exams that were not face-to-face due to the difficulties to supervise them remotely and the

possible challenges and attitudes of students to these kind of assessments (James, 2016). However, the confinement was extended and it was going to affect the final exams of that semester. So, at the same time the University began to study different ways to be able to carry out non-face-to-face evaluations. The commission proposed five different options to assess the students:

1. Examination using software (Excel, MATLAB…), uploading the files to the Learning Management System (LMS).
2. Written problem tests which were scanned and uploaded to the LMS.
3. Multiple-choice tests through the LMS.
4. Examinations without supervision.
5. Other modalities like oral presentation though a web conferencing platform, etc.

These possibilities can be included in the different kinds of online assessment methods of assessment found in literature (Khan & Jawaid, 2020): assessment portfolios (1 and 2), multiple choice questions (3), open book exams (4), and online video calls (5).

The commission also suggested two options to monitor these assessments: supervision through a web conferencing platforms or proctoring tools. Proctoring tools were considered because of their reliability (Arnò et al., 2021) as professors had different concerns about the online assessment. In fact, unproctored assessments have some bias towards higher ratings (Ardid et al., 2015). However, students may have to tackle different technical difficulties with the installation and configuration of these tools, so conferencing platforms were also suggested as their adoption is easier (Linden & Gonzalez, 2021).

Results and discussion

We proceed to analyze the results of the evaluation by answering each of the questions posed:

1. How many students not residing with their families during the course returned home and how many remained in their colleges, residences or student apartments?

87 (54.37% of the survey) students do reside in their family home, while 73 reside in student apartments, residences or halls of residence. From this group, 49 (30.63% of the survey) returned home and 24 (15% of the survey) stayed in their residence in the city. In the survey, students who spent the confinement with their family have expressed the difficulty of "working alone at home without being able to ask questions directly to the teachers", "lack of silence because the other members of the family could be doing other activities". Some of them expressed that they "struggled to study due to worries because of the pandemic or illness of family members", etc. From the responses to the survey, no relevant differences can be detected between students who live with their families or in halls, residence, etc.

2. How widespread was the use of technological tools for teaching among Tecnun professors?
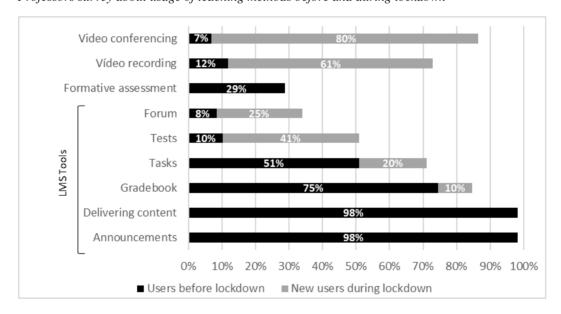
The aim of this question was to know what technologies were used and what percentage of teachers used them before the outbreak of the pandemic to assess how this emergency has influenced the utilization of these tools. At the time the confinement began, 20 Tecnun professors were taking a Flipped Learning Training Course in which, in addition to the pedagogical basics, there were some workshops on the use of appropriate technological tools for teaching. However, most of the professors had not yet put them into practice in their classes. Figure 1 shows the results of the

professors' survey about the use of online teaching tools. We can see that delivering content and announcements were already highly used before the lockdown. Instead, the use of video conferencing and video recording grew as a consequence of adapting the traditional classes to the online environment.

It can be concluded that before the confinement, the LMS used at our University was mainly used as a repository where professors provided students with documents needed for their subject, and as a facilitator for giving notices or posting grades. In the wake of the pandemic, there has been an increase in the use of other tools of the platform, especially online quizzes, assignment submission and correction, and sometimes the forum. In the other categories, there has undoubtedly been an increase in the use of videoconferencing and 61% of professors who had never recorded videos of teaching content have had their first experience.

Figure 1

Professors survey about usage of teaching methods before and during lockdown

3. What means has our faculty and the University put in place to support professors in the transition to remote teaching?

The Quality and Innovation Service of the University published a "Guide to change the scenario of your teaching" which included recommendations for class planning, video tutorials on the use of Google Meet, Zoom and the Panopto tool for video recording. This guide also included the calendar of online training sessions for professors with the link to register. Each session was held on different dates and times to facilitate the attendance of as many professors as possible. The records of the Quality and Innovation service are shown in Table 3, where a total of 38 Tecnun professors attended the proposed online training.

Table 3

Number of Attendees to Each Online Training Session

Online training session	Attendees	Percentage
Blackboard evaluation	24	63,16%
Mentoring	14	36,84%
Forums	13	34,21%
Panopto	13	34,21%
Google Meet	12	31,58%
Zoom	8	21,05%
Homework	7	18,42%
Auto assessment	4	10,53%
Management of online activities	3	7,89%
Teamwork	3	7,89%
Google apps: Gmail, Calendar and Drive	2	5,26%
Writing tests	1	2,63%
Problem tests	1	2,63%
Turnitin	1	2,63%

In our faculty, the Online Teaching Committee was in constant contact with the professors, suggesting ways of teaching the classes, exchanging experiences and ways of carrying out the evaluations. The members of the commission of each department were especially focused in the material needs of their corresponding professors.

4. How effective was the communication between students, professors, School of Engineering and University of Navarra?

The average score of the students on the usefulness of the information received from the University was 3.46 out of 5. While the average rating on the clarity and accuracy of the information received is 3.91 out of 5.

The involvement of students in the system adopted by Tecnun is undoubtedly one of the keys to the success of this experience. It is also worth mentioning the figure of the mentor, a professor assigned to each student since his or her arrival at the University of Navarra in the first year, who maintains a close relationship with the students. In this way, they had real-time feedback on the progress of the classes and were able to adapt and solve problems.

To the question "Have you noticed the support and closeness on the part of your mentor during this situation?" the score is 3.32. In fact, the percentages of Tecnun students who have been mentored increases a little with respect to other years, as well as the average number of interviews per student interviewed as it is shown in Table 4, although the interviews during the months of confinement have been held remotely.

Table 4

Mentoring Data Comparison in Recently Years

Course	Average interviews per year per student	Mentored students
2017-18	5.87	81%
2018-19	5.58	82%

2019-20	5.97	84%

5. What percentage of subjects were adapted to remote teaching?

As it was described in a previous section, all the subjects were adapted to remote teaching. Most of them replace the classroom lessons for online live classes. However, all of them were recorded considering the students in different time zones. Even some classes replaced by uploaded videos in Panopto. In the case of laboratories, they were replaced by online simulations or projects. Regarding the exams, all of the students were remotely evaluated through different methods using different surveillance tools.

6. Was the design of the subjects adapted to the new circumstances? (Workload, evaluation...)

When students were asked if "the circumstances of each student have been taken into account, such as personal situations, different time zones, technological difficulties, etc.", the average response in the student survey was a 3.58.

In the survey, 58 students gave their opinion about the weaknesses or negative aspects of their experience at the University during this period. 19 of them reported that the workload increased considerably because the professors did not consider that the viewing of the videos required more time than the duration of the videos, since they had to take notes and go back to understand the content. They also reported that they did not consider the difficulty in carrying out team work due to the distance. More than half of the comments on negative experiences (33) are related to exams and evaluation methods. Students felt that the stressful situation of taking the exams online had not been considered. They felt that the time available for taking the exams was insufficient as it was reduced to avoid cheating.

However, when students were asked for their opinion on the strengths or positive aspects of their experience at the University during this period, 30 of the 50 comments reflected the dedication and effort of the professors. In fact, the mean of the question "Do you value the availability of the professors to solve questions and doubts during the Covid-19 crisis?" the mean obtained is a 4.16. We can affirm that the professors were aware that the new teaching modality could pose greater difficulties for the students and they tried to overcome them with their availability.

7. Which tools have been mainly used during remote teaching?

The University's survey of professors asked them to indicate the type of teaching activity carried out during the distance teaching period. The results obtained are shown in Table 5 (1: I have hardly used it – 5: I have used it a lot).

Table 5

Results of Professors' Survey About Their Teaching Activities

Type of teaching activity	Score
Live videoconferences via Google Meet, Zoom or other systems.	4.02
Recorded teaching videos (Panopto, YouTube...) posted in Virtual Classroom	3.42
Contents uploaded to the Virtual Classroom (PDF, PowerPoint, Excel)	3.71
Use of Virtual Classroom tools (forums, journals, assignments, tutorials...)	2.67

8. What were the main difficulties encountered by professors in adapting their teaching?

In the survey carried out by the University to the professors, a Likert scale was used to measure the effort required by professors in some areas of improvement (1: little effort – 5: a lot of effort). Table 6 shows the average in different areas.

It is observed that didactic training (meaning by didactic the appropriate use of models, methods and techniques that optimize teaching and learning processes, including both teacher-centered instruction and facilitation of student-centered learning) requires more effort than technical training on the tools, which is logical considering the engineers' area of work.

Table 6

Professors' Average Effort Score for Different Areas to Improve in Remote Teaching

Area of improvement	Score
Didactic training for online teaching	3.55
Technical training on tools for online teaching (LMS, videoconference, forums, etc.)	2.81
Availability of material resources (computers, webcam, headphones, microphones, etc.)	3.64
Adapt the teaching materials (subject manuals, notes, etc.) to a digital environment	3.57
Improve coordination among the professors of the Centers	2.87
Promote activities for the exchange of experiences	3.19

Although the School acquired some material resources such as digital tablets, webcams, etc. and the members of the Online Teaching Committee coordinated the use of these resources among the professors of their departments, they were insufficient. Most of the professors used their laptops, and some of them even bought digital tablets for their use.

Likewise, the effort to adapt the teaching materials is highly valued. In Tecnun all teaching is face-to-face and as seen in the methodology section, very few professors had previously used videoconferencing platforms or recorded their own videos.

Less effort is reflected for the improvement of coordination among professors. It is a common practice for faculty members in the same course to coordinate exam dates, review the workload of the different subjects, etc. The Online Teaching Committee has played an important role in this aspect during the confinement.

9. How satisfied are professors and students with online teaching?

To the question "In general terms, are you satisfied with the non-classroom teaching you have received?" the Tecnun students rated it with an average of 3.64. In the case of the professors, the question was twofold, asking the degree of satisfaction with the non-classroom teaching given, from the technological point of view and from the didactic point of view. In the first case, the mean obtained by the professors was 4.19, and in the second case, 3.81. As mentioned in the previous question, the difficulties with technology were easily overcome by the teaching staff, although the score for didactic practice is not low either.

10. What conclusions can be drawn about online teaching methods for the future?

Despite that it is difficult to have a similar situation where all the teaching must be remote for such long period of time, it is possible that current and future issues like wars and climate change could led to emergencies that demand flexibility from professors and students to adopt remote teaching. In that sense, the experience obtained during the pandemic should be used to be better prepared for these situations. The actions that were proof to be successful, like the creation of a committee to assess and coordinate the faculty employees, should be considered as a part of a plan to face remote teaching in the future. Accordingly, Universities should work to solve the identified problems during this period, even if there is no emergency ahead, such as the remote assessment of tests and exams.

In order to face successfully similar challenges in the future, professors should be better prepared both in technical and didactic capabilities. The results from the surveys may recommend to organize professors learning at a faculty level. In the case of our faculty, engineering professors expressed their facility to learn how to use new technologies and programs, but they required more effort to learn how to teach in an online environment. Then, professors from other faculties may require a different balance between their technical and didactical training.

From another point of view, professors who have previously used new teaching methods like flipped learning and blended learning, have seen their commitment reinforced because they have had an easier time adopting their way of teaching. In addition, the students who were used to these teaching methods did not have to make major changes in their study habits. Universities should therefore facilitate the training of faculty in new teaching methodologies, and positively encourage teachers to use and evaluate them, especially if they make use of new technologies.

Despite our University has come back to face-to-face teaching, there are noticeable changes inside and outside of classrooms. The necessity to adapt to remote teaching has pushed both of them to be more aware of the technological tools available. Some of them are now part of their workflow, making it more efficient and flexible, such as the use of smartphones to scan documents on the go, use of graphical tables in lectures, or the normalization of online meetings if it is not possible to get together in one place.

Conclusion

As a result of the assessment conducted we can answer the research questions we have raised in the Introduction section of this paper.

Regarding the effectiveness of the methods and tools used during the ERT period, we can say that we have managed to maintain the teaching of all subjects, despite the fact that it was done remotely. The classes through the available teleconference programs have made it possible to replace the face-to-face classes, after a period of adaptation in which the professors have been trained and, in many cases, have had their first experiences. In addition, the recording of all classes helped students to follow the classes at their own pace according to their personal circumstances. The rest of the teaching activities, such as laboratories, practices or presentations, were also replaced in various ways by making use of the available technologies. In general, the effort to adapt the teaching to the new situation was very great on the part of the professors, but the lack of experience in this way of teaching classes led to shortcomings such as the heavy workload, the evaluation method or the recording of videos that were too long.

Considering the degree of satisfaction of professors and students, the results show that both are grateful for the information transmitted by the University. In the case of professors, they have always received information about training resources and advice on how to make the transition to online teaching. In the case of students, they have also received various announcements about the functioning of the University in different periods of the confinement. Regarding the measures and decisions taken by the University, both professors and students have positively valued the clarity and speed with which they have been communicated. In this section, the decision to maintain the online teaching including the evaluations until the end of the course, considering the uncertainty in the displacement of students who do not live in the region of the University, stood out. On the other hand, there was controversy in the choice of online evaluation methods. The professors expressed many doubts due to the possibility of students cheating, and the students stated that they did not feel comfortable with the monitoring systems used.

Finally, in order to face possible emergencies in the future, it is possible to improve performance. The results show that both professors and students had to go through a process of adaptation to online teaching. This occurred because in both cases, the vast majority had no experience with this type of teaching. This is why it would be advisable that in the future there should be a training plan for all teaching staff to deal with similar emergencies. New technologies have played an important role in enabling remote teaching. Therefore, such training should encourage their use in the classroom, even if there is no emergency. In this sense, the LMS used by the University has proved to be a very good support for professors, as it includes a large number of tools that professors have discovered during the confinement and that were not previously used. An example of these tools are the forums, which can be used to resolve doubts as well as to encourage discussion among students.

Another aspect to highlight for possible emergencies that has been positive during this confinement has been the order in making decisions and transmitting them to professors and students. In this way, all members of the University are encouraged to have a clear understanding of how teaching activities will be carried out during the emergency period. The Quality and Innovation Service of the University and the Online Teaching Committee created in Tecnun had played an important role in this area, helping professors with advice and recommendations for their teaching without taking away their initiative, which has resulted in a better organization of classes, adapting the measures to each one.

We can say that the leadership of the University, the prompt and fluid communication between the different agents and the collaboration between teachers, were key to the success in maintaining teaching from March to the end of the academic year (even with the inevitable mistakes that such a rapid and unexpected change entails). All of this, together with the individual efforts of teachers and students, made it possible for the course to conclude successfully and with a positive experience.

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