education sciences

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Teachers' Perceptions of Remote Learning during the Pandemic: A Case Study

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Citation: Silva, S.; Fernandes, J.; Peres, P.; Lima, V.; Silva, C. Teachers' Perceptions of Remote Learning during the Pandemic: A Case Study. *Education* **2022**, *12*, 698. https://doi.org/10.3390/educsci12100698

Academic Editors: Elena Makarova and Kerstin Göbel

Received: 21 July 2022
Accepted: 4 October 2022
Published: 12 October 2022

Abstract: The closure of higher education institutions (HEIs) due to the outbreak of the COVID-19 pandemic led to visible changes in pedagogical practices. With the lockdown, there was ambiguity and disagreement about the workload of teachers and students, and about what to teach and what strategies to select. For most instructors, the first challenge was to recreate the face-to-face experience. Worldwide, most universities have speedily adopted synchronous and asynchronous communication modes. Google Classroom, Microsoft Teams, Cisco, Webex, Zoom, and Moodle were among the most used tools. The present study is based upon a quantitative approach, and it intends to analyse teachers' perceptions of remote teaching during the first pandemic period. Data were collected through an online questionnaire during June and July 2020. The questionnaire had 27 questions divided into three main sections: sociodemographic characterization, e-Learning strategies, and remote assessment. The study population was teachers of a Portuguese HEI. A random sample was used with 547 participants. The main conclusions show that the less experienced teachers are, the more satisfied they feel with remote classes and remote assessment. On the other hand, the most experienced teachers used more tools during the remote teaching period and developed more strategies to perform remote assessment. Regarding the overall assessment of the emergency remote teaching, the participants consider that it was a positive period, and they were moderately satisfied with remote classes and the strategies and tools used during this period.

Keywords: remote teaching; higher education; assessment; teacher's perceptions; levels of satisfaction

1. Introduction

On 11 March 2020, the World Health Organization (WHO) officially declared the existence of a coronavirus pandemic. All over the world, face-to-face classes were suspended, and social isolation was applied with the aim of slowing down the advance of the pandemic. More than 90% of students around the world saw their schools closed.

The closure of higher education institutions (HEIs) naturally implied inevitable changes in pedagogical practices. The knowledge accumulated over decades about digital education, governmental and institutional guidelines, the process of fast adaptation to an education system in which students and teachers are physically distanced, led to the so-called emergency remote teaching [1].

The creation of an educational system online (e-learning), implies much more than separating students and teachers from their physical learning space. In a very general way, in addition to the physical distance between those involved in the training process, e-learning implies a pedagogical redesign of a course and the preparation of social and cognitive interaction systems online.

In contrast, the remote teaching and learning system tends to implement traditional teaching and learning practices in a digital environment, without the prediction of methodological changes [1].

With this study, we intend to analyse the perception of teachers in the implementation of emergency remote teaching, in the context of a Portuguese HEI.

Therefore, this paper aims to know the teachers' perception of remote learning during the COVID-19 pandemic; to know the e-learning tools used during the pandemic COVID-19; to identify the satisfaction regarding e-learning tools used during the COVID-19 pandemic; to know distance assessment strategies used during the pandemic COVID-19; and to distinguish teacher profiles according to the overall evaluation of the lessons in remote learning and the evaluation of the assessment process in remote learning.

1.1. Teaching in the Outbreak of an Emergency Remote Environment

Over the years, researchers in distance learning instructional design, and education technology carefully struggled to define terms such as online learning, distance learning, blended learning, and hybrid learning [2], and to build and test technology-based educational models. Suddenly, the COVID-19 threat abruptly transformed higher education and the role instructors were used to performing. Pressed by the need to suspend the traditional face-to-face delivery mode, most teachers worldwide moved their classes online in order to address the severe global public health crisis [3,4].

In this way, the utopian desire of extending the people-centric classroom experience in space and time has finally come true [5], forcing teachers to embrace remote digital strategies and tools. The change was disruptive in a deep sense. Because it succeeded a catastrophic event, there was no logic or natural evolution. Ali [3] believes that the coronavirus has revealed emerging vulnerabilities in education systems around the world and that it is now clear that instructors need to adapt themselves to flexible education systems.

In fact, moving instruction online was a very quick, non-voluntary, and overwhelming process, as stated by Hodges et al. [1]. Given these dimensions, the authors proposed to coin this move "Emergency Remote Teaching" (ERT), a distance and online instruction designed and delivered in pressing circumstances.

Before the pandemic context, online education and collaborative work had already been regarded as a valuable means to exchange ideas and mental frameworks and to develop a shared understanding of topics by involving participants in working together [6]. However, with the lockdown, there was ambiguity and disagreement about the workload of teachers and students and about what to teach and what strategies to select. Instructors were engaged in adopting different sorts of strategies to improve students' emotional and cognitive involvement. They were also forced to deal with formal and informal virtual settings that started to occur simultaneously.

The concept of instructional strategies (also named teaching strategies) is complex and, to a certain extent, fuzzy. It can relate to interventions guided by top-down, centralized control used by instructional designers, teachers, and trainers to plan lessons or blocks of instruction. It can, on the other hand, be grounded in and driven by epistemological orientations and theoretical foundations that are primarily constructivist and connectivist in nature [4].

For several decades, the design of instructional strategies was linear and micro levelled, regarding the importance given to analysing particular learning outcomes, aligning them with suggested instructional strategies, and then delivering instruction in straight-

forward ways to elicit desired responses [7]. However, the coronavirus created an unprecedented opportunity for instructors to carry out different sorts of experiments, as for the first-time, entire student bodies have been compelled to take all of their classes online.

During 2020 and 2021, a great deal of individual and institutional studies have been published [4]. Most of them recognize that the primary objective in these circumstances was not to recreate a robust educational ecosystem but rather to provide temporary access to instruction and instructional support systems [1]. This way, the available technology, the class size, and the lack of time to plan and design a consistent model constrained the strategies the instructor could use to facilitate delivery.

Bannan et al. [7], claim that "we need to modernize our conceptualization of 'instructional strategies,' and expand these principles to support a more open, flexible, and personalized learning ecosystem". In fact, the role of the instructor became multidimensional due to the context, and naturally expanded its scope to encompass other roles as facilitator, adviser, and mentor, among other dimensions.

According to Slusky [8], the sudden move from face-to-face (or brick-and-mortar approaches) to remote instruction brought other sudden transitions. Innovative pedagogical strategies have certainly been put forward. An extensive range of pedagogical concerns emerged during this disruptive period that were not that central in the pre-pandemic period. For instance, the importance of voice and pitch management, the encouragement of the practice of remote feedback, the transformation of a large-class lecture course to smaller modules, the recording of lectures, as well as other strategies for student engagement in conferencing and synchronous planning, started playing a central role.

The quick and non-voluntary experiment in emergency remote teaching we went through alerted instructors to the ways in which online redesign requires additional time and resources to provide meaningful learning experiences and to create distinctive learning environments with the help of digital technologies.

For most instructors, the first challenge was to recreate the face-to-face experience [4,9]. Worldwide, most universities speedily adopted mediated communication modes (synchronous or asynchronous): Google Classroom, Microsoft Teams, Cisco, Webex, Zoom, and Moodle, among other tools.

Around the world, the 2020 Spring semester was a testing ground for the adaptability and flexibility of higher education in their day-to-day online teaching and learning communication. Despite different teaching styles and course formats, one of the tools that has become crucial was video conferencing. During the lockdown, videoconference tools (VCT) were embraced by teachers as a temporary solution to an urgent problem. As stated by Peters [10], most universities were unprepared in terms of online delivery modes, so an expedient default was the replacement of face-to-face lecturing with the use of the Zoom. Despite several other available technologies, Zoom managed to hold 36% of the market share [11], making it the most used platform for video conferencing.

Before the pandemic context, VCT was regarded as a way to expand learning opportunities, as they assist online learning and teaching through supporting, watching, and interacting both in a formal and informal way. In fact, the increasing availability of video conferencing tools enables multisensory experiences and offers valuable opportunities for complex multimodal and multiliteracies expression. As stated by Thorne and May [12] "multimodality is an omnipresent feature of much communicative activity in online environments". It implies a semiotic complexity that can include written and spoken language, image, gesture, and haptics, among others.

According to Burnett [13], digital modes of communication have much to offer to pedagogy. They call for new discourse skills to overcome the lack of embodiment. Regarding the role of the teacher as a communicator, speaking directly to a camera, knowing that there are multiple viewers, having attentiveness and empathy to listen to our interlocutors with rare care and focus is also vital. Digital communication also creates pedagogical scenarios that are open and dialogical. Nevertheless, the author also states that, in

terms of a more classic conception of teaching, status, self-perception, control, and authority can all be at risk.

During the pandemic, the use of digital tools related to communication technologies was in many instances involuntary.

Ali [3] states that meta-synthesis of relevant literature reveals that in recent years, there has been an increasing interest in the development and use of multimedia-enhanced content through the use of ICT to enhance the quality of teaching and learning. However, the point was that the transition to online teaching, under the circumstances, ideally required digital-savvy teachers and quick online adaptability. Yeigh et al. [14] state that creativity is needed to capitalize on affordances of technology, and also that time is required to learn how to integrate these tools into existing educational practices. In our opinion, regarding the current and future instructional scenarios, instructors need time to fully understand and manage multimodal communication tools.

Unlike video conferencing tools, learning management systems (LMS) have been central in higher education for more than two decades [15]. They can be defined as web-based platforms for administration, documentation, tracking, reporting, and delivering courses or training programmes. Furthermore, the underlying assumption of these platforms is to provide a constructivist theory-based instruction, focusing on flexibility and learner autonomy.

Before the pandemic crisis, for most teachers, LMS were clearly regarded as a catalyst for a paradigm shift from traditional educational environments to online educational environments. Implementing and using LMS was also part of strategic plans in several faculties and departments, to promote changes induced by digital technologies and to improve and integrate the hybrid and web-enhanced teaching and learning environments. Furthermore, according to Dobre [16], it was also fully recognized by instructors and scholars that LMS facilitate interaction and support higher-order learning, such as critical thinking, problem-solving, and collaboration.

However, in most cases, instructors tended to use LMS in a narrow fashion, as a repository, i.e., as an organizational infrastructure for learning materials relevant to a given course, making materials easily accessible, copied, and downloaded, primarily serving the purpose of supporting face-to-face teaching. LMS are indeed a powerful medium for enabling personal asynchronous learning, not only used to provide content to the students but also to incorporate alternatives to encourage their autonomous learning. According to Dias [17], expediency and flexibility are the two most valuable features.

Several years ago, Norberg et al. [18] had already stated that students' asynchronous work can be supported much more effectively with learning management systems, by using a wide range of resources, such as assignments, drop boxes, forums, and other tools.

During the remote emergency context, instructional design and organization played a very important role and teachers were forced to become designers and tutors overnight, hence, LMS became the core of the teaching and learning process [19]. LMS were a vital structure for ensuring educational sustainability, allowing teachers to track, report, and respond to learners' needs. They also became a primary organizing construct for education in an emergency technology-supported environment and not a mere supplemental resource for asynchronous activities.

As pointed out by Ali [3], overall, technology has become a powerful force in transforming the educational landscape. However, preparing to move education outside of traditional physical classrooms in response to COVID-19 instructors required a great deal of thought, coordination, and careful decision-making [3].

In terms of pedagogical implications, one can expect that the post COVID-19 period will place greater emphasis on virtual learning and the role of the teacher and learners will significantly change. In this fashion, LMS allow different forms of teaching, by interconnecting, accelerating, condensing, monitoring, and supporting—with many possible combinations of instructional strategies encompassing substitution and integration.

Therefore, we can notice that somehow all the institutions and teachers implemented strategies and adopted technologies to react to the lockdown imposed by the COVID-19 pandemic. Nevertheless, we cannot find any study about teachers' perception concerning the implementation of those strategies and technologies, and the learning process in all that period. This perception can be crucial to understanding what can possibly change in the post COVID-19 era and what could be an effective transformation in the learning and teaching processes.

1.2. Teaching and Assessment Methodologies in Situations of Crisis

In the context of remote teaching and learning, the pedagogical methodologies to be applied constituted a dimension on which many doubts were raised. The range of teaching methodologies available to the teacher is vast, from more traditional methodologies to more innovative and active methodologies. These methodologies can include a variety of teaching strategies ranging from exposition, interrogation, and action, such as problem-based learning, problem-solving, project-based learning, peer-reviewed learning, design thinking, case study, flipped classroom, among others. Gómez-Pablos et al. [20] shows that the use of active methodologies with digital technologies improves the digital skills of teachers defined in the European framework for the digital competence of educators.

Digital competence has gained a strong prominence in the educational context. There is a growing interest in knowing the state of the digital competences of university teachers, that is, the set of knowledge, skills, and attitudes necessary for a teacher to make effective use of technologies [20].

Another factor related to emergency teaching and learning, which worried teachers and students during the time of the pandemic, is related to the distance assessment processes.

Assessment in the context of higher education is a complex issue that has always concerned teachers, students, managers of HEIs, and other players in educational processes. Assessment influences the way students organize their study and develop their skills [21], and even the way students understand the processes involved in acquiring their learning [22].

Often, the assessment process is seen solely as a way of measuring whether or not students have achieved the objectives of a given course.

In the context of higher education, the most implemented assessment instrument is the traditional written exam, wrapped in a classification and a hierarchy system. Usually, these written exams take place at a pre-defined time and focus on the results achieved during the training process, that is, they focus essentially on the product with a target on individual learning [10]. The existing literature essentially describes two distinct assessment methods: the traditional method and alternative methods that essentially differ in their focus on teacher-centred practices and student-centred practices [21]. Teacher-centred assessment practices circumscribe the focus on teacher assessment of the learning product. Student-centred assessment methods describe the focus on students' self-assessment of the learning process itself. These methods allow the development of technical and transversal skills such as the ability to solve problems and the involvement of students in the process itself. Usually, these methods involve more global learning activities that are developed over the duration of the course, individually and in groups, focusing on both the product and the process, encouraging each student's autonomy and responsibility [14]. These methods can also cover practical laboratory work, projects, and reflections [23]. The Bologna Process itself stimulated reflection on assessment and the need to implement more challenging, interactive, and creative tools and learning opportunities [24,25].

Thus, there are more and more advocates of an assessment that does not consider only one or more moments of assessment but includes reflection on the processes of acquiring knowledge and competencies, in a perspective of continuous and holistic learning (e.g., [23,25,26]). McDowell [27] emphasizes the instrumental characteristic of assessment

as a form of learning and adds the responsibility of the students themselves in this process, understanding the assessment as an integral part of learning [25].

In this context of continuous assessment throughout training, teachers also need to play a role, essentially as a facilitator of a collaborative teaching and learning process, through projects and the collective production of knowledge. Flores and Veiga Simão [24] refer to the importance of making the learning process more creative, looking for innovative ways to structure teaching and assessment [21].

There is also the importance of rethinking HEIs as a space for thinking, and for cognitive and social interaction capable of generating knowledge [28].

According to Means et al. [29], the assessment of learning in the context of online education is not done by the simple application of a learning measurement instrument and consequent release of a grade in the system. This process, which is of concern to all those involved in the training processes, today more than ever, requires the need to reflect on the assessment, essentially as a process and not as a product. Thus, the complexity of the process requires a great concern about the method of planning and execution, considering different criteria and modalities, including new times and individual and social spaces, in order to expand the potential to measure the acquisition of knowledge and skills in a reliable manner.

The active methodologies based on a critical process, self-assessment, network learning, problem-based and project-based, among others, are considered essential in these environments. As an example, it is possible to assess the degree and type of participation in a forum or digital portfolio, always offering constructive personalized feedback from the active teacher and learning mediator. Some of the individual oral exams may be implemented via videoconference, for example for the demonstration of knowledge, understanding, practical skills, and argumentation.

In an emergency teaching and learning context, all these considerations were of particular concern. There were many operational difficulties reported by teachers during the online assessment process. One of the major concerns is regarding the guarantee of students' identity as well as the demonstration of some practical skills. In response, new software has popped up on the market that intends to address these concerns, namely online supervision systems (for instance, Proctortrack) which bring together advanced features such as [8] real-time supervision of students during an exam through artificial intelligence, implementing continuous and peripheral scans of hardware to detect virtual machines and other restricted devices, disabling keys and applications that cannot be used during the online exam, facial recognition, and detection of attempts to receive outside help or to use unauthorized sources (devices, course materials), ways to mark attempts of searching the web for answers, the possibility of intervention by the watchman, blocking the browser, multi-factor biometric authentication, facial scan, etc.

In fact, online supervision still offers many challenges. Unlike an in-classroom exam, online monitoring requires students to have access to adequate technological infrastructure. Without that, the surveillance program will not function accurately. Naturally, this creates a separation between students who have and those who do not have the necessary technological infrastructure. There are also concerns about video recording processes, such as how it will be used and by whom.

It is unlikely that these problems will vanish in a short amount of time, which means that online supervision can only be offered as one more solution alongside other options. As advocated by Hussein et al. [30], this type of assessment should not be promoted as the only solution, and it should be adopted and used carefully and selectively in contexts and situations in which it is the best solution. According to the FCCN (Scientific Computing Unit of the Portuguese Foundation for Science and Technology), currently, there are still no remote assessment systems, proctoring systems, data protection and identity assurance that are sufficiently tested, that serve the current purposes of Portuguese HEI and that guarantee compliance and consent by the General Data Protection Regulation (GDPR).

In this context, it is urgent to deepen the research and development in this area, which, according to Arnò et al. [31] represents a crucial challenge to improve the quality of the current automated supervisory systems.

On the other hand, some studies have shown that the absence of stability of the teachers and their age seem to be factors related to the introduction of innovative practices in the teaching process [32], whereas HEI with a stable number of teachers and older and senior teachers seem to introduce more innovative methods in their practices.

Moreover, it is also necessary to understand the level of satisfaction of teachers with the assessment methods they adopt during the pandemic period, knowing that in most cases they use the least worst assessment strategy, but without being satisfied with it.

2. Materials and Methods

The described theoretical framework served as a support for carrying out the study now presented, in which it is intended to understand the perception of teachers of a higher education institution regarding emergency remote teaching.

2.1. Study Design

A quantitative, transversal, descriptive, and correlational study was performed to answer the research question: what is the teachers' perception of remote learning during the COVID-19 pandemic?

Our main objectives were: (1) to know the teachers' perception of remote learning during the COVID-19 pandemic; (2) to know the e-learning tools used during the COVID-19 pandemic; (3) to know distance assessment strategies used during the COVID-19 pandemic; (4) to distinguish teacher profiles according to the overall evaluation of the lessons in remote learning and the evaluation of the assessment process in remote learning.

2.2. Instrument

A questionnaire was organized to answer the research question. This questionnaire had 27 questions divided into three main sections: sociodemographic characterization, e-learning strategies, and remote assessment. The sociodemographic section had questions such as gender, age, professional status, professional category, teaching course, and year. The second section, teaching strategies, presented a list of tools such as Moodle, Zoom, Microsoft Teams, Google Forms, Wetransfer, Socrative, Kahoot, Skype, Youtube, and Social Media, among others, and the participants had to select the frequency and the satisfaction level with the tool. There were also a set of questions about the frequency and satisfaction with Moodle activities and with Microsoft Teams. The answers were presented in a four-point Likert scale. There were a set of questions regarding positive and negative aspects during the remote period, short training courses attended by teachers, organizational support perceptions, and general assessment. The third section, distance assessment, had questions related to tools used for assessing learning. For teachers' that used online tests, there was a set of questions about frequency and satisfaction with tools. The tools listed were: Moodle, Socrative, Exam.net, Kahoot, Google forms, Microsoft forms, Quizizz, PowerPoint, and Word/Excel. Additionally, there was a question about positive, negative, and general perceptions regarding remote assessment.

2.3. Sample

The study population was teachers of a Portuguese Higher Education Institution. This institution has eight schools teaching in the areas of engineering, accounting, health, education, media and arts, tourism and hospitality, technology, and music. It has 58 undergraduate courses, 77 masters, and four PhD programs in partnership with other universities.

Regarding this study, a random sample was used with 547 participants. Our sample had a 95% confidence level and a 3% margin of error [33]. Regarding gender, 257 (47%)

were male and 290 (53%) were female. The mean age was 46.09 (SD = 9.4) years, 315 (57.6%) were full-time professors and 232 (42.4%) were part-time professors. Most of the teachers were from graduation (n = 474; 86.7%) and masters (n = 238; 43,5%) courses. Regarding the professional status, 254 (46.4%) were assistant professors; 168 (30.8%) assistants; 98 (17.9%) invited assistant professors, and 26 (4.8%) were associate professors.

2.4. Procedure

Our study was disseminated through an institutional email for all the professors of the higher education institution, explaining the objectives of the study and with the link for the online survey. Data were collected between June and July 2020.

A quantitative analysis was conducted using IBM SPSS version 26.0. Descriptive measures were performed for every variable. To understand the differences in perceptions among teachers, a cluster analysis was developed. Cluster analysis is a multivariate technique whose purpose is to group objects based on the characteristics they possess [34] . This technique allows us to find teacher profiles who share the same perceptions about remote emergency teaching and who differ from the rest. To define the similarities or dissimilarities between the teachers, a likelihood distance was used, which was defined taking into consideration the variables that best characterise the teacher's professional experience, such as labour contract, professional category, and age. The professional category variable represents the type of teacher employment contract and has five categories: Invited Assistant; Assistant; Invited Assistant Professional; Assistant Professor; and Associate Professor. The labour contract variable has two categories: full-time and part-time. The age variable is numeric and includes values ranging from 22 years old to 67 years old.

3. Results

Our results showed that the most frequent tools used during remote learning were Zoom (n = 458; 83.7%), Moodle (n = 390; 71.3%) and Microsoft Teams (n = 135; 24.7%), as we can observe in Table 1. Regarding the satisfaction level with the tool used, most of our participants referred that they were satisfied with their options (cf. Table 1).

Table 1. Tools used during remote learning and their satisfaction level.

Frequency	Moodle		Zoom		Microsoft Teams		Microsoft Forms		Google Forms		Wetransfer		Socrative		Kahoot		Skype		Youtube		Whatsapp		Social media		Others	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Never/Rarely	77	14.1	30	7.3	342	62.5	503	91.9	480	87.8	391	71.4	530	96.9	511	93.4	451	82.5	351	64.2	411	75.1	477	87.2	536	97.9
Sometimes	80	14.6	49	9	70	12.8	36	6.6	56	10.2	115	21	13	2.4	25	4.6	67	12.2	129	23.6	60	11	43	7.9	9	1.6
Several times	390	71.3	458	83.7	135	24.7	8	1.5	11	2	41	7.5	4	0.7	11	2	29	5.3	67	12.2	76	13.9	27	4.9	2	0.4
Satisfaction level																										
Very unsatisfied/Unsatisfied	28	5.8	28	5.4	39	13.6	18	22.6	14	12	17	7.3	17	36.4	21	29.5	28	15.2	19	7.7	24	11.7	25	20.3	18	3.3
Satisfied	194	39.8	152	28.9	140	49	42	50	58	50	70	30	11	25	27	30	88	47.8	107	43.3	74	36.3	58	47.2	12	2.2
Very satisfied	265	54.4	346	65.8	107	37.4	23	27.4	44	37.9	146	62.7	17	38.6	23	32.4	68	37	121	49	106	52	40	32.5	7	1.3

Regarding the use of Moodle, the most frequent activities are file (n = 492, 89.4%), test (n = 353; 64.2%), forum (n = 329; 59.8%), and assignment (n = 328; 59.6%) as we can observe in Figure 1.

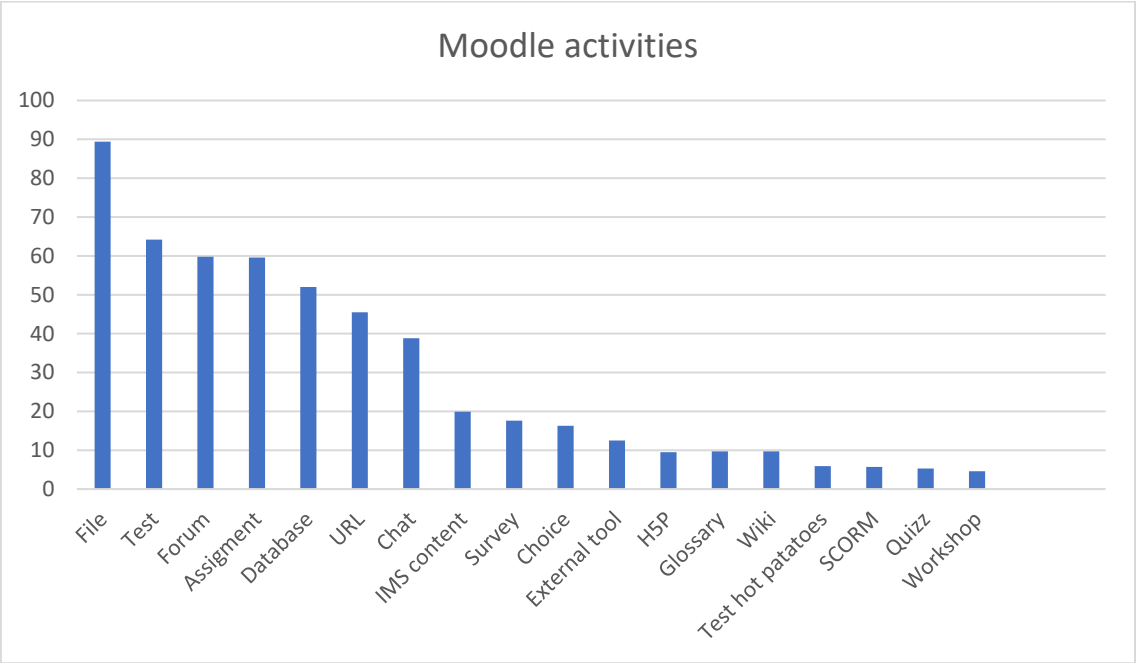


Figure 1. Frequency of use—Moodle activities.

Regarding the use of Microsoft Teams, videoconference was used by 66% (n = 277) of the participants, file sharing by 47.2% (n = 230), chat by 50.5% (n = 247), and notebook by 26.3% (n = 127).

We also asked our participants if they felt supported by the higher education institution. Most of the participants (n = 463, 84.6%) reported the institution's support. Additionally, most of the teachers (n = 343, 62.7%) did training in learning and distance assessment. This training was positively evaluated (Mean = 3.94, SD = 0.97).

When asked what the most positive factors were during remote teaching, our participants referred to better interaction with students (n = 109, 20%), better time management (n = 86, 15.7%), and effective learning (n = 73, 13.3%). Curiously, the negative aspects were worse interaction with students (n = 239, 43.7%), worse organization (n = 56, 10.2%), and less effective learning (n = 49, 10.2).

The general assessment about the remote teaching period was very positive (Mean = 6.96; Range: 1 to 10; SD = 1.96). This assessment was made firstly by administrative issues (n = 400, 73.1%), secondly by technical issues (n = 343, 62.7%), and thirdly by pedagogical issues (n = 354, 64.7%).

3.1. Distance Assessment

To understand the strategies used by teachers to perform assessments we asked about the frequency of use of several assessment strategies. As we can observe in Figure 2, the most frequent strategies were essay (n = 265; 48.3%), presentation (n = 176; 32%), project (n = 139; 25.2%), and exam (n = 138; 25%).

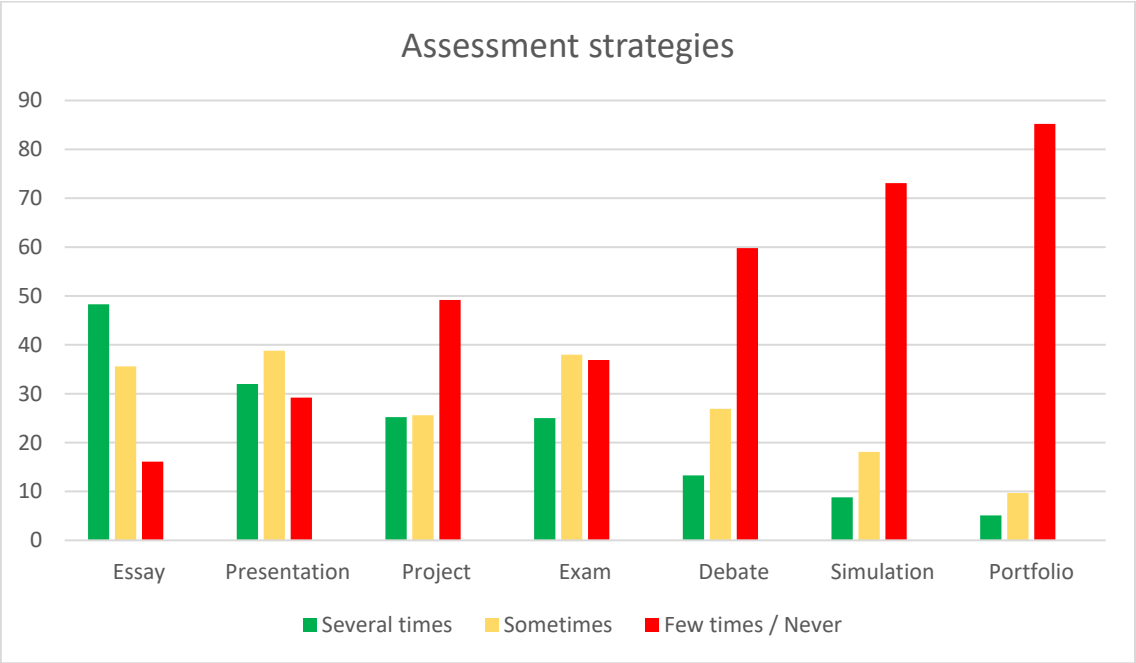


Figure 2. Frequency of use—Assessment strategies.

We also tried to identify what platform was used to conduct online exams and their satisfaction level. As we can observe in Table 2, most of our participants have used Moodle (n = 201; 36.7%) and are satisfied with the use of it.

Table 2. Tools used to conduct exams and satisfaction levels with the tools.

Frequency	Moodle		Socrative		Exam.net		Kahoot		Google Forms		Microsoft Forms		Quizizz		Powerpoint		Word/Excel	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Never/ Few Times	51	13.9	327	98.5	318	95.8	328	98.8	319	96.1	326	98	329	99.1	303	91.3	272	81.9
Sometimes	80	14.6	4	1.5	10	3	3	0.9	9	2.7	2	0.6	2	0.6	17	5.1	32	9.6
Several Times	201	36.7	0	0	4	1.2	1	0.3	4	1.2	4	1.2	1	0.3	12	3.6	28	8.4
Satisfaction level																		
Very unsatisfied/Unsatisfied	25	8.5	14	70	12	42.9	15	71.4	14	50	15	68.2	12	70.6	11	25.5	16	22.3
Satisfied	150	50.5	4	20	6	21.4	4	19	9	32.1	3	13.6	3	17.6	18	41.9	29	40.3
Very satisfied	122	41.1	2	20	10	35.7	2	9.5	5	17.9	4	18.2	2	11.8	14	32.6	27	37.5

Comparing the use of the exam with the use of essays to perform the class distance assessment, our participants reported a satisfaction level, on average, of 3.08 (Range: 1 to 5; SD = 1.09).

When asked about the most positive aspect of distance assessment, participants reported greater convenience and ease in assessment (n = 95, 17.4%), although 10% (n = 57) referred to the absence of positive aspects. Regarding the negative aspects of distance assessment, one in three participants (n = 185, 33.8%) referred to less control over fraud and identity, and less equity (n = 14, 5.2%), lack of interaction (n = 28, 10.4%), more work/harder (n = 29, 10.7%), and digital problems (n = 12, 4.1%).

Most of the participants in the study (n = 430, 66.5%) stated positive perceptions regarding the distance assessment during the pandemic period.

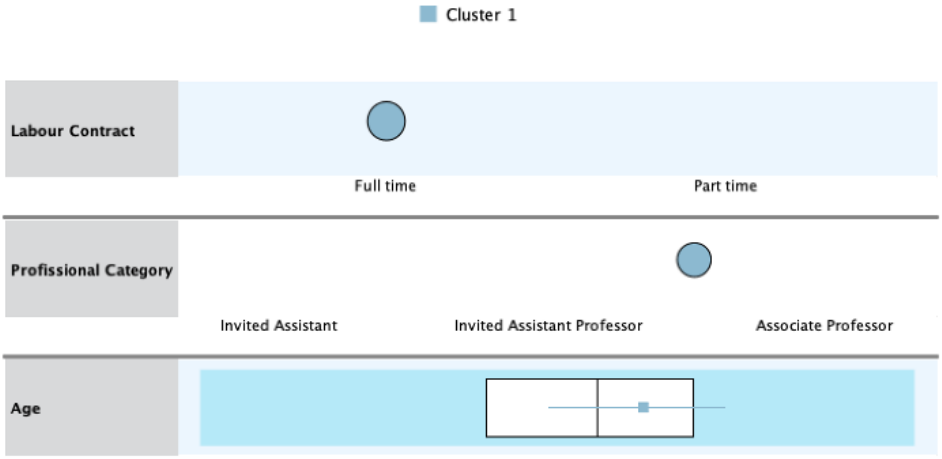
3.2. Cluster Analysis

In order to verify the existence of meaningful groups of individuals within the database with similar perceptions about remote teaching and assessment, a two-step cluster analysis was developed using categorical and continuous variables that characterize the teachers. The two-step cluster analysis uses a hierarchical agglomerative clustering procedure in which individual cases are successively combined to form clusters whose centres are far apart [34] (. Likelihood distance was selected because it is especially appropriate when categorical variables are used. The likelihood function was computed using the normal density for continuous variables and the multinomial probability mass function for categorical variables. All variables—two categorical variables (labour contract and professional category) and one continuous variable (age)—were treated as independent.

The analysis allowed us to extract two clusters of similar sizes: cluster one includes 314 teachers (57.6%) and cluster two includes 231 teachers (42.4%). The clustering quality was considered good (average silhouette measure equal to 0.7).

Three input variables were used, and the labour contract was the predictor with the highest importance for the creation of the clusters, followed by the professional category, and finally the age.

In terms of cluster characterization (see Figure 3), cluster one includes full-time teachers, mostly in the professional categories of assistant professor and adjunct professor and with an average age of approximately 50 years; cluster 2 includes part-time teachers, mostly in the professional category of invited assistant, and with an average age of 41 years.



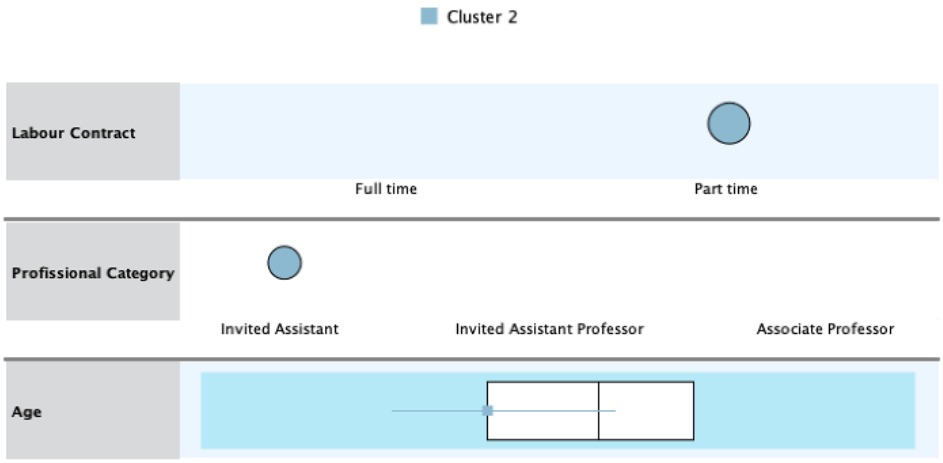


Figure 3. Cluster characterization.

The major evidence of this data reduction into two clusters is that cluster one comprises the teachers with more professional experience, stronger employment links and higher ages when compared to the teachers in cluster two.

After determining the two clusters, we aimed to understand whether the overall evaluations about the way the lessons and assessment took place in the remote learning period were different between the two groups. To achieve this objective, two-sample t-tests for the equality of means were carried out (see Table 3).

Table 3. Two-sample t-tests for equality of means.

Variables	Statistics		Levene's Test for Equality of Variances		t-test for Equality of Means		
	Mean		F	Sig.	t	df	Sig. (2-tailed)
	Cluster 1	Cluster 2					
Overall evaluation of the lessons in remote learning	6.79 (n = 314)	7.19 (n = 231)	11.138	0.001 [1]	−2.423	539.450	0.016
Overall evaluation of the assessment in remote learning	5.96 (n = 314)	6.54 (n = 231)	7.700	0.006 [1]	−3.145	530.693	0.002

[1] Equal variance not assumed.

The variables "Overall evaluation of the lessons in remote learning" and "Overall evaluation of the assessment in remote learning" were measured using a 10-point scale, where one represents the greatest dissatisfaction and ten the greatest satisfaction. The means analysis shows that the teachers with less professional experience (cluster two) have higher mean levels of satisfaction when compared to the teachers in cluster one. The t-tests for equality of means show that the differences observed between the two clusters are statistically significant.

Subsequently, we tried to understand whether the number of tools used in remote teaching and the number of strategies used in the assessment process was the same across the clusters, using descriptive data analysis (see Figures 4 and 5) and a two-sample t-test for the equality of means (see Figure 4).

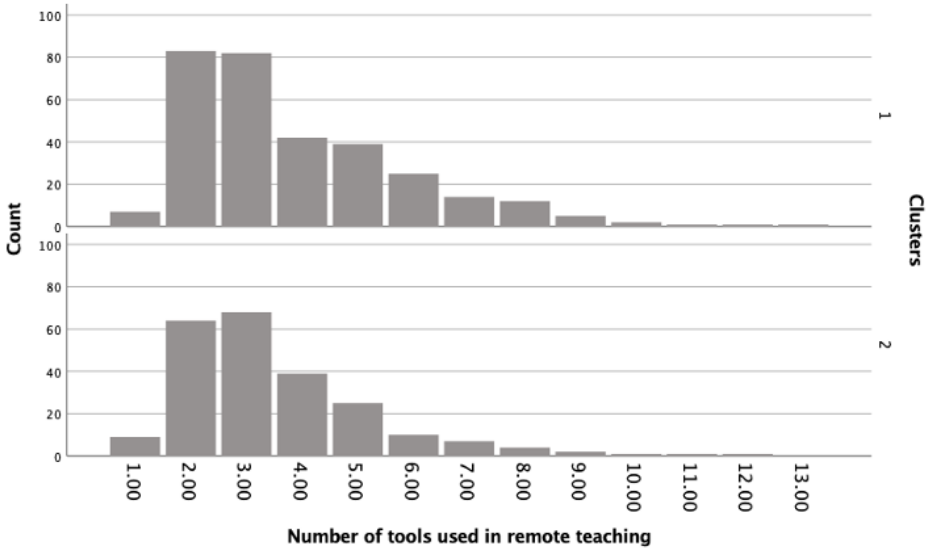


Figure 4. Number of tools used in remote teaching by cluster.

Regarding the number of tools used in remote teaching, we can see that the data distributions are similar between the two clusters. In both clusters, the most frequent values are the use of two or three tools in remote teaching.

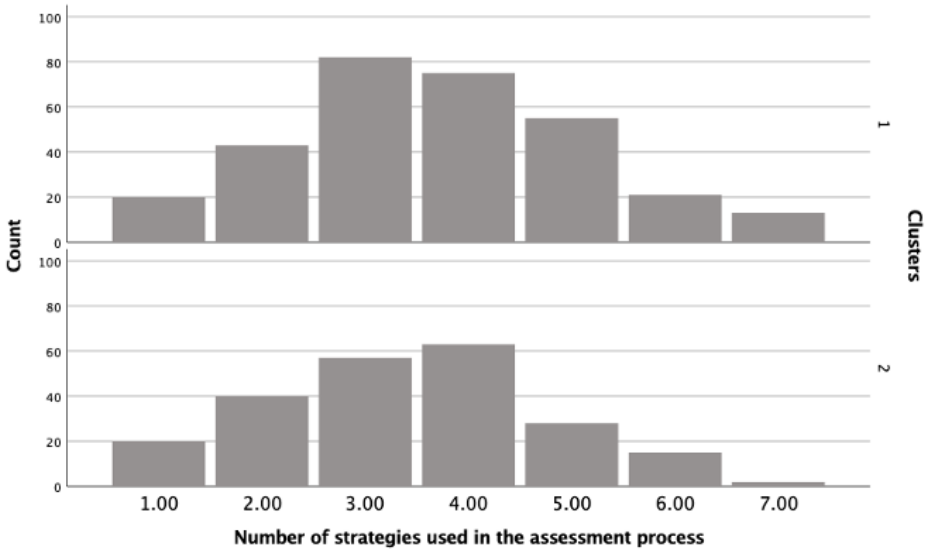


Figure 5. Number of strategies used in the assessment process by cluster.

Regarding the number of strategies used in the assessment process, the data distributions of the two clusters are also similar. In both clusters, the most frequent values are the use of three or four strategies in the assessment process.

The means analysis shows that the teachers with more professional experience (cluster one) use, on average, more tools and strategies to support lessons and assessment in remote teaching compared to the teachers with less professional experience (cluster two). The t-tests for equality of means show that the differences observed between the two clusters are statistically significant for both variables. Thus, there is statistical evidence to state that the teachers' behaviour regarding the use of tools and strategies was different between the two clusters (see Table 4).

Table 4. Two-sample t-tests for equality of means for the frequency of use of tools and strategies.

Variables	Statistics		Levene's Test for Equality of Variances		t-Test for Equality of Means		
	Mean		F	Sig.	t	df	Sig. (2-tailed)
	Cluster 1	Cluster 2					
Frequency of use of tools to support lessons in remote learning	3.91 (n = 314)	3.52 (n = 231)	6.019	0.014 [1]	2.317	526.928	0.021
Frequency of use of strategies for assessment in remote learning	3.70 (n = 309)	3.41 (n = 225)	0.703	0.402 [2]	2.342	532	0.020

[1] Equal variance not assumed; [2] Equal variances assumed.

4. Discussion and Conclusions

This study aimed to understand the teacher's perspective about emergency remote teaching and emergency remote assessment during the COVID-19 pandemic. A cross-sectional quantitative study was performed during June and July 2020 in a higher education institution.

Our results, in line with previous studies [10,11], showed that Zoom was the most used tool by teachers. Zoom was used for videoconference classes, replacing face-to-face regular interactions, which suggests that the change of paradigm from traditional education to innovative one's were short.

The needs of a teacher are not limited to face-to-face time with students. Therefore, the use of other platforms is urgently needed. In this case, Moodle is the most used platform for sharing files, assignments, to perform exams, but also to implement asynchronous interactions with students, as previously argued by Ozadwicz [35]. On the other hand, Microsoft Teams was also used by some teachers, namely the videoconference tool, file sharing, and chat. The combination of asynchronous and synchronous strategies in one single platform seems to be perceived as useful by the teachers [34]. Although teachers used Moodle and were satisfied with it, we notice that they used it mostly for sharing files, receiving essays, forums, and doing tests. These results can indicate that strategies used were more related to emergency remote teaching, as a quick way to answer an education need, than using online education strategies with planned combination of asynchronous and synchronous activities.

Regarding the overall assessment of the emergency remote teaching, and despite all the uncertainty and the lack of knowledge related to remote teaching and the use of different platforms, the participants in the study consider that it was a positive period, and they were moderately satisfied with remote classes and the strategies and tools used during this period.

Assessment seems to be the highest challenge to teachers during the pandemic period. Our results about remote assessment are in line with previous studies (e.g., [23,24]) defending that remote assessment should integrate different strategies. The participants mentioned the use of exams, projects, oral presentations, and essays to perform remote assessment. Therefore, the use of exams as a strategy to perform remote assessment was very frequent in our sample, as previously argued by several studies [10,26]. To perform the exams, Moodle was the most used platform in our study. Ozadwicz [35] stated that Moodle was frequently used to perform exams.

Regarding the positive and negative aspects of the remote assessment, teachers identified as positive aspects the ease of performing assessments, and the increase of autonomy enabling the combination of several types of strategies. These arguments are in line with the positive aspects of remote assessment referred to by Flores & Veiga Simão [24], although remote assessment presents many issues and questions to teachers. The most negative aspect reported by teachers was issues related to fraud and identity control. These issues were widely discussed by the scientific community, highlighting that teachers recognized the absence of certain digital skills, especially those related to the evaluation of educational practices [20]. It is relevant to notice that this "good" perception of teachers may be related with being in a pandemic lockdown period, and where the expectations regarding this issue were low. Therefore, more research is needed about assessment strategies and teacher's confidence in applying them, without being in a forced remote teaching process, but as taking part of an integrated assessment process according to online education principles.

Analysing our results according to teachers' characteristics, such as labour contract, professional category, and age, it was possible to observe two different groups of teachers. The less experienced teachers are more satisfied with remote classes and remote assessment. On the other hand, the most experienced teachers employed more tools during the remote teaching period and used more strategies to perform remote assessment as stated by previous studies [32]. Despite this finding, our study found that in general teachers use technology to a limited extent, as is also highlighted in other previous research [20,36].

Therefore, this study has important implications for higher education. Firstly, the pandemic period brought the need to rethink distance learning, namely concerning methodologies, strategies, and assessment. Secondly, it is important to consider different learning modes, such as e-learning, remote learning, hybrid contexts, and in-presence environments. Additionally, it is crucial to invest in the acquisition of software and teaching tools more adequate for virtual environments. Moreover, to achieve continuous improvement it is crucial to implement training programmes on pedagogical and digital issues for higher education teachers, as also advocated by Gómez-Pablos et al. [30]. It can also be concluded that teachers made a huge effort to use new educational technology in their classes and assessment process, although the results denote that this may be a onetime effort to answer to a world emergency. Further research is needed to understand if HEI are using the experiences and efforts made during this period to consistently introduce policies that potentiate that teachers adopt new and innovative methodologies such as those preconized by online education in their teaching processes.

This study has some limitations. On one hand, it is a case study analysing the teachers' perspective within a higher education institution. On the other hand, we did not consider the knowledge domains either in terms of teaching methodologies or for the assessment process, and it should be considered that there might be some changes and specificities in these processes according to the knowledge domains taught. Therefore, for future studies it is important to analyse the knowledge domains and to consider their perspective over time, in a longitudinal perspective, because we are only considering a transversal perspective in a very specific moment—the 2020 pandemic period.

In this study we have focused on discussing the teachers' perspective, but it is also relevant to consider other perspectives, namely the students' perception about the learning process during the 2020 pandemic period. Moreover, it is also relevant to analyse the governance board perspective, including their policies about remote learning and remote assessment and the guidelines given to teachers and students during remote and hybrid periods of classes and assessment.

Author Contributions: All the authors contributed to all sections of the article. All authors have read and agreed to the published version of the manuscript.

Funding: The APC was financed by Portuguese national funds through FCT—Fundação para a Ciência e Tecnologia, under the project UIDB/05422/2020.The work of author Vanda Lima is supported by national funds, through the FCT—Portuguese Foundation for Science and Technology under the project UIDB/04728/2020.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data available upon request sent to the authors.

Conflicts of Interest: The authors declare no conflict of interest.

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