



# A double-edged sword: Teachers' perceptions of the benefits and challenges of online teaching and learning in higher education

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## Abstract

Due to the impact of the recent pandemic, the teaching and learning experience worldwide was marked by a wave of emergency digitalization. The sudden need to transition to online teaching and learning (OTL) has forced Higher Education actors to adapt quickly without proper planning. This study examines teachers' perceptions of the benefits and challenges posed by OTL during the pandemic in Higher Education. Data were collected from 636 teachers from 54 different countries using an internationally distributed online survey, and responses were coded using thematic analysis. While the main benefits perceived by teachers relate to flexibility (in tasks execution), accessibility, pedagogical innovation, and self-regulation, key challenges emerge in domains such as engagement, interaction, infrastructure/technical support, assessment and pedagogical practice. Our results further suggest a phenomenon that we describe as a “double-edged sword” with elements of OTL being perceived both as a benefit and a challenge. Results and implications for OTL and future blended practices in Higher Education are discussed.

**Keywords** Online teaching and learning · Higher education · Transition to online and blended learning · Qualitative study · Content analysis

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## 1 Introduction

The unexpected spread of the first COVID-19 outbreak in 2020 forced teachers and students to switch and adapt quickly to online teaching and learning (OTL). While different studies suggest it sparked an unstoppable digitalization of Higher Education (HE) (García-Morales et al., 2021; Guppy et al., 2022; Zawacki-Richter, 2020), others suggest it exposed HE failures to face the demands, as well as teachers' unpreparedness to use digital technologies to support OTL practices (Dhawan, 2020; Watermeyer et al., 2021). As online modes of delivery, particularly blended ones, tend to continue and to expand (Pelletier et al., 2021; Verpoorten et al., 2020; Zawacki-Richter, 2020), the adoption of new pedagogical practices and the integration of digital technologies are pivotal.

How teachers perceive OTL, specifically the benefits and challenges they associate with it, will determine their technology adoption and shape their educational practices. Different studies addressing the perceptions of OTL exist (e.g. Kim et al., 2005; Lee et al., 2011; van Wart et al., 2020; Shea, 2007; Wandler & Imbriale, 2017). However, while providing important insights to the field, the majority of these studies are prior to the emergence of the pandemic and do not consider the unplanned and involuntary shift to OTL. In addition, they mainly focus on students' perceptions (Martin et al., 2020), leaving a knowledge gap regarding teachers' perceptions and experiences during this particular timespan (Flores et al., 2021; Guppy et al., 2022). It is well established that teachers' perceptions of benefits or challenges differ and what some may consider to be a benefit, others may perceive to be a challenge. At the same time, particular aspects of OTL may be perceived as both benefits and challenges. However, few studies have focused on the concrete benefits and challenges as being in both categories.

In this sense, it is essential to look with more detail into the perceived benefits and challenges of OTL from the teachers' perspective, as this may inform future HE institutions at different levels. On the one hand, it will enable a better understanding on how to support teachers to develop sustainable OTL practices by, for instance, informing the development of targeted professional training based on their specific needs. This is of particular relevance when considering how to develop more flexible modes of delivery, such as blended teaching and learning. On the other hand, it may contribute to the careful design of effective online/blended courses and quality practices, particularly if teachers' perceptions are paired with those of students.

In the present study, we examined teachers' perceptions of the benefits and challenges of OTL during the pandemic in 2020. To achieve this goal, we have conducted a thematic analysis of open-ended questions drawn from survey data of HE teachers across the world (N=636, 54 countries). This unique dataset will enable us to consider a wide range of perceptions of OTL across HE within the breadth and scope of the rapid transition inflicted by the pandemic. Findings will help us deepen knowledge on how to move forward with transitioning teachers to online and blended learning.

## 2 Literature review

### 2.1 Online and remote teaching and learning

The rapid changes imposed due to the COVID-19 pandemic have made OTL a common mode of delivery in HE across the world - at least around that time, surely affecting HE forever. OTL can be generally defined as any mode of teaching and learning mediated by digital technologies to enable access and interaction with learning materials (text, video, audio, ...), as well as with instructors and other learners (Anderson, 2011; Bower, 2019). Different authors suggest it is more flexible in time and space than face-to-face teaching and learning, allowing learners to acquire knowledge and construct meaning from the learning experiences and interactions (Anderson, 2011; Means et al., 2013; Shea, 2007). Others suggest it is more challenging and demanding than traditional face-to-face classes, requiring mastery in the crafting of digital environments in which students are able to build knowledge, feel engaged, emotionally connected and are provided with timely feedback and guidance (Kim et al., 2005; Lee et al., 2011; Song et al., 2004).

The emergency measures taken during the coronavirus outbreak offered a new term for the type of teaching being delivered during that period: emergency remote teaching and learning (Hodges et al., 2020). This can be described as an alternate temporary mode of instruction to provide access to learning in response to an emergency or crisis. Overall, it refers to improvised, limited and impoverished planned pedagogical strategies to rapidly meet the needs of learners. It differs from OTL in the sense that it is not the result of carefully planned, implemented, and evaluated learning designs (Baggaley, 2020; Hodges et al., 2020).

Currently, emergency remote teaching and learning is not the global norm anymore. But the experience was sufficient to drive HE institutions to more hybrid territories: many are now supporting the adoption of online and blended teaching and learning models as a means to enable higher flexibility between online and face-to-face experiences, and to ensure continuity of teaching and learning through future emergency situations (Joosten et al., 2021; Pelletier et al., 2021). Reports from different HE institutions suggest there will be an increase in online and blended modes of delivery and reveal teachers' intention to adopt them (Bartolic & Guppy, 2021; Guppy et al., 2022; Verpoorten et al., 2020). As such, looking at teachers' perceptions of the benefits and challenges in a time of rapid change, without adequate professional development and support for transitioning may facilitate future actions related with the development and implementation of future online and blended practices.

### 2.2 Teacher change and professional development

Adopting online and blended teaching and learning practices requires that teachers are well trained in the pedagogical approaches best suited for these modes of delivery. Teachers' professional development is a complex, multidimensional practice, requiring cognitive engagement in active learning, disposition to reflect upon the added value of digital technologies for teaching and learning, and to adopt new roles and skills that may lead to changes in their practices (Bruggeman et al., 2021;

Philipsen et al., 2019). Among other aspects, it is further framed by HE policies and organisational cultures, which may, or may not, favour and foster professional learning (Hardy, 2012).

Research has shown that, in general, professional development initiatives have little impact on teacher change (Guskey, 2002; Whitworth & Chiu, 2015). Reasons pertain mostly to the nature of the process itself, which encompasses a set of dimensions that interact at different levels, for instance personal (previous experiences, beliefs, expectations, sense of identity, etc.) and contextual ones (institutional support, leadership, peer collaboration, etc.). Different researchers put forward a number of principles that should guide the development of effective professional learning towards the implementation of online and blended learning. One is that it is framed by clear goals and strategies; another is that it involves teachers in their planning and design; still another is that it combines theory and practice, and covers a period of time that allows for actual implementation and experimentation; another is that there is time for reflexive practice within a context of collaborative work; that it is differentiated and responds to the needs of each teacher and, finally, that it helps teachers identify and strategize about challenges they will encounter (Baran et al., 2011; Philipsen et al., 2019; Wolf, 2006).

Another crucial aspect is obviously that professional learning covers and supports the development of online teaching competences. Recent studies (Martin et al., 2019; Martin & Bolliger, 2022) found the competences teachers perceived as most important relate to designing effective pedagogies for online teaching and learning (including planning activities that provide students opportunities for interaction and engagement, and assessments), responding and giving feedback (synchronously and asynchronously also as a means of students' guidance and self-regulation), scheduling fixed time to execute tasks and knowing the technical aspects necessary to operate digital technologies.

### 2.3 Benefits and challenges of online teaching and learning

Different studies have focused on the benefits and challenges of OTL. Frequently cited benefits include greater flexibility and convenience (Dhawan, 2020; Paudel, 2021; Shea, 2007), increased inclusion and educational opportunities for students who are unable or choose not to attend traditional classrooms (Means et al., 2013; Pearson & Koppi, 2002), the promotion of students' autonomy and self-regulation (Eberle & Hobrecht, 2021; Wandler & Imbriale, 2017), reduced costs, both in terms of physical facilities and travelling and the opportunity to enhance one's digital skills (Pelletier et al., 2021; Shea, 2007).

Research highlights the importance of course design in order to fully reap the benefits associated with OTL (Baran et al., 2011, 2013; Martin et al., 2018; van Wart et al., 2020). Teachers should be knowledgeable of different pedagogical approaches to structure OTL and feel confident enough to employ different strategies to engage students in the learning process. Presence (in all its dimensions), interaction, a sense of community, participation, collaboration, involvement and communication are essential elements to cater for in the design of OTL, which are linked to better learning

outcomes and achievements (Lee et al., 2011; Martin et al., 2019; Martin & Bolliger, 2022; Oliveira et al., 2021).

These elements often emerge as challenges associated with OTL as well. Bolliger et al., (2019) found that effective communication and feedback was a challenge during the establishment of an online program community. The same was found by other studies (Lee et al., 2011; Martin et al., 2018) that stress the importance of such elements for establishing social presence and a sense of community in which students do not feel isolated or disengaged (Aguilera-Hermida, 2020; Means & Neisler, 2021). Other frequent challenges include infrastructure, technical difficulties and related lack of support, increased time and workload, and inadequate training (Eberle & Hobrecht, 2021; Mishra et al., 2020; Paudel, 2021; Song et al., 2004; van Wart et al., 2020). Still others include controlling assessment fraud, assessing and resilience to adopt digital technologies (Flores et al., 2021; Oliveira et al., 2021).

As pointed out earlier, most studies conducted so far look at OTL and associated benefits and challenges from the perspective of students. There is little research focusing on teachers' perceptions, particularly pertaining to their experiences during the timespan covered by our study. The few available (e.g., Mishra et al., 2020; Oliveira et al., 2021; Paudel, 2021) pertain to small samples of teachers at a single HE institution or a single country. While these studies provide important insights for the field, it is necessary to develop a more specific understanding of perceived benefits and challenges of OTL from the teachers' perspective. Moreover, looking at the elements of OTL that teachers perceive as both benefits and challenges is new to our knowledge. Doing so will contribute to a deeper understanding on how teachers can be better supported to sustain new online teaching practices and consider future blended learning. In addition, it will highlight the need to go beyond remote OTL practices to provide evidence that acknowledges the specificities of teachers.

## 2.4 Purpose of the study

Our study draws from the perspective of a unique large international sample and aims to examine HE teachers' perceived benefits and challenges of OTL. The research question that guided our study was: What are the perceived benefits and challenges teachers identify for OTL?

## 3 Method

### 3.1 Sample and procedure

In March 2020, when the COVID-19 pandemic broke out in Europe, an online survey was launched to collect data on teachers' readiness for OTL around the world. The anonymized survey was shared via Twitter, collaborating universities and HE institutions. Participation in the survey was voluntary and its purpose was fully disclosed. Participating teachers gave their consent before starting the survey and agreed with the use of their data for research. One of the aims of the survey was to identify

teachers' perceptions of the benefits and challenges they associated with OTL. These were collected via two open questions: "What do you feel are the top three benefits of online learning?" and "What do you feel are the top three challenges of online learning?"

When the survey was closed, at the end of May 2020, data extracted corresponded to 1144 teachers from 54 countries and different educational levels, ranging from primary to higher education. The sample drawn for the present study consisted of higher education teachers who responded to both open questions, totalling 636 teachers (55.5% female). Respondents were from countries mainly distributed across Europe (81.4%) and were on average 48 years old ( $SD=9.8$ ). They had 19.3 years of teaching experience ( $SD=10.8$ ) and their OTL experience averaged 6.0 years ( $SD=5.7$ ).

### 3.2 Coding of the open responses

The open answers were coded following an inductive approach, grounded on a data-driven analysis of the corpus (Charmaz, 2001, 2006). The objective of coding was to define the primary categories and related sub-categories of the participants' answers regarding benefits and challenges. The corpus was analysed and coded using the NVIVO software package. Since the process of coding is permeable to subjective judgments and interpretation (Burla et al., 2008; e.g. Lombard et al., 2002), an inter-coder reliability check was implemented for primary categories and related sub-categories, using the Intraclass Correlation Coefficient (ICC) in the statistical software SPSS Version 23, checking absolute agreement in a confidence interval of 95%. The objective of these tests is to verify if ratings by different coders do reflect the dimension they are purported to reflect.

Coder A (first author) proceeded to the coding of the total sample of responses to the open-ended questions ( $N=1272$ ). During this phase, the master coder was assisted by a junior researcher with knowledge in the subject of study and who had received training in view of the coding process. A collaborative and reconciliation procedure was adopted by both researchers: differences in coding were discussed with the two coders returning to the original answers and comparing together the assigned codes with the specific descriptions articulated in the coding scheme. This procedure allowed for a collegial consensus-building and led to a refinement and finalization of the main categories and related sub-categories.

This scheme was later shared with Coder B (second author), who independently coded a sample of 15% of responses ( $N=190$ ) for primary categories and related sub-categories. An intercoder reliability test was then performed comparing the coding results of coders A and B. The ICC for primary categories and related sub-categories was of 0.925,  $p<.001$ , 95% CI [0.876, 0.954], meaning that there was a complete agreement between coder A and coder B. The final coding scheme, presenting each of the categories and sub-categories, describing its precise scope, including examples of the coded content can be found as an Appendix. Further examples are included in the next section, where teachers' quotes are identified by the coding they were assigned (ID\_1, ID\_2, ID\_3 and so forth).

**Table 1** Categories and subcategories associated with benefits of OTL.

Category	Sub-category	N	%	Total N	Total %
<b>Self-Management</b>	Time management	51	4%	248	18%
	Flexibility (in tasks execution)	197	14%		
<b>Work-Life balance</b>	Convenience/ Comfort	58	4%	222	16%
	Environmental sustainability	17	1%		
	Timesaving	58	4%		
	Commuting/ travelling	47	3%		
	Costs/resources	42	3%		
<b>Teaching-Learning activities</b>	Feedback	49	4%	463	34%
	Self-regulation	79	6%		
	Flexibility (of schedules)	48	3%		
	Personalization	42	3%		
	Pedagogical innovation	87	6%		
	Pedagogical practice	64	5%		
	Collaboration	9	1%		
	Autonomy	31	2%		
	Planning	54	4%		
	<b>Teacher-Student social interaction</b>	Interaction	57		
Engagement		40	3%		
Proximity		19	1%		
<b>Technological affordances</b>	Digital skills	39	3%	331	24%
	Digital resources	53	4%		
	Continuity	77	6%		
	Accessibility	109	8%		
	Inclusion	53	4%		
<b>Total</b>				1380	100%

## 4 Results

### 4.1 Perceived benefits of OTL

Table 1 shows the category with the highest number of codes related to Teaching-learning activities, followed by Technological affordances, Self-management, Work-life balance and Teacher-student social interaction. The main benefits perceived by teachers relate to *Flexibility (in task execution)*, *Accessibility*, *Pedagogical Innovation*, *Self-regulation* and *Continuity*.

In relation to *Flexibility (in tasks execution)* and *Time management*, teachers acknowledge the ability to follow their own rhythm and decide when and what to prioritize (e.g. recording lectures, scheduling with students) as beneficial elements. Teachers feel they can “choose the time [they] want to spend on something

or what to do first” (ID\_12) and acknowledge students can also “choose their own pace” (ID\_419) and “decide what to watch (and focus on what they lack the most)” (ID\_428).

Within Teaching-learning activities, teachers identify benefits mostly related to *Pedagogical innovation* and *Self-regulation*. Teachers recognize the transition to OTL as a “possibility to innovate” (ID\_13), “rethink pedagogy” (ID\_327) and “use new pedagogical strategies” (ID\_301). At the same time, they consider it contributes to structuring teaching content and students’ activities in a more effective way, which in turn, may lead to an improvement of students’ responsibility and accountability for their learning process. Indeed, as one teacher puts it “if learning paths are well enough structured, students will be able to enhance their self-regulated learning skills” (ID\_345). Apart from *Self-regulation*, *Autonomy* and *Personalization* are pointed out as benefits as well. In this respect, teachers say they are able to place a “higher focus on individual learning needs” (ID\_247), “rather on mandatory whole group teaching” (ID\_455), and on planning targeted learning designs ahead. Other benefits within this main category include receiving/providing more timely and personalized *Feedback* from/to students and the possibility to promote *Collaboration* among them.

As to Technological affordances, teachers highlight the affordances technologies provide to students to access contents, review/revise lectures whenever and as many times they want and clarify questions they were not able to during class time. Other benefits relate to the development of teachers and students’ *Digital skills*, as both need to use digital technologies to engage in the teaching and learning process. For teachers, the development of new *Digital resources* is also acknowledged as beneficial and essential to support OTL practices. When referring to this, teachers mention the creative process of using different digital tools and more interactive elements to build new pedagogical material that, nevertheless, “need to be clear and user friendly as students have to access them alone” (ID\_455). In addition, teachers indicate OTL as an efficient approach to ensure *Continuity* of the teaching and learning activities in occasions where face-to-face activities are not possible (e.g. pandemics, illness) and to provide greater students’ *Inclusion*, because technology facilitates “reaching all students, including those with different profiles and conditions” (ID\_344).

In regard to Work-life balance, teachers refer to the personal convenience and *Comfort* of working and learning from home as a benefit. In this case, both teachers and students do not need to *Commute*, which has implications in terms of *Timesaving* and *Environmental sustainability*. Several teachers also mention the reduction of *Costs*, not only in financial terms, but also in relation to the physical and technical infrastructure that is needed at the different HEIs.

*Interaction*, *Engagement* and *Proximity* are identified as benefits within the Teacher-student interaction main category. In general, teachers reporting these benefits indicate OTL offers more choices for communication and interaction, in addition to enabling greater proximity with students who in face-to-face situations are normally shy and distant from the greater group. Different teachers also consider their students are more engaged and participative during online classes.



**Table 2** Categories and subcategories associated with challenges of OTL.

Category	Sub-category	N	%	Total N	Total %
<b>Self-management</b>	Time management	20	1%	41	3%
	Emotional regulation	21	2%		
<b>Work-Life balance</b>	Overuse/exposure	27	2%	51	4%
	Costs/resources	12	1%		
	Balance work / family	7	1%		
	Work overload	5	0%		
<b>Teaching-Learning activities</b>	Assessment	103	7%	530	38%
	Pedagogical practice	96	7%		
	Collaboration	15	1%		
	Feedback	81	6%		
	Pedagogical innovation	75	5%		
	Self-regulation	34	2%		
	Fraud	27	2%		
	Planning	67	5%		
	Monitoring	32	2%		
	<b>Teacher-Student social interaction</b>	Interaction	173		
Engagement		179	13%		
Sense of community		20	1%		
Non-verbal communication		67	5%		
Social contact		29	2%		
<b>Technological constraints</b>	Infrastructure/technical support	152	11%	303	22%
	Digital skills	59	4%		
	Accessibility	38	3%		
	Inclusion	28	2%		
	Digital resources	26	2%		
<b>Total</b>				1393	100%

## 4.2 Perceived challenges of OTL

Table 2 shows the category with the highest number of codes related to Teaching-learning activities, followed by Teacher-student social interaction, Technological constraints, Work-life balance and Self-management. The main challenges perceived by teachers relate to *Engagement, Interaction, Infrastructure, Assessment and Pedagogical practice*.

Perceived challenges identified within Self-management relate to *Time management* and *Emotional regulation*. Apart from references in relation to teachers and students' difficulties in using their time productively and efficiently, different teachers refer to the impacts OTL may have at emotional level. In this respect, teachers feel students may struggle with loss of empathy, loneliness and isolation.

As to Teaching-Learning activities, the most perceived challenges relate to *Assessment*. In general, teachers express difficulties in using effective methods and strategies to assess students in online environments. Examples include references to being unable to “design suitable assessment methods to evaluate students in a fair and honest way” (ID\_49) or to “adapt traditional tests to the online environment” (ID\_197). Other teachers refer to their unpreparedness to prevent *Fraud* during assessment tasks and exam periods. As to *Pedagogical practice*, challenges include limitations to implement the practical and experimental components of teaching, such as lab classes or field trips, and to employ efficient teaching strategies. Several teachers refer to the adaptation of common face-to-face strategies (e.g., lecturing) into online environments and the design of adequate pedagogical approaches as challenging and more demanding, requiring extra *Planning* time and effort: “Preparing high quality online activities that take full advantage of the potential of the medium takes time - more time than preparing a face-to-face lecture/tutorial” (ID\_11). In most cases, teachers feel they lack experience and adequate theorized pedagogy to diversify and combine new pedagogies and technologies. They also refer to the need for training and support to be able to modify their teaching and promote *Pedagogical innovation*. In this regard, different teachers point at the lack of an OTL strategy in their HEIs. Within this category, further challenges include receiving/providing *Feedback* from/to students, especially because they feel it is difficult to exercise *Monitoring* during online classes (e.g. video and cameras off), as well as *Collaboration* and *Self-regulation*.

Challenges identified within Technological constraints relate to *Infrastructure*, *Accessibility*, *Inclusion*, *Digital skills* and *Digital resources*. Teachers mention the lack of technical support, equipment and insufficient technological infrastructure to accommodate different online activities simultaneously as aspects that may impact the quality of OTL. Particularly, when these affect students, they also impact their access to contents and online classes and contribute to greater digital inequalities. Different teachers refer to the only device their students have to access classes and content is their smartphone, which has obvious implications in the way they interact and engage in classes and with content. The lack of digital skills, both in relation to knowing how to operate different tools and build digital resources adapted to OTL, is also mentioned as challenging.

Although working from home presents elements that are considered as beneficial (convenience, comfort, no need to commute), there are teachers who feel they compromise their Work-Life balance. Related challenges include the effects of *Overexposure* to technology/screens and Increased costs with equipment and other infrastructure, such as electricity, the need to update outdated equipment or pay for specific software. Less mentioned challenges include risks for *Work overload* and difficulties in balancing working from home, for example, taking care of children.

The challenges teachers most identify are found within the Teacher-Student social interaction category and relate to *Engagement* and *Interaction*. In this respect, teachers express their difficulty in keeping students engaged and motivated. Related reasons include the lack of human and *Social contact*, “which is where a lot of effective, efficient and personalised instruction can happen” (ID\_451), the difficulty in creating a *Sense of community* and belonging among students and the absence of *Non-verbal communication*.

## 5 Discussion

### 5.1 The “Double-Edged Sword” of OTL

The current study depicts OTL as a “double-edged” sword – with both beneficial effects and associated challenges for teachers. To illustrate, the results show that teachers consider time management as a benefit, but also a challenge. While managing time is often associated with higher degrees of flexibility in terms of balancing work and family responsibilities (Dhawan, 2020; Paudel, 2021), committing to OTL requirements is known to be challenging (Baran et al., 2011; Philipsen et al., 2019). Redesigning and setting up new learning scenarios, specifically when no time was allowed to it, demands planning in advance, readapting or creating course materials and familiarizing with the digital tools being used for course delivery, which may be extremely time-consuming activities.

Interestingly, flexibility in performing tasks, such as preparing teaching, emerged as the most significant benefit reported. However, our study also amplifies it to include a dimension we associate with teachers’ autonomy. Teachers’ control and freedom to implement individualized strategies for managing their tasks is known to have an impact on teachers’ professional identity, job satisfaction and on higher degrees of decision making in terms of instruction (Vangrieken et al., 2017; Strong & Yoshid, 2014). Different studies also highlight the relation between enhanced teachers’ autonomy, organizational efficiency and excellence (Friedman, 1999; Prakash, 2011). Future studies could look into the impact of greater degrees of autonomy on these aspects within the framework of the HE institutions teachers work for.

Our results also show that the reduction of costs and resources consumption is perceived as a benefit associated to OTL, particularly for institutions in terms of reduced demand for classroom space and campus infrastructure, energy and water, in addition to those related with course materials. While the beneficial side of these aspects is well acknowledged (Joosten et al., 2021; Pelletier et al., 2021; Shea, 2007; Watermeyer et al., 2021), the imposed transition to OTL forced teachers (and students) to stay and work from home. All the expenses that were once incurred by HE institutions became an additional burden for teachers (and students). Increased costs with equipment, software licenses, technical support and electricity are drawbacks teachers associate with OTL. Stemming from this, our results further expose the deficient conditions of HE institutions in terms of infrastructure and technical support capable of enabling an effective and efficient response to teachers and students. Infrastructure has long been identified as a challenge of OTL (Shea, 2007; Mishra et al., 2020) and its availability or lack of will limit the opportunities for digital transformation and transition to more flexible modes of teaching and learning (García-Morales et al., 2021; Vicente et al., 2020).

Elements of OTL perceived as both benefits and challenges are particularly evident in relation to the crafting of teaching and learning activities. Such elements pertain to feedback, self-regulation, collaboration, planning, pedagogical innovation and pedagogical practice. Concerning feedback, teachers consider OTL as a facilitator for the provision of instant, more timely and more personalized feedback to students, which is known to be associated with teaching presence, better learning outcomes

and achievements (Lee et al., 2011; Martin et al., 2019; Martin & Bolliger, 2022), and to enable and enhance students' self-regulation (Joosten et al., 2021; Wandler & Imbriale, 2017). Teachers struggling with the lack of feedback (in both directions), mostly due to the nature of the learning technologies used (cameras off, lack of non-verbal communication elements, etc.) can experiment with other technologies that support the collection and provision of feedback, not only to inform students and scaffold their self-regulatory skills, but also their own planning. Indeed, it is well established that planning a course to be delivered online requires more than casual preparation. It requires planning in advance, orchestrating teaching, learning and assessment activities, as well as creating digital educational resources that support teaching and learning aims. While some teachers acknowledged the transition to OTL gave them the opportunity to rethink their course and plan activities more carefully, others found it challenging to cope with demands in terms of the time needed to the sudden change and to modify and adapt their pedagogical approaches.

In this respect, our results also showed OTL was a gateway for pedagogical innovation, but also an indication of the need for professional development. In line with different studies demonstrating that OTL requires knowledge and mastering pedagogies that are specific to OTL (Baran et al., 2011; Martin et al., 2019; Wolf, 2006), our study indicates teachers need a solid and holistic view of the pedagogy of OTL. This needs to incorporate the pedagogical affordances of digital technologies and resources and an exploration of what best works, in which contexts and for which learning purposes. Increasing knowledge on such affordances may contribute to fostering teachers' confidence and ability to integrate digital technologies meaningfully in their practices (Ertmer et al., 2015). Professional development programs should also be developed in the contexts in which teachers will be exercising their practice in the future, which are predicted to rely mostly on blended modes (Joosten et al., 2021; Pelletier et al., 2021; Verpoorten et al., 2020;). As such, teachers should be trained in blended-based contexts so that they are immersed in the scenarios they may be encountering. As previous research has shown, effects of OTL on face-to-face teaching include moving to more blended types of course designs and placing a higher focus on student-centered approaches that can contribute to students' success (Baran et al., 2013; Joosten et al., 2021). They should further offer teachers the opportunity to develop their own course designs, incorporating and experimenting with instructional strategies, which are central to successful online and blended teaching and learning experiences. These include, for instance, engaging students in and promoting interaction during online activities, which were identified as main challenges in our study, confirming what previous studies had already found (Lee et al., 2011; Martin et al., 2018; Martin & Bolliger, 2022). Nevertheless, it is worth noting that such elements – interaction and engagement – were also perceived as beneficial elements. Indeed, as pointed out by different authors (Bolliger et al., 2019; Oliveira et al., 2021), these are some of the central elements in the development and maintenance of learning communities. It is important that teachers get the necessary support to craft learning experiences for students, which allow them to interact with each other, with the content and with the teacher, while sensing intellectual and emotional stimulation, as well as belonging. In this respect, the blend of face to face and online components could be considered in a complementary way. Careful planning

could consider the redesign of learning objectives and activities to incorporate those that could be accomplished face to face and those that could be accomplished online.

Considering teaching and learning activities, our results further suggest a clear tension between face-to-face teaching practices centered on fixed assessment moments and their transferability to the online context, revealing a significant unpreparedness of teachers and/or HE institutions in the deployment of assessment methods natively designed for digital environments. The same challenges were found by Watermeyer et al., (2020) and Zawacki-Richter (2020). The shift into more active, student-centered learning approaches requires diverse and more authentic forms of student assessment that include, for instance, formative, peer and self-assessment, self-reflection-rubrics or e-portfolios.

The sudden transition to OTL would not have been possible without technology. Yet, despite the crucial role it played – and will continue to play to sustain online and/or blended teaching practices – our results describe a duality regarding technology-related elements. In terms of accessibility and inclusion, for instance, teachers recognise the affordances of technology to enable anywhere/anytime access to all students, regardless of their location and profiles. But teachers also acknowledge patterns of digital inequality and dual exclusion, because not all students own or have access to the needed equipment/conditions. Means & Neisler (2021) found students from lower-income households experienced more challenges than students from higher-income households during the rapid digital transition. Other authors (Aguillera-Hermida, 2020; Laufer et al., 2021) also highlighted inequalities in their study of digital education during the pandemic. To tackle this, HEIs need to address digital access and inequality by considering setting up initiatives that do not exclude those who cannot afford technology, such as loaning schemes or working with telecom companies to offer affordable access to broadband and Wi-Fi.

Another technology-related element refers to digital skills. The efficient use of technology depends on these, or lack thereof, and to some extent so does designing effective pedagogies for online teaching and learning (Martin et al., 2019; Martin & Bolliger, 2022). Such as other studies have found (Rivera-Vargas et al., 2021), our study indicates teachers perceived OTL as an opportunity to develop their digital skills. It also indicates though, that the lack of such skills was a barrier for transforming and innovating pedagogies, and for developing digital resources. It is important that teachers are given the opportunity to engage in professional learning activities about digital technologies and their pedagogical affordances through digital technologies to develop their own pedagogical digital skills.

## 6 Limitations and future directions

When considering the results of our study, some limitations should be considered. Variables such as teachers' age, teaching experience, experience in online learning and even the particular contexts in which they work did not come into play in the analysis. Future studies could include such variables to understand more specifically contextual and personalised factors and their relationship with the perceived benefits and challenges related to the transition to OTL. Teachers' digital competences were

not assessed, nor their relationship with the perceived benefits and challenges they associate with OTL. It is well established that teachers' digital competence, their beliefs and attitudes towards technology have an impact on their pedagogical practices and therefore future studies could combine this research with in-depth analysis of these aspects.

Future studies could also investigate the specific teaching methodologies, pedagogical and assessment approaches that occurred in online environments during the pandemic, in addition to how organizations have supported the development of teachers' design of online and blended learning. Understanding changes and their possible relations to change could provide further insights to teachers' professional development. Finally, and because some time permeates the first wave of COVID-19 and today, looking into tendencies pertaining to OTL and blended transitions across international HEIs would be useful. In this respect, the replication of the present study would enable the comparison of results knowledge and a deeper knowledge on how to move forward with transitioning teachers to online and blended learning.

## 7 Appendix Coding scheme for main categories and related sub-categories (benefits and challenges of OTL)

Category	Sub-category	Description	Extract of the coded content
<b>Benefits of OTL</b>			
<b>Self-management</b>	Time management	References to a better time management for both teachers and students	“Time management” (ID_34) “Better time management” (ID_125)
	Flexibility (in tasks execution)	References to a higher degree of flexibility for task execution	“More flexibility for recording and editing lectures” (ID_439) “More flexibility to prepare teaching” (ID_38)
<b>Work-Life balance</b>	Convenience/ Comfort	References to the comfort/ convenience, such as being at home or in a familiar environment	“Teachers can teach from their homes” (ID_476) “Possible from home to home” (ID_433)
	Environmental sustainability	References to reducing environmental resources consumption	“Better for the environment (i.e paperless)” (ID_328) “Less traveling is good for climate” (ID_349)
	Timesaving	References to saving time by avoiding commuting to the university	“Time saving” (ID_135) “Saves time” (ID_552)
	Commuting/ traveling	References to reducing costs regarding traveling/commuting to university	“Money gains (no commute to campus)” (ID_350) “It saves up on commute costs” (ID_441)
	Costs/ resources	References to reducing costs regarding physical infrastructures for working, learning and living	“Saving resources such as physical space and utilities” (ID_352) “Cost reduction” (ID_594)

Category	Sub-category	Description	Extract of the coded content
<b>Teaching-Learning activities</b>	Feedback	References to receiving/providing feedback from/to students	“Many options for individual feedback” (ID_352) “Feedback can be given more easily via online platforms” (ID_605)
	Self-regulation	References to students’ responsibility, control, self-discipline, concentration and attention	“Allows for more personal accountability on part of students” (ID_251) “Responsibility of students for own learning process” (ID_289)
	Flexibility (of schedules)	References to a higher degree of flexibility in terms of time/schedules	“More flexibility in my time schedule” (ID_16) “Time flexibility” (ID_23)
	Personalization	References to the personalization of teaching according to students’ needs and pace	“Can be tailored to the students’ needs” (ID_114) “It offers possibilities for increasing personalized learning” (ID_161)
	Pedagogical innovation	References to pedagogical innovation, incl. developing new resources, methods and strategies	“Innovation in teaching” (ID_162) “Encourages creativity in teaching materials/teaching methods” (ID_95)
	Pedagogical practice	References to elements that facilitate teaching, incl. employing efficient strategies, structuring content and students’ activities	“Focused instruction” (ID_522) “Teachers can integrate more materials into their teaching” (ID_210)
	Collaboration	References to the promotion of collaborative work among students	“It eases collaborative learning” (ID_161) “Students can collaborate easily” (ID_619)
	Autonomy	References to the development of students’ autonomy	“Independent learning” (ID_167) “Allows to promote autonomy in students” (ID_168)
	Planning	References to a higher focus on planning and preparing lessons	“Thoughtful planning” (ID_220) “Lecturers need to think about their course content ahead and highlight the important parts” (ID_131)
<b>Teacher-Student social interaction</b>	Interaction	References to the interaction between teachers and students	“More choices for interaction” (ID_20) “More frequent interaction with students” (ID_176)
	Engagement	References to greater engagement/participation of students during online lessons	“Can enhance engagement/contribution to discussion for students” (ID_11) “Greater engagement of all students” (ID_238)
	Proximity	References to greater proximity and the reduction of distance between teachers and students	“We can connect anytime with students and academic staff” (ID_301) “Maintaining proximity while separated from learners” (ID_338)

Category	Sub-category	Description	Extract of the coded content
<b>Technological affordances</b>	Digital skills	References to the development of digital skills by teachers and students	“Advancement of digital literacy” (ID_74) “Learning to use new tools” (ID_176)
	Digital resources	References to the variety/availability of digital resources	“Creation of suitable online resources” (ID_102) “Ability to integrate different resources” (ID_190)
	Continuity	References to the affordances for continuing education in cases teaching and learning is otherwise possible	“Ability to continue course during a pandemic” (ID_1) “You don't have to stop teaching at all” (ID_24)
	Accessibility	References to elements that enable accessibility anywhere/anytime, such as recording, "infinite" viewing, ease of sharing	“Permanent access to materials” (ID_52) “Always available for later recaps” (ID_124)
	Inclusion	References to the ease of reaching all students, incl. those with different profiles and conditions and from different locations	“Equal opportunities to all students” (ID_20) “Possibility to reach all students” (ID_66)
<b>Challenges of online learning</b>			
<b>Self-management</b>	Time management	References to teachers and students' difficulties in managing their own time	“Requires strong time management skills” (ID_229) “Time management” (ID_588)
	Emotional regulation	References to impacts at emotional level, such as loss of empathy, loneliness and isolation	“Stress, uncertainty” (ID_85) “Loneliness” (ID_354)
<b>Work-Life balance</b>	Overuse/exposure	References to the effects of excessive/prolonged exposure to technology/screens	“More tiring, talking to a screen for a couple of hours is more demanding” (ID_83) “You work long hours sitting behind your desk” (ID_102)
	Costs/resources	References to increased costs with equipment and other infrastructure	“Costs for infrastructure” (ID_223) “Costs of teaching aids e.g. paid software” (ID_271)
	Balance work/family	References to teachers' difficulties in balancing working at home and family life	“Combine work and taking care of children=very difficult, almost impossible” (ID_38) “Organisation of job taking household into account” (ID_133)
	Work overload	References to increased workload for both teachers and students	“Risk for heavy workload” (ID_67) “Increased workload for students and faculty” (ID_240)
<b>Teaching-Learning activities</b>	Assessment, strategies and methods	References to difficulties in assessing students, such as using effective methods and strategies	“Difficulty in assessment of students” (ID_412) “Assessment methods” (ID_436)



Category	Sub-category	Description	Extract of the coded content
<b>Teacher-Student social interaction</b>	Pedagogical practice	References to the limitations of teaching practical classes, laboratories and employing efficient strategies	“Practical work is impossible to do online, the students lose the hands-on experience” (ID_10) “Using the best method that fits the goal” (ID_43)
	Collaboration	References to the difficulties in engaging students in collaborative work	“Working in groups (for students)” (ID_9) “Creating a collaborative community of learners” (ID_213)
	Feedback	References to constraints in receiving/providing feedback from/to students	“Time needed to provide individual feedthrough and feedback” (ID_35) “Lack of real time feedback from the students” (ID_66)
	Pedagogical innovation	References to difficulties regarding pedagogical innovation, incl. developing new resources, methods and strategies	“Mastering online learning pedagogy” (ID_95) “Professors lack pedagogical innovation” (ID_142)
	Self-regulation	References to difficulties regarding students' accountability for their own learning	“Lack of self-discipline for some students” (ID_4) “Students need to be guided, get enough structure or else they will have difficulty to self-regulate” (ID_67)
	Fraud	References to difficulties in preventing fraud by students during tasks/assessment	“Monitor examination so that the students do not cheat” (ID_175) “Students assessment (how to prevent cheating)” (ID_226)
	Planning	References to the demands for planning and preparing lessons	“Ensure that my plan is well aligned with the needs and motivation of the students” (ID_585) “Most content needs to be made from scratch” (ID_54)
	Monitoring	References to difficulties in monitoring the attendance and presence of students during lessons	“Hard to know what students are doing in online practical sessions” (ID_83) “Keeping track of attendance of students” (ID_301)
	Interaction	References to the lack of interaction between teacher and students	“Interactivity with large groups” (ID_41) “Less possibilities for interaction” (ID_68)
	Engagement	References to the decrease of engagement/participation of students during online lessons	“Keeping ALL students engaged” (ID_5) “Keep the students attention” (ID_399)
Sense of community	References to the difficulties in promoting a sense of community and belonging among students	“Alienation and lack of sense of community” (ID_25) “No sense of belonging” (ID_195)	

Category	Sub-category	Description	Extract of the coded content
<b>Technological constraints</b>	Non-verbal communication	References to the lack of non-verbal communication elements easily grasped during f2f lessons	“Overcoming the absence of face to face” (ID_237) “Lack of face to face interaction, discussions lack the non-verbal aspect” (ID_340)
	Social contact	References to the loss of social contact and interaction	“Difficult to make up for the loss of social contact” (ID_30) “Less social interactions” (ID_45)
	Infrastructure/technical support	References to technological difficulties, such as poor infrastructures, technical support and security	“Providing technical support to students” (ID_10) “Technological impediments (insufficient hardware or software, poor broadband)” (ID_213)
	Digital skills	References to the lack of digital skills by teachers and students	“Our own professional development on the use of different tools, and platforms is a challenge” (ID_56) “Teachers lack of knowledge about digital tools and their semiotic/pedagogical affordances” (ID_199)
	Accessibility	References to elements that do not enable accessibility anywhere/anytime, such as equipment, connection	“Students access to internet and hardware” (ID_132) “Not everyone consistently has strong internet, so it can create challenges” (ID_242)
	Inclusion	References to difficulties in reaching all students, incl. those with different profiles and conditions and from different locations	“Including all students” (ID_119) “Digital exclusion” (ID_608)
	Digital resources	References to difficulties in preparing and offering adequate resources	“Create resources to allow asynchronous learning” (ID_405) “Preparing new pedagogical materials” (ID_521)

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