

Digital Teaching in Higher Education during the Pandemic: Experiences in Four Countries

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Abstract. *This paper presents a study conducted within an international project to investigate the experiences of higher education (HE) teachers with the shift to digital teaching during the COVID-19 pandemic. The study was based on a survey conducted among HE teachers (n = 167) in autumn 2021 in four European countries: Spain, Portugal, Finland and Croatia. Analysis of Variance (ANOVA) was used to investigate the differences in responses with respect to the country and the study field, with more significant differences found among the countries than among the study fields. The results will contribute to a MOOC for teachers' professional development.*

Keywords. higher education, online learning, hybrid learning, blended learning, teachers, COVID-19 pandemic

1 Introduction

Online learning took full speed with the onset of the COVID-19 pandemic in spring 2020, when nearly all teaching and learning was shifted online, including in higher education (HE) (OECD, 2021). The prediction for the future of education online came true (Powell et al., 2015).

Challenges of online education were met differently by different countries, and even institutions, depending on their digital maturity. Well-prepared countries, with advanced IT strategies, infrastructure, and human potentials, as the key elements of digital maturity of educational institutions (Ifenthaler & Egloffstein, 2020; Đurek et al., 2017), shifted to the online learning mode nearly instantly, while for others the challenges were more overwhelming. There were

also countries not performing the best in relation their overall digital maturity, but “fit” in terms of ongoing reforms and readiness for change (Svetec & Divjak, 2021). Yet, similar challenges were widely identified in shifting to online education; first is the ICT accessibility, affordability, and flexibility, followed by pedagogical competence, combined with online teaching and learning methodologies and modes (Murgatroyd, 2020). In other words, the pandemic not only raised technical and resource issues, but also brought forward the question of teachers' and students' digital competences. It raised questions on pedagogical practices in teaching, learning and assessment, by taking away the face-to-face interactions between learners and teachers.

Some higher education institutions (HEI) had already introduced practices contributing to the flexibility and accessibility of HE, including blended learning and hybrid learning (Bashir et al., 2021). However, in many countries, HEIs were not well prepared for the shift to predominantly online education, and there was often not enough experience and time to conceive new formats of teaching and learning (OECD, 2021). The pandemic made many HEIs speed up the developments related to e-learning, which was done in emergency, without structured long-term planning (Müller et al., 2020). After the initial closures of HEIs and mainly online learning, in some countries, possibilities for hybrid learning were introduced (OECD, 2021). In terms of future developments, research has shown that HE teachers appreciated blended and hybrid learning, allowing them to use the strengths of both face-to-face and online learning (Müller et al., 2020).

The change from traditional face-to-face learning to an online learning environment during the pandemic has been experienced differently by teachers and

students (OECD, 2021). Teachers have had an essential role in the continuation of learning during the pandemic (Council of the EU, 2020), and how teachers cope generally affects many aspects of the learning process (Jelińska & Paradowski, 2021). Some research in secondary and primary education has indicated that teachers' frequency, confidence and self-perceived proficiency in using digital technologies for teaching, as well as their motivation for improving their digital skills and using digital technologies have increased during the pandemic (Beardsley et al., 2021). However, many HE teachers were not fully satisfied with the transition to online teaching and learning (OECD, 2021), and some research has distinguished between teachers who were more engaged and better coping with the challenges of online teaching, and those who were struggling in both aspects (Jelińska & Paradowski, 2021). It has also suggested that teachers with prior experience with online teaching were the most engaged and the best coping (Jelińska & Paradowski, 2021). Similarly, it has been found that HE teachers who had used innovative pedagogies like flipped classroom before the pandemic, in the face-to-face or blended mode of delivery, had more success with their online implementation during the pandemic (Divjak et al., 2022). In this respect, it should be noted that the use of online tools by HE teachers (academics) before the pandemic was not widespread (OECD, 2021), which could have considerably affected their experiences with the shift to online teaching and learning. Moreover, digital competences for teaching and possibilities for professional development aimed at developing digital competences were found essential in adapting to online teaching (König et al., 2022).

In order to explore the experiences of HE teachers with digital teaching before and during the COVID-19 pandemic, and compare the perspectives of teachers in different HE systems and different study fields, we conducted a study within the international Erasmus+ project entitled *Digital and Entrepreneurial Skills for European Teachers* (eDesk). The project includes partners from Spain, Portugal, Finland and Croatia. The aim of the project is to develop a hybrid teaching methodology and encourage the development of teachers' competences by supporting their continuous professional development. In this context, our research was conducted as the basis for the preparation of a MOOC for HE teachers' professional development.

The study was focused on the following research questions (RQ):

RQ1: What were the experiences of HE teachers with the shift to digital teaching during the COVID-19 pandemic?

RQ2: Were these experiences different with respect to the country and the field of study?

Our study encompassed various modes of digital teaching, including fully online, blended, and hybrid. Though blended and hybrid teaching are distinguished from each other in this study, it needs to be noted that they have frequently been used interchangeably.

Therefore, in discussing the two teaching modes, it is important to point out the difference within this study, as explained in the Methodology section.

2 Methodology

Our study included HE teachers in four European countries: Spain, Portugal, Finland, and Croatia. It was based on a survey carried out in the period between 24 August 2021 and 21 September 2021 (further: autumn 2021).

2.1 Instrument

The questionnaire was developed by the international project team. The first version was developed by the second author, at the LUT University, Finland, based on daily discussions with teachers, and subsequent discussions with IT staff. The questionnaire was then further discussed with the researchers from the international project team, primarily the third author, from the University of Zagreb, Croatia, and the final version was prepared.

The final version of the questionnaire included 28 questions, with the majority of questions being multiple-choice, in form of Likert-type items (from 1 - *Strongly disagree* to 5 - *Strongly agree*, or adjusted to a specific question). The remaining were multiple-choice questions with multiple answers possible, *Yes/No/I don't know* questions, and open-ended questions.

The questions were focused on teachers' experiences related to the shift to digital education, including their practices before and during the pandemic. Several groups of questions were included, focused on (1) perceived benefits of digitalization for teaching and learning, (2) use of digital technologies in teaching and learning, (3) teaching delivery modes, (4) teaching strategies and methods, (5) assessment, (6) self-assessment of competences, (7) organizational support, (8) interaction with students and peers, (9) entrepreneurial teaching. In this paper, due to the foreseen length, we analyse all the groups except for entrepreneurial teaching. As for the included groups, we present the key results, but not details related to all the questions.

To ensure focused responses, the questionnaire included the essential definitions, including those of the modes of delivery of teaching, defining:

- *fully online mode*, in which students complete courses entirely online;
- *blended mode*, in which the learning environment includes both online environment and face-to-face teaching;
- *hybrid mode*, in which students are simultaneously present in the same classroom, either physically or remotely.

Additionally, the questionnaire was designed to collect background data on participants' country,

gender, age, teaching experience (years), employment (permanent or not, full-time or part-time), type of a HEI (public or private), and the study field.

2.2 Participants

The questionnaire was distributed electronically by each project partner among their HEIs, and filled in by HE teachers teaching in various study fields. A total of 167 fully completed responses were collected: 36 in Spain, 73 in Portugal, 27 in Finland, and 31 in Croatia.

2.3 Data analysis

To respond to RQ1, related to the teachers' experiences with the shift to digital teaching during the pandemic, we used descriptive statistics to analyse the sample and the overall responses to the multiple-choice questions. Moreover, we used qualitative analysis to analyse the open-ended questions.

To respond to RQ2, we conducted one-way Analysis of Variance (ANOVA) tests, taking into account unbalanced designs (considering the differences in group sizes) on a subset of chosen questions, to determine whether there are statistical differences between the groups related to the independent variable. The first independent variable was the *country*, with four groups of data (Spain, Portugal, Finland, Croatia). The second independent variable was the *study field*, with six groups of data (Arts & Humanities, Social Sciences, Technical Sciences & Engineering, Science & Mathematics, Health Sciences, Other).

As ANOVA assumes that the observations within each group are normally distributed and have equal variances (De Veaux et al., 2012, pp. 727 – 729), additional tests were conducted before the ANOVA. To determine whether the groups have a normal distribution, histograms were analysed. To determine whether the variances are similar, the Levene test was conducted. For several questions in which the Levene test pointed to unequal variance, Welch's ANOVA was conducted (Dalggaard, 2008, p. 133). After the ANOVA, for variables (questions) that demonstrated significant differences between the groups, the Tukey test was additionally conducted, to investigate which specific groups' means are different in comparison to each other. The analyses were conducted in R, with *tidyverse* and *car* as essential packages.

With respect to both RQs, in this paper, we present only a sample of the most interesting results.

3 Results

3.1 Sample analysis

In the total sample (167 participants), including all the four countries, there were 85 female HE teachers (50.9%), 79 male (47.3%), and three who declared

themselves as other or preferred not to say (1.8%). Their age ranged from 25 to 69 years, with teaching experience from one to 45 years. A majority of teachers held a permanent position (76%). Moreover, a vast majority worked full-time (93.4%). Finally, all the participants worked at public universities, except for one, who worked at a private university. As for the field of study, the distribution of the participants was as follows: Social Sciences (41), Technical Sciences & Engineering (41), Arts & Humanities (40), Science & Mathematics (29), Health Sciences (13), Other (3).

3.2 Experiences with the shift to digital education (RQ1)

In terms of the **perceived benefits** of digitalization for teaching and learning, a vast majority of the participants (strongly) agreed that digitalization *supports* teaching and learning (88%), as well as that it *enhances* teaching and learning (70.6%).

When it comes to the **use of digital technologies** in teaching before the pandemic, only a small portion of the participants (13.8%) reported having ICT fully embedded in their practice, but a majority (59.8%) reported either using ICT as a significant or regular feature (31.1%) or frequently using ICT with a varying impact (29.3%). Some of the participants also reported never (2.4%) or only occasionally (23.4%) using ICT in their practice. In autumn 2021, the proportion of the participants having ICT fully embedded in their practice increased almost three times (40.7%), while a majority (56.9%) still used ICT as a significant or regular feature (39.5%) or frequently with a varying impact (17.4%). While there were still some of the participants who reported using ICT only occasionally (2.4%), none responded they never used ICT in their practice. Similarly, a vast majority of the participants (78.4%) (strongly) agreed that the pandemic had had a positive effect on the use of digital technology in their institutions.

In relation to the **modes of delivery**, regarding the period before the pandemic, a vast majority of the participants (89.2%) reported using face-to-face teaching always or frequently. On the other hand, a vast majority reported using other delivery modes (fully online, blended, hybrid) occasionally, rarely, or never. In autumn 2021, the proportion of the teachers who reported using the face-to-face mode of delivery always or frequently decreased (59.9%), while the portion of the teachers who used other delivery modes (fully online, blended, hybrid) always or frequently increased. Details are presented in Fig. 1.

As for the **teaching methods** used in digital teaching, a majority of the teachers reported always or frequently using questions and answers (63.5%), while around a half of the participants reported always or frequently using problem-based (45.5%), project-based (45.5%), work-based (45.5%), collaborative and peer-learning (41.9%). Inquiry-based learning, flipped classroom, and learning based on cooperative models

(such as social economy or cooperative values) were reported as less frequently used. Details are presented in Fig. 2. In terms of other methods, in their comments, the teachers mentioned traditional lessons, individual lessons, presentations, guest speakers, debates and discussions, game-based learning, team-based learning, peer-learning, case studies, reading scientific texts, brainstorming sessions, field trips, and other.

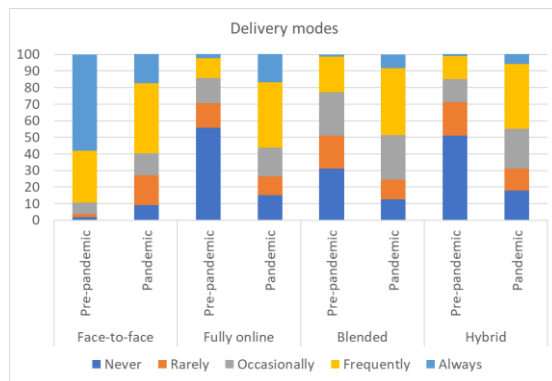


Figure 1. Delivery modes before the pandemic and in autumn 2021 (responses in percentages)

In relation to **assessment during the pandemic**, slightly more than a half of the participants (strongly) agreed that they tried to replicate the approaches used before (53.3%) and that they adapted assessment approaches used before to the online environment (55.7%). The participants expressed the highest level of agreement with the claim that they had to rethink assessment and introduce considerable changes, with which two thirds (strongly) agreed (67.7%). In terms of concrete assessment methods and tools, results suggested that more than a half of the participants applied more problem-solving exercises, while fewer participants introduced group reflection and peer-

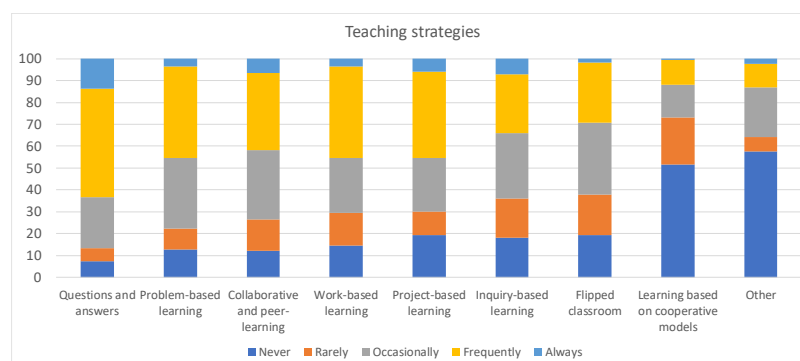


Figure 2. Teaching strategies used in digital teaching (responses in percentages)

assessment, or used examination databases and self-assessment in a digital environment. Details are presented in Fig. 3. However, in their comments, some of the participants explained that they did not introduce peer-assessment and group reflection, as they had already used them before. They also mentioned using

online formative quizzes, online tests, oral assessment, and interactive and metacognition activities, as well as rubrics supporting the assessment of complex tasks. Finally, a majority of the participants (60.5%) (strongly) agreed that they used continuous, formative digital assessment methods.

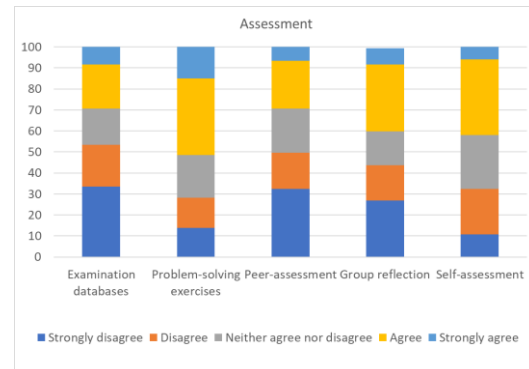


Figure 3. Assessment tools and methods (responses in percentages)

As for the participants' **self-assessment of competences**, more than a half (59.3%) (strongly) agreed that their digital teaching competence is very good, while around two thirds (70.7%) (strongly) agreed that their pedagogical competence is very good.

In terms of **organizational support**, about a half of the participants (strongly) agreed that their organization offers effective support for digital teaching (50.3%), but nevertheless, more than a half (56.3%) found their organization needed to offer more support to improve online teaching.

In terms of **available digital resources** at their institutions, the participants pointed out online platforms (162) and LMSs (151). These were followed by editing tools (58), polling tools (57), add-on

software for including questions in Moodle videos (49), and game-based tools (49). As far as the **forms of ICT support** are concerned, the teachers preferred videos (102), followed by short courses (81), tutorials (81), manuals (79), and workshops (76).

As for **interaction** during the pandemic, only a minority (strongly) agreed that they interacted with students (21%) or peer teachers (16.2%), or noticed students interacted with their peers (15.6%) more than before. However, around a half of the participants (48.5%) (strongly) agreed with having noticed that students interacted more with available digital material.

In their responses to open-ended questions related to changes, successes, and challenges of digital teaching, teachers reported different experiences. While some of the participants mentioned that not much had changed with the pandemic as they had used digital tools and resources before, others had less successful experiences. Several of the participants pointed out that they made more digital materials, introduced new tools, prepared new course designs, and had to rethink their practices and enhance their own competences. Several mentioned more creativity in teaching and better access to information for students. But while some found that digitalization enriched and improved their teaching practice, others found it impoverished their practice and was overwhelming for students, and pointed out that digital teaching cannot replace face-to-face. Several of the participants also reported that digital teaching required more effort, workload, and preparation, but some pointed out that digitalization made their teaching more effective. While some reported that digitalization made teaching more impersonal, others stressed it made it more inclusive and open. Moreover, while some thought there was less contact, communication, and interaction with students, others mentioned good interaction and better relationships with students.

3.3 Differences between the countries and study fields (RQ2)

The ANOVA test pointed to a number of variables (questions) that showed significant differences with respect to the country, and fewer that showed significant difference with respect to the study field. (In further text, when the countries and study fields are compared, the one with a higher mean is marked with an asterisk.)

In relation to the **perceived usefulness of digitalization** in terms of supporting and enhancing teaching and learning, there were no significant differences neither between the countries nor between the study fields.

However, the results showed significant differences among the countries with respect to the **extent to which digital technology was used** for lessons before the pandemic ($p = 1.48e-06$, $F = 10.89$), but also in autumn 2021 ($p = 1.44e-05$, $F = 9.03$). With respect to both questions, the differences were the most significant between Portugal and Croatia*, and Portugal and Finland*. Regarding the use of digital technology in autumn 2021, there was a significant difference between the study fields as well ($p = 0.005$,

$F = 3.48$), in particular between Social Sciences* and Arts & Humanities.

With respect to the statement that the pandemic has had a **positive effect on the use of technology** at the participants' institutions, the difference between the countries was not found to be significant. However, the difference was significant between the study fields ($p = 0.008$, $F = 3.22$), in particular between Health Sciences* and Arts & Humanities, and between Technical Sciences & Engineering* and Arts & Humanities.

Significant differences were also found between the countries in relation to all the **modes of delivery** before the pandemic: face-to-face (Welch: $p = 1.089e-09$, $F = 20.89$), fully online (Welch: $p = 3.113e-07$, $F = 13.87$), blended ($p = 7.85e-05$, $F = 7.68$), and hybrid (Welch: $p = 0.005$, $F = 4.65$). In autumn 2021, there was a significant difference with respect to face-to-face (Welch: $p = 9.8e-10$, $F = 20.86$) and fully online learning (Welch: $p = 1.649e-07$, $F = 14.51$), but no significant difference in relation to blended learning and hybrid learning. In relation to fully online learning, differences were the most significant between Spain and Croatia*, and Spain and Finland*. When it comes to the study fields, the only significant difference was found regarding the use of fully online teaching before the pandemic (Welch: $p = 0.0007$, $F = 6.83$).

In relation to **teaching and learning strategies**, a significant difference between the countries was found in problem-based learning ($p = 0.002$, $F = 5.03$) and work-based learning (Welch: $p = 0.02$, $F = 3.53$). For problem-based learning, there were significant differences between Portugal and Croatia*, and Spain* and Portugal. For work-based learning, there was a significant difference between Spain* and Finland. As for other teaching strategies, including flipped classroom, project-based learning, collaborative and peer learning, learning based on cooperative models, questions and answers, inquiry-based learning, there were no significant differences among the countries. Regarding the study fields, the only significant difference was found in relation to work-based learning (Welch: $p = 0.02$, $F = 3.44$), in particular between Technical Sciences & Engineering and Arts & Humanities*.

As for **assessment**, there were significant differences in relation to all the variables (questions), except for two, related to whether the participants tried to replicate assessment approaches used before and adapted their approaches to the online environment. Conversely, from the study field perspective, no significant difference was found in relation to the vast majority of variables.

In relation to the participants' **self-assessment of digital teaching competences**, a significant difference was found both among the countries (Welch: $p = 0.0002$, $F = 7.62$) and the study fields (Welch: $p = 0.02$, $F = 3.51$). In particular, in relation to the countries, there was a significant difference between Portugal and

Croatia*, and in relation to the study field, between Science & Mathematics* and Arts & Humanities.

When it comes to **organizational support**, there were significant differences among the countries both in whether the participants found their organization needed to offer more support to improve online teaching ($p = 7.9e-05$, $F = 7.67$) and whether it offers effective support for digital teaching ($p = 0.03$, $F = 2.99$). In relation to the former, there were significant differences between Croatia and each of the three countries*. In relation to the latter, there was a significant difference between Spain and Croatia*. Moreover, there was a significant difference between the study fields in relation to the need for more support from the organization ($p = 0.03$, $F = 2.65$), in particular Science & Mathematics and Health Sciences*, and Social Sciences and Health Sciences*.

In relation to **interaction**, there was no significant difference with respect to either the country or the study field.

4 Discussion

Our research, even though conducted on a relatively small sample, presents an overview of HE teachers' experiences with the shift to digital education in four countries with different educational traditions. The results mainly confirm the already existing knowledge and assumptions related to the shift to digital education during the pandemic (OECD, 2021), but also offer some interesting and specific insights, especially useful for the preparation of the project's MOOC for professional development of teachers. It should be noted that the study was conducted in autumn 2021, which was a year and a half into the pandemic, when certain teaching and learning practices had already been adapted to the pandemic circumstances. This was no longer the emergency response as the one during the onset and the peak of the pandemic. Nevertheless, the results still suggested a decrease in face-to-face teaching and learning, and an increase in other digital modes of delivery, including fully online, hybrid and blended. This suggests that the pandemic has fostered the digital transformation of HE in a sustainable way.

The results show that HE teachers widely recognize that digitalization *supports*, but are not so much aware that it *enhances* teaching and learning. This may be related to the less positive experiences of some teachers with the shift to digital teaching, and the fact that some found that digitalization impoverished their practice. This may, in turn, relate to the fact that not a negligible proportion of teachers (40.7%) found their digital teaching competence not very good. In this respect, it is not surprising that teachers in Science & Mathematics found their digital teaching competence significantly better than teachers in Arts & Humanities.

Moreover, all of this could also be linked with the level of organizational support, as more than a half of the participants (56.3%) found that their institutions

should offer more support for online teaching. In this respect, the ANOVA showed that Croatian teachers reported the highest level of the existing support and the lowest level of the need for additional support. The high level of the need for more support is consistent with the small proportion of teachers (13.8%) who reported having ICT fully embedded in their practice before the pandemic. In relation to innovative pedagogies, previous research reviews have found that HE teachers who had used innovative pedagogies such as flipped classroom before the pandemic were more successful in their implementation during the pandemic (Divjak et al., 2022). However, the causality of this assumptions has not been tested in this research and should be investigated further.

Among the study fields, the highest level of the need for more support was reported in Health Science, which can be related to the fact that this study field includes a lot of practical work, which has also been reported as challenging during the pandemic (OECD, 2021).

It is no surprise that the proportion of teachers who reported having ICT fully embedded in their practice increased almost three times during the pandemic (from 13.8% to 40.7%), and that in autumn 2021, none reported never using ICT in their practice. However, it is interesting to note that some teachers (2.4%) still reported they used ICT only occasionally.

Expectedly, the results confirm that the use of face-to-face teaching decreased, while the use of all other modes of delivery (fully online, blended, hybrid) increased during the pandemic. Here, it is interesting to note that in autumn 2021, there was a bigger emphasis on fully online learning in comparison to blended and hybrid learning (between which there was no significant difference between the countries). The fact that hybrid learning was the least used may be related to the fact that its implementation is also quite complex and requires substantial effort on behalf of the teacher (Goodyear, 2020), which confirmed the need for guidance and methodology, such as those provided by the eDesk project.

It is commendable that the teachers often used innovative strategies like problem-based, project-based, collaborative and peer-learning, as well as work-based learning, which might have been challenging during the pandemic. Some teachers mentioned laboratory classes (practical work) as particularly challenging, but they also mentioned a solution in the form of virtual laboratories. The only significant differences in relation to the teaching and learning strategies were found between the countries by the ANOVA regarding problem-based learning (most frequently used by Croatian and Spanish teachers) and work-based learning (most frequently used by Spanish teachers). Unfortunately, flipped classroom and inquiry-based learning were not widely used, even though they provide substantial opportunity for students' active learning and engagement in online learning (Divjak, 2022; Zhang et al., 2021).

Another interesting result also refers to the extent to which digital technology was used before and during the pandemic. Namely, the result showing significant differences between the same groups of countries (Portugal and Croatia, Portugal and Finland) before and during the pandemic may indicate that a country's response to the pandemic was linked with its digital readiness before the pandemic (similar was indicated in relation to pre-tertiary education by Svetec & Divjak, 2021). This can also be related to the digital maturity of HEIs (Đurek et al., 2017). Similarly, when it comes to the perceived positive effect of the pandemic on the use of technology, significant differences between the study fields, in particular between Arts & Humanities and Technical Sciences & Engineering, may also suggest that the extent to which the pandemic changed the teaching practices depended on how much a study field is technology-related, with a stronger effect reported in Technical Sciences & Engineering.

Finally, interaction with (and among) students and peers was confirmed as one of the most challenging aspects of the shift to digital teaching, without significant differences between either countries or study fields. This is in line with previous research, and corresponds with the results suggesting that active learning strategies such as flipped classroom and inquiry-based learning were not widely used.

4.1 Limitations and future research

One of the limitations of our study is the size of the sample, and including a wider range of participants may have elicited different results. However, it should be noted that the population included in the study were HE teachers, who are not as numerous as students, and might not always have the capacity to take part in extensive surveys as this one. Moreover, the sample was not balanced, as more responses were collected in some countries than in other. The sample was also not randomly assigned, which was due to the specific context and purpose of the project (learning design of the MOOC). It should also be noted that the study was not longitudinal, and the teachers were asked to report on their practices before the pandemic retrogradely. Having already changed their practices during the pandemic might have influenced their answers about the pre-pandemic period. In terms of further research, it would be worth exploring the experiences of HE teachers in other countries in order to make additional comparisons, as well as broaden the sample in the already included countries. Moreover, the study indicates a difference in the implementation of technology in teaching, and self-assessment of digital competences, with respect to specific study fields. However, to make more definite conclusions, further original research or meta-analyses are needed. It would be especially interesting to relate teachers' perceptions with the digital maturity of their HEIs. Finally, it would be useful to conduct longitudinal research, to explore

whether and how the pandemic has changed the practices of HE teachers in long term. This paper presents only a summary of the key findings due to the prescribed length. However, more detailed insights into the findings of the conducted analyses may provide deeper insights into the topic.

5 Conclusion

We presented a survey design research (n = 167) aimed at exploring the experiences of HE teachers with the shift to digital teaching during the COVID-19 pandemic in four countries: Spain, Portugal, Finland and Croatia.

The study found that in autumn 2021, the portion of teachers having ICT fully embedded in their practice was almost three times higher than before the pandemic. In autumn 2021, the portion of teachers who reported using the face-to-face mode of delivery always or frequently decreased, while the portion of teachers who used other delivery modes (fully online, blended, hybrid) always or frequently increased. As autumn 2021 was no longer the period of the most serious emergency, this suggests that the pandemic has triggered a sustainable digital transformation of HE. The results also indicated that some innovative pedagogies, like problem-based, project-based, collaborative and peer-learning, as well as work-based learning, were often used, whereas others, like flipped classroom and inquiry-based learning were not used in their full potential.

We analysed the results to determine whether there are significant differences in teachers' responses with respect to the country and the study field. Among the countries, there were significant differences related to the extent of use of digital technologies in teaching before and during the pandemic, delivery modes, some teaching and learning strategies, assessment, teachers' self-assessment of digital competences, and organizational support. Among the study fields, there were fewer significant differences, and those were primarily related to the use of digital technologies during the pandemic and the positive effect of the pandemic on the use of digital technologies, teachers' self-assessment of digital competences, and organizational support. In relation to teaching and learning strategies, there was a significant difference in the use of work-based learning.

It would be valuable to conduct further research with a broader sample and including other countries, as well as longitudinal research. It would also be worth digging deeper into the established differences between the countries and study fields. Finally, future research could consider the relation between teachers' perceptions and the digital maturity of their higher education institutions.

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