Supporting teachers in higher education: Design of an institutional programme from a socio-technical perspective

Abstract

Purpose – The acceleration of technology adoption in higher education, prompted by the global shift to online teaching during the COVID-19 pandemic, called for responsive programs to address pedagogical challenges. This paper presents the design process and initial adoption of an institutional programme created to support instructors in providing educational resources for online and hybrid undergraduate courses in a Nordic University.

Design/methodology/approach – By adopting a socio-technical perspective, the programme encompasses teacher support and digital platform use. Additionally, the program aimed to enhance the student experience by increasing course consistency and facilitating data collection for future research on learning analytics.

Findings – Our findings demonstrate the programme's successful adoption, effectively strengthening teachers' practices. Key contributions include a teacher-centric perspective on technology challenges and a socio-technical conceptualisation informed by teachers' experiences during the pandemic.

Originality/value – This research provides valuable insights for teachers, administrators, and researchers developing similar initiatives for effective professional development of faculty in online and hybrid teaching environments.

Keywords

Socio-technical system, online learning, remote teaching, educational institutions, workplace development programme, digital learning environment

1. Introduction

The COVID-19 pandemic accelerated technology adoption, bringing about cascade effects of major changes in the educational provision. As a result, the number of digital platforms used for teaching has increased, and their usage has changed (Mishra *et al.*, 2020; Patricia Aguilera-Hermida, 2020). Since the first term of 2020, most institutions changed from on-site teaching, to distance learning conducted online to follow the restrictions imposed by governments (Gaebel *et al.*, 2021; Nations, 2020). Several digital platforms that offer streaming and conferencing features, and learning management systems (LMSs) were the protagonists of the online lectures and virtual classrooms in the so-called emergency remote teaching (ERT) (Hodges *et al.*, 2020). Moreover, since the pandemic started spreading, teaching practices were influenced by inconsistencies related to the digital platforms used to support education provision, including: a) resource availability, reflected on some institutions quickly shifting to online teaching whereas others had to rely on printed materials (Gaebel *et al.*, 2021; Niu, 2024; Nworie, 2021), b) platform selection, which included LMSs, streaming platforms, and varied communication channels (Mishra *et al.*, 2020; Nworie, 2021; Patricia Aguilera-Hermida, 2020), c) users' readiness for online and distance teaching (Niu, 2024; Ahmed *et al.*, 2023; Garcia *et al.*, 2024; Nikolopoulou and Kousloglou, 2022),

d) integration limitations, e.g. stable internet connection, and hardware accessibility (Nations, 2020; Nworie, 2021; Patricia Aguilera-Hermida, 2020), and e) specific course requirements for teaching, e.g. labs and workshops (Code *et al.*, 2020; Niu, 2024).

Overall, the ERT period was challenging for students and teachers alike as most teaching practices changed from an on-site only practice to distance and online settings with a mix of synchronous and asynchronous modalities (Martin *et al.*, 2023). This included online flipped classrooms, pre-recordings, and streamed lectures which supported teaching provision since the beginning of the pandemic (Gaebel *et al.*, 2021; Means *et al.*, 2020; Mishra *et al.*, 2020). Studies have been conducted on the effect and impact of the ERT on teaching and learning in varied educational settings. For instance, changes in students' learning patterns, motivation and engagement levels have been researched (Means *et al.*, 2020; Patricia Aguilera-Hermida, 2020); as well as the pre-pandemic students' study profiles and their relationship with the forced change in the teaching modality to online and distance learning (López Flores *et al.*, 2022) .

There were multiple challenges teachers faced during this period, including feelings of ineffectiveness when it came to using digital platforms (Abilleira *et al.*, 2021; Trust and Whalen, 2020), the lack of institutional support for professional development and workplace learning (Niu, 2024; Nikolopoulou and Kousloglou, 2022), and the need to nurture pedagogical and technological training (Tsegay *et al.*, 2022). Although instructor readiness for virtual environments improves with the provision of organisational support (Garcia *et al.*, 2024), the need for evaluating how the technology is used (Trust and Whalen, 2020) and cultivating workplace learning to support teachers in blended educational settings after the pandemic remains (Li and Yu, 2022). Moreover, regardless of the rapid digital adoption, leading educational digital transformation effectively requires digital competence (Willermark *et al.*, 2023), emphasising the importance of providing adequate workplace learning, training and support for teachers.

This paper describes the design and adoption of an institutional programme launched during the pandemic at [blinded for review] University, guided by two research questions (RQs):

1. What difficulties and challenges did teachers face during the early stages of the pandemic?
2. To what extent can teachers' positive and negative experiences using digital platforms guide the creation of resources to support workplace learning within teaching practices after the pandemic?

The programme had the objective to provide guidance and support for creating educational material in undergraduate programmes during and after the pandemic. For its design and adoption, we followed a socio-technical perspective on learning (Bednar and Welch, 2020). In educational settings, the socio-technical perspective involves human and technological participation, along with learning, i.e. internalisation and cultivation of knowledge as a social process and LMSs as technological resources (Islind *et al.*, 2021). We use a qualitative approach. Thirteen semi-structured interviews were conducted, transcribed, coded, and analysed through content analysis (Graneheim and Lundman, 2004). The insights obtained were used as guidance to create and improve the resources included in the programme thus focussing on cultivating workplace learning, outlining our main contribution.

2. Related work

2.1 Learning platform usage during and after the pandemic

Digital platforms do not cause learning. Rather, it is how they are used and how the resources within them are accessed and used that determines whether learning takes place. In recent years, along with the increased facility of accessing online resources, the availability of online programmes has also increased (Tannehill *et al.*, 2018). In fact, since the beginning of the COVID-19 pandemic, a marked increase has been observed in the use of digital platforms for supporting the delivery of education (Mishra *et al.*, 2020; Patricia Aguilera-Hermida, 2020). Nonetheless, despite their rapid and in many cases forced adoption, there is still a growing need for investigating the features that are needed by teachers and students for different teaching modalities (Islind *et al.*, 2021). While online learning and its features have been widely investigated and were fully adopted by most institutions during the pandemic, the post-pandemic landscape of higher education has changed significantly as the ERT could not be considered a suitable long-term solution (Nworie, 2021).

Although students and teachers are back in the classroom, the use of digital platforms is shaped by either positive or negative experiences with ERT (Aucejo *et al.*, 2020). Teachers' challenges mentioned in the literature relate to the lack of guidance and training on distance learning modalities, work overload, reduced interaction with the students, and difficulty in upholding students' motivation levels (Benito *et al.*, 2021). Additionally, regarding the ERT and its perceived benefits and positive effects on education, increased flexibility, and successful technology adoption have been emphasised. Students and teachers have communicated their satisfaction about the experience with online and distance learning, the on-demand access to digital learning material, and the flexibility in the distance teaching modality (Benito *et al.*, 2021; Gaebel *et al.*, 2021). The first insights about the future of education in the post-pandemic era indicated that those elements, along with online, blended, and hybrid learning, were more likely to remain in higher education (Nworie, 2021). Consequently, higher education institutions had to identify the digital platforms that would best accommodate their online and hybrid teaching and learning strategies (Nworie, 2021), calling for research of digital technology integration after the pandemic (Akram *et al.*, 2021).

2.2 Socio-technical arrangements and digital platforms

The existing research on digital platforms and ecosystems, hereinafter called `platforms', often puts weight on the technical aspects of these systems without considering their social context, which is essential for understanding platform dynamics (Kapoor *et al.*, 2021). In contrast, research from socio-technical perspectives considers interactions between social and technical subsystems, where the social subsystem may encompass elements such as organisational culture, structure, or human behaviours. These interactions have been conceptualised in a socio-technical system defined as the "Recognition of a recursive (not simultaneous) shaping of abstract social constructs and a technical infrastructure that includes technology's materiality and people's localised responses to it" (Leonardi, 2012, p. 42). Although the definition has evolved, the underlying concept remains, acknowledging the importance of both technical and social subsystems (Sarker *et al.*, 2019). The technical subsystem includes the physical infrastructure (hardware), software, and the associated platform mechanisms (Sarker *et al.*, 2019). In contrast, the social subsystem, is composed of individuals, relationships, and human attributes (Sarker *et*

al., 2019). An integrated socio-technical perspective attempts to understand subsystem interactions, optimise their fit or harmony, and improve platform (instrumental) or social (humanistic) outcomes (Sarker *et al.*, 2019). Furthermore, as socio-technical systems scale, new capabilities, and novel services are created, leading to the emergence of new socio-technical arrangements, Kapoor *et al*., (2021) suggested more research is needed on the organisational aspects of platform ecosystems, to investigate social challenges, and participant dynamics within the social subsystem.

Bednar and Welch (2020) emphasise the socio-technical nature of learning, describing learning as efforts to leverage internal and external procedures, and noting its evolutionary characteristics. The importance of interactions between the subsystems is highlighted, characterising the whole system through four elements, people, technology, processes, and structure/tools/resources (Islind *et al.*, 2021; Molebatsi, 2015; Wang *et al.*, 2010). In education, these elements represent teachers and students, teaching platforms, the knowledge shared, and the environment, respectively (Olney *et al.*, 2021). These elements including users' backgrounds, task, technology fit to task requirements, and system attributes, influence the adoption of educational platforms (Molebatsi, 2015). Regarding learning platforms, socio-technical approaches have been adopted in workplace learning to support professional development programmes (Hult *et al.*, 2020), to support virtual educational settings during the pandemic (Willermark and Islind, 2022; Găină and Bălos, 2021), and for curriculum development in vocational education through the implementation of digital technologies (Widiaty *et al.*, 2021).

Socio-technical perspectives have been found adequate to investigate technology use in varied educational contexts from both students' and teachers' perspectives. For example, on the students' side, Fair *et al*., (2016) adopted a socio-technical perspective for higher education module design, reviewing theoretical and pedagogical underpinnings in an undergraduate course, recognising the importance of pedagogy and learning theories as well as the students' needs and digital literacy. On the other hand, Islind *et al*., (2021) investigated the teachers' perspective on how the students engage in learning, focusing on the shift between classroom and platform interactions, showing how such interactions enhance learning. Wang *et al*., (2010) proposed a socio-technical-based model for evaluating success in higher education distance learning. Moskal *et al*., (2016) also adopted an teachers' perspective to assess the engagement levels with evaluation systems, positively influencing it by addressing technical limitations. Finally, in a comparable study, Olney *et al*., (2021) investigated faculty adoption practices for dashboards created based on learning analytics methods.

Although it has been shown that platform engagement improves when technical limitations are addressed properly (Moskal *et al.*, 2016), providing access to learning resources alone does not guarantee that learning will occur effectively (Molebatsi, 2015). That is, learning will unlikely occur by purely providing technological resources and expecting users to equally benefit from them. In contrast, stakeholders in learning environments are active technology recipients, whose use of technological tools and resources adapts in multiple ways depending on their contexts (Olney *et al.*, 2021). Therefore, to drive effective platform usage and learning, both social and technical components should be integrated. Herein, we adopt the socio-technical perspective for evaluating potential uses of an educational platform for transforming period during and after the pandemic, supporting instructional material design, workplace learning and assessing the teachers' adoption

of the platform. In alignment with socio-technical research for digital work highlighting this perspective's meaningful impact for varied processes (Islind and Vallo Hult, 2024), we argue that the integration of both subsystems will allow for enhanced understanding of how stakeholders' (teachers') needs can be fulfilled by technology's (educational platform's) features.

3. Research approach

This section outlines the social and technical subsystems that underpinned the development of the institutional programme. Socially, an investigation into teachers' experiences with educational platforms during the pandemic revealed key technological features necessary to support the creation and delivery of educational materials for undergraduates. Technically, the focus is on an existing educational platform used at [blinded for review].

3.1 The social subsystem: Teachers experience and needs throughout the pandemic

Two rounds of interviews were conducted. The first one, from now on called *design phase*, started in early 2021, still under pandemic restrictions. Six teachers of undergraduate courses at [blinded for review] were interviewed. Four participants were female, two were male, and the age ranged from 34 to 60 years old. The semi-structured interviews evolved around the transition to fully online teaching imposed by the pandemic, including the learning platforms used, changes in teaching methods, assessment structures, as well as challenges faced by the teachers in that period. The second round of semi-structured interviews, referred to as *application phase*, had place in August 2021, before the start of the autumn term. In this round, we interviewed seven teachers who were invited to take part in the institutional programme created (See Section 3.3). Five of the teachers participating in this phase were female, two were male, and the age ranged from 34 to 60 years old. Each teacher participating in the *application phase* belonged to a different department at the University.

In total, our data consists of 13 interviews. The interviews were recorded and transcribed verbatim. Afterwards, transcriptions were qualitatively analysed through content analysis; by organising, coding, and categorising patterns and themes within the data (Schreier *et al.*, 2019; Graneheim and Lundman, 2004). Content analysis of qualitative data can be considered as a hybrid method, integrating different phases of analysis (Schreier *et al.*, 2019; Prior, 2020). Further, considering our interest to not only identify the most common challenges, requirements, and needs, but also to gain a deeper understanding of the teachers' experiences throughout the pandemic, content analysis enabled focus on both manifest and latent content (Graneheim and Lundman, 2004). We followed a mixed coding frame, by combining deductive and inductive strategies (Schreier, 2012). Initial dimensions in the code framing were deductively created based on the semi-structured interviews' questions. Subcategories were created inductively based on the teachers' contributions and added to each dimension. Initial dimensions and subcategories in the coding frame were revised and modified to better reflect the data.

In the *design phase*, the analysis focused on understanding the teachers' experiences related to technological challenges and features adopted in response to pandemic restrictions. The findings, which served as the basis for creating the initial version of an online repository of tutorials, are presented in Subsection 4.1. On the other hand, for the *application phase*, the analysis sought to identify specific requirements the participants had for the courses they would be teaching during

the next term (Autumn 2021), their previous experience using the platform, as well as specific concerns regarding the platform functionalities. The findings, used as a guideline to provide the participants with tailored recommendations and tutorials, are presented in Subsections 4.2 and 4.3.

3.2 The technical subsystem: The educational platform

The educational platform selected for the programme is Echo360 ("Echo360", 2024). Among its features, the platform facilitates live-streaming, video pre-recording, and delivery of lectures and educational material to the students. It offers a set of engagement tools to help the teachers enhance the lecture provision, and improve the students' participation and engagement with the lecture content. It also includes tools available for students to use during or after the lectures for studying or preparing for assignments and exams. The platform is embedded in the LMS and can be used and accessed by students and teachers in all the courses taught each term. Furthermore, the IT department fully supports the platform, and all lecture rooms have the infrastructure needed for optimal lecture recording and streaming. Despite its several benefits and features for lecture provision, the use of the platform in undergraduate courses is not mandatory and its use depends completely on the teacher's decision. During autumn 2020, despite the possibility of teaching onsite due to the favourable pandemic situation in [Blinded for review], and the well-managed contagion rate, most of the courses provided were taught online. In response to a sudden increase in COVID-19 restrictions in the middle of September, all the teaching activities were moved fully online. In that term, 390 courses were created in the LMS. Those courses represented all undergraduate and postgraduate studies across the seven departments in the School of Technology and the School of Social Sciences. Among those, only 20% used the platform's basic features, such as lecture recordings and slide provision. In fact, only one course included student engagement tools. The potential of the platform and its features for improving teaching and learning processes, and supporting the transition to a hybrid or hyflex teaching strategy were also key factors for focusing the programme on facilitating teachers' guidance for using Echo360 to its full potential in alignment to their preferences and their courses' requirements.

4. Results

4.1 About RQ1- The design phase: Difficulties and challenges faced

From the interviews in the *design phase*, which delved into the difficulties and challenges experienced due to the sudden shift to ERT; four main themes were identified: (i) digital overwhelm, (ii) pedagogical strategies and engagement, (iii) technology integration and transition, and (iv) adaptation to remote learning.

Firstly, concerning digital overwhelm during the transition period, the teachers' reflections included technological disruptions, work overload, and technical challenges. Concerning pedagogical strategies and engagement, teachers shared the need of real-time communication platforms for classes and distance exams. Furthermore, regarding engagement, the teachers described the use of quizzes in the assessment structure to motivate the students and keep them engaged with the course content. Regarding technology integration and transition, the teachers shared their experiences and challenges regarding lecture recording and streaming, and the

management of and switching between multiple platforms for different purposes. Finally, concerning adaptation to remote teaching, the participants discussed the importance of flexibility in learning environments to adapt to the needs of remote students for both the lectures and practical sessions. Additionally, they shared the strategies followed to adapt their courses to fully online teaching, including both live lectures and pre-recordings. A number of factors were taken into account when choosing a digital platform for teaching during the pandemic, including previous experience with the platform, as well as the limitations associated with bandwidth for streaming.

The six teachers interviewed in this phase highlighted the use of Echo360 as the platform they used for delivering lectures during the pandemic. Among the comments, the technological convenience of the platform was also mentioned. As expressed by two of them:

> "*Previously, I was using Google's live studio, I think it was called. But then I found out that the Echo360 was easier. And they, they could actually set up the schedule for me in advance. So it went from taking a little while to set it up and for it to become basically automatic.*"

> "*I can't remember when I switched from studio to Echo360 [...]. At least this switch from studio to Echo, didn't have anything to do with the pandemic it was more like technological things. There is this that missing back end in studio. It's difficult to search for videos that you've already made and stuff. So the Echo back end, helps you a bit more when you're user*"

Moreover, although most of the teachers interviewed used pre-recordings for teaching during the pandemic, one of them who had been teaching to remote students for several years and was live-streaming the lectures during the pandemic also mentioned using the platform for live-questions in class:

> "*Instead of getting questions from, from the students in class, I started using basically the Echo360 as an input [...]. Now, I have been using Echo360 in one particular way, which is, besides just recording the lectures, I now use it for the questions in class. So I can embed questions in the slide deck. And then I asked them, the ones that are not there, I asked them to go through the slide deck, and then they get the question coming up, and then they can answer the question [...]. But this is the first time that I actually tried to integrate it into the system.*"

4.2 About RQ2 - The application phase: Creation of resources to support workplace learning.

4.2.1 Programme creation

The institutional programme was developed in conjunction with multiple factors to act as a link between the social and technical subsystems. The first factor, was the insights obtained from the *design phase* interviews regarding the teaching practices adopted during the pandemic, their challenges, and limitations. The second factor involved the platform's capabilities and perceived convenience for addressing the teachers' needs for different teaching modalities. Finally, the third factor was the institutional support, which was provided by the teaching affairs office, as well as the information technology department (IT). The programme was supported by three units at the university: the teaching affairs office, the IT department, and the learning analytics research group based at the Department of Computer Science.

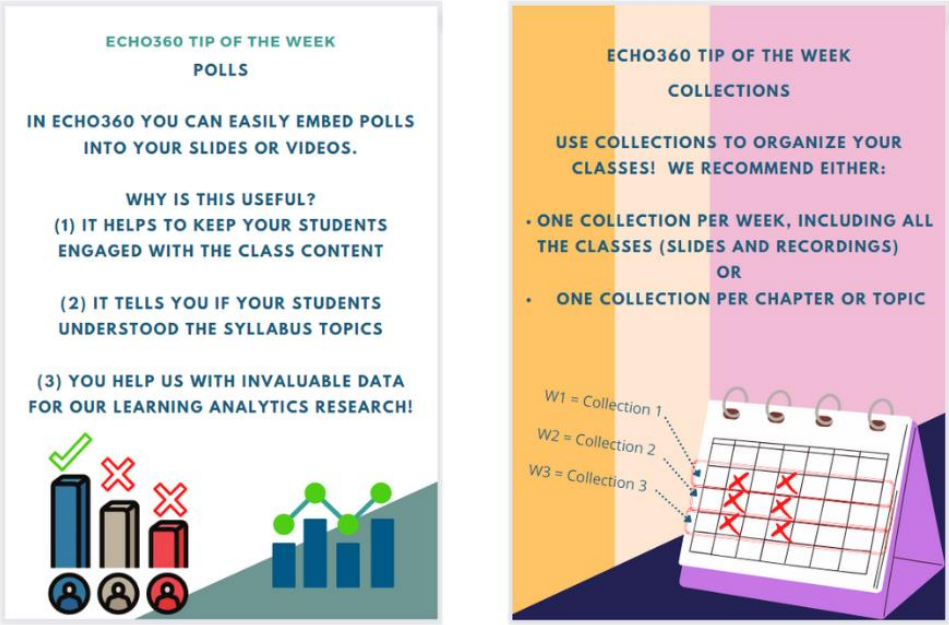
The programme was designed with three main goals: (i) provide the teachers with personalised support and tutorials on the best usage of the platform to fit their needs and help them to know and use all the features available, (ii) improve the students' learning experience during and after the pandemic with more consistency among the platforms used for teaching and easier access to learning material, and (iii) facilitate data collection, as well as the quantity and quality of data, among years and university departments for future learning analytics research. The programme included the following elements:

(a) Initial interview: Before the start of the term, an initial interview was conducted with teachers participating in the program. They provided information on the courses they would teach in autumn 2021, expected student enrolment, and their planned teaching modality. Participants were also asked about their previous experience with Echo360, any issues they had encountered, and questions about the platform. Teachers using Echo360 for the first time received an introduction to its key features. These interviews correspond to the application phase outlined in Section 3.1. Following the interview, teachers were provided with Echo360 tutorials and recommendations based on their selected teaching modality. Both resources were optional, allowing participants to decide whether to use the platform's features.

(b) Website: A website was created to store and distribute the Echo360 tutorials for the participants. For the teachers' use, the website includes an (i) introduction to the platform, (ii) a set of beginners' tutorials of all the basic features in Echo360, (iii) a set of guidelines and recommendations created to facilitate the students' and teachers' experience using the platform, and at the same time to improve the quality of the data gathered, and (iv) a teaching modality subsection. In the teaching modality subsection, the Echo360 features recommended for four teaching modalities were presented: Fully face-to-face, blended, hybrid, and fully online teaching.

(c) Weekly tips: Each week from the start of the programme, participants received infographics highlighting one or few features of Echo360 and their benefits. The Echo360 weekly tips were always linked to their tutorial on the website. Fig. 1 shows two examples of the tips sent to the teachers.

(d) Feedback: Following the completion of the programme, the participants would be invited to take part in a final feedback session that would collect their thoughts on the strengths and weaknesses of the programme structure, the tutorials created, and the recommendations received as part of the programme. The feedback would be used to improve the programme, supplement the tutorials, and incorporate the participants' questions into the website's Frequent Asked Questions (FAQ) section.



Source: Figure created by the authors for the purpose of this publication

Figure 1 Examples of the weekly tips shared with the participants.

4.2.2 Programme adoption

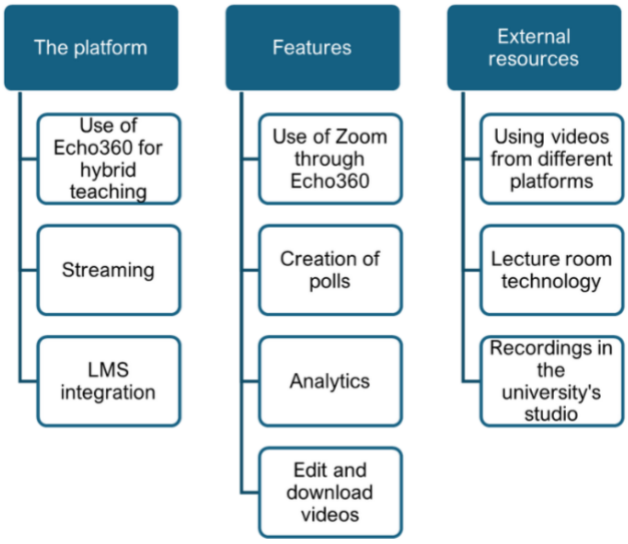
The programme was advertised to all teachers in the seven departments at [blinded for review] before the start of the autumn 2021 term. The objective was to recruit at least one participant from each department, to give the programme more visibility, and to include teachers and courses from all departments. Seven teachers participated in the program. Table I provides details on their departments, number of courses for autumn 2021, expected student enrolment, and initial course plans. Teaching modalities included blended, hybrid, and fully online approaches, with both synchronous and asynchronous elements. Only one participant had prior experience with the platform. The teacher from Sport Science had no courses in autumn 2021 but was scheduled to teach four in spring 2022.

Table I Participants' information, courses, and teaching modalities selected for the term Autumn 2021.

Department	Number of courses	Expected number of students	Teaching modality - settings
Applied engineering	1	40	Pre-recordings
Computer Science	2	60 and 300	Hybrid
Engineering	2	150 and 200	Streaming and pre-recordings
Business	3	80, 40, and 30	Hybrid / blended
Psychology	1	30	Fully Online (Streaming)
Law	1	40	Pre-recordings
Sport Science	4	4	Flipped Classroom

Source: Table created by the authors for the purpose of this publication.

During the application phase interviews, participants raised various questions and concerns about using the platform. Most issues were resolved either during the platform introduction or through the tutorials provided later. Three main themes emerged from their feedback: the platform itself, its features, and external resources related to its use. Figure 2 summarizes these concerns by theme.



Source: Figure created by the authors for the purpose of this publication.

Figure 2 Echo360 summary of concerns.

Participants in the course implemented several features in the platform throughout the course, depending on the teaching modality and needs of the course during the term. An overview of the courses' Echo360 sections at the end of the term revealed most of the participants used the basic features in the platform, e.g., pre-recordings and slides provision. Moreover, these resources were useful in varied teaching modalities.

Figures 3, 4, and 5 display examples of the features adopted in online and hybrid settings. Figure 3 corresponds to an online setting where the teacher used pre-recordings to teach the course asynchronously. Two video sources were uploaded, one with the recording of the teacher talking while explaining and the second one showing the written explanation of the class topic. Figure 4 corresponds to an online synchronous setting, where the teacher held the class online via Zoom and recorded the session. The recording was then uploaded to the platform alongside the slides that were annotated during the class streaming. Finally, Figure 5 displays a hybrid setting, where students were allowed to attend in person or join the livestream. The teacher included engagement tools (polls) in the lecture slide deck, which was uploaded in advance to Echo360, to gather information about the students' understanding of the lecture topics and to keep the students engaged. Through this process, remote students were also able to become a part of the class dynamics. In addition, the class was recorded and uploaded to the platform afterwards, since attendance was not mandatory. In addition, the guidelines, tutorials, and tips shared during the programme, were beneficial to organise the resources within the platform and give them consistent names, allowing students to interact with the platform more easily and find specific resources more quickly. Although there was no formal request for feedback from the students in

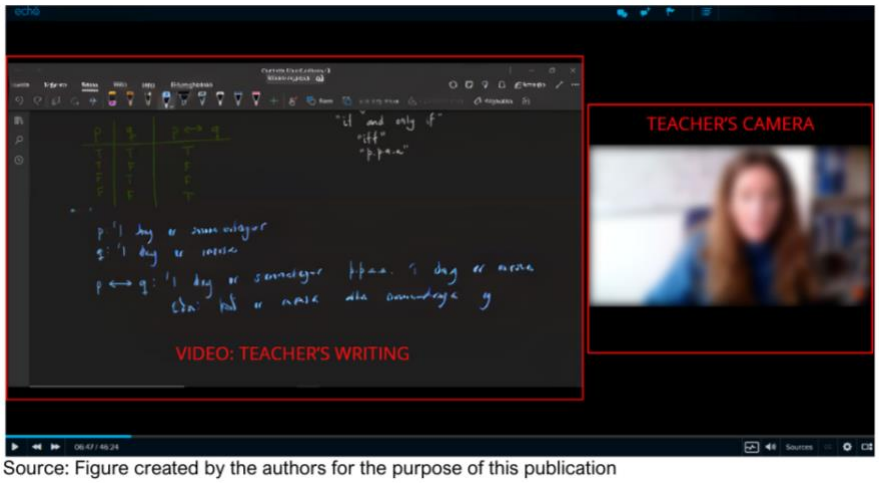
the groups that the participants taught about the programme or the platform, a few of them provided some positive comments in the courses' evaluation at the end of the term:

"*The pre-recordings were nice to have because I could use the spare time I had in between classes to squeeze it in and watch them at a more convenient time*"

"*The polls helped me to at least try and focus on what she was saying. Because I wanted to take part in the polls and show I was actually there*"

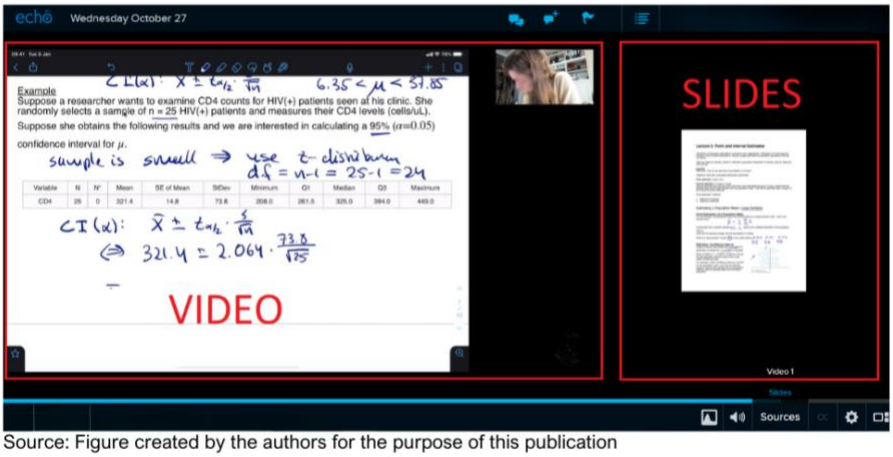
"*I really appreciate that the lectures are available immediately after the class - please show this feature to other teachers :')*"

These comments suggest that the platform and the features used supported flexibility and engagement.



Source: Figure created by the authors for the purpose of this publication

Figure 3 Participant adoption example: Pre-recording, including two video sources.



Source: Figure created by the authors for the purpose of this publication

Figure 4 Participant adoption example: Online setting and slides.

Source: Figure created by the authors for the purpose of this publication

Figure 5 Participant adoption example: Hybrid setting and embedded polls.

4.2.3 Programme evaluation

Both the platform and the structure of the programme received positive feedback from one teacher:

> *"Overall my experience was very positive, I have some minor niggles which are very small things that I would like, but the ease of use and setting it up inside the actual labs, like inside the actual lectures going and getting started with the 360 was trivial and really easy and straightforward"*

In addition, the teacher shared that the initial meeting was for them the most valuable, allowing for a quick snapshot of the platform features. The level of engagement after the first meeting, using the weekly tips was also indicated as adequate, as multiple meetings throughout the course would have demanded too much time.

As a first-time user, the participant had some difficulty implementing the platform's features into the lectures due to the necessary adaptations and workload. As the teacher expressed:

> "*I'm teaching all my courses for the first time. So my big focus is not necessarily on using engagement tools or different modalities, but rather just on getting good quality content out there. And I'm going to be hopefully more engaged with the tool you know towards the second-half of next year when I'll be teaching my course for the second time [...], and perhaps it's the wrong approach, but my idea was I need to record these lectures and I want to learn the least amount I need to learn to make this happen*"

Hence, pointing out teachers teaching a course (or at the university) for the first time, might face additional difficulties to quickly get used to new platforms.

Recommendations for improvement were also provided. Firstly, regarding the initial meeting, it was recommended to include a demonstration of the engagement tools usage, rather than only describe what engagement tools could be included. The second recommendation was to include short tutorials, of two minutes maximum, on features that were not included in the initial meeting, for example, how to edit and cut videos in the platform. Finally, the teacher shared some difficulties experienced while using the platform, such as an automatic device lock after a period of inactivity while answering questions from students in the room. The recording stopped automatically when the computer locked and was automatically uploaded after a few hours, causing confusion among students relying on the recordings uploaded. Both recommendations were incorporated into the website tutorials. The concern about the device locking was outside of our control of being resolved, but it was submitted as a request for the platform development team to consider. After the end of the term and the conclusion of the programme, a set of tutorials on the tools available for the students' use was included as a subsection on the website. This subsection included an introduction to Echo360 from the students' view and information about how to interact with the classes and educational material.

5. Discussion

This paper presents the development of an institutional programme created to support workplace learning during and after the pandemic. The programme addressed three objectives: (i) to assist teachers using the platform to the fullest in accordance with their preferences and needs, (ii) to ensure that students' experiences are improved during and after the pandemic by increasing consistency among platforms, and (iii) facilitate data collection to conduct learning analytics research. We envisioned the adoption and usage of the learning platform as a socio-technical system, where the teachers' needs, preferences, and course requirements constitute the social subsystem, whereas the platform features, and the extent to which they can fulfil the teachers' needs, correspond to the technical subsystem. Our approach encompassed two phases, *design* and *application*, allowing us to address the RQs presented in Section 1. On the one hand, the *design phase* in the social-subsystem element provided an answer to the first RQ. That is, teachers at [blinded for review] experienced difficulties and challenges in four main areas including digital overwhelm, pedagogical strategies and students' engagement, technology integration and transition, and adaptation to remote teaching. On the other hand, the second RQ, regarding the *application phase* along with the technical-subsystem element informed the creation, adoption, and evaluation of the program demonstrating that not only teachers' previous experience during the pandemic could inform the creation of resources to support teaching practices, with these resources accommodating a variety of course requirements including several teaching modalities and group sizes.

The programme's design and adoption not only contribute with direct benefits for faculty workplace learning support on updating technological skills and competence (Akram *et al.*, 2021), but they also contribute to filling a gap in educational research addressing the lack of emphasis on teachers, compared to the widely studied topics of learners and administrators (Leitner *et al.*,

2017). It upheld the sudden shift in teaching methods (Dewangan *et al.*, 2024), providing faculty training, and resources for online teaching support and flexibility enhancement (Benito *et al.*, 2021; Garcia *et al.*, 2024). Furthermore, the set of guidelines and recommendations created for consistency in the recordings and material provided through the platform not only supported students' learning experience, but also educational data collection. The need for school support for the improvement of data quality has been highlighted (Nations, 2020) along with thoughtful data creation and storage planning (Kitto *et al.*, 2020). Our programme contributes to that call from a teachers' perspective, enhancing data quality and quantity, complementing the recommendations for institutions, vendors, and learning analytics researchers community (Kitto *et al.*, 2020).

Along with these contributions, practical insights and recommendations can be drawn from both challenges and effective practices observed throughout the programme, potentially informing the development of programmes with similar objectives. Regarding challenges, the programme development was mainly impacted by two difficulties related to the teachers' engagement and increased workload. Active involvement of relevant departments at the university was helpful to overcome the first difficulty, reaching out directly to some key teachers, promoting the programme, and getting them to take part in. Concerning the pandemic's impact on the teachers' workload (Lizana *et al.*, 2021; Lizana and Vega-Fernadez, 2021) throughout the programme development and adoption, its effect impacted the teachers' availability to participate in the programme's activities, which were modified to better align with the teachers' needs and availability. In this regard, although both challenges in our case were in part consequence of the pandemic and its restrictions, future implementations would also benefit from institutional involvement and support, as well as from providing flexibility to facilitate the teachers' participation in the programme.

Effective platform practices addressed pandemic-related educational challenges highlighted in the literature, including the enhancement of teaching sessions to address the students' lack of engagement and interactions (Ahmed *et al.*, 2023; Benito *et al.*, 2021; Code *et al.*, 2020; Dario *et al.*, 2024). Furthermore, the impact of the adoption under varied teaching modalities extended beyond the initial objective of supporting workplace learning, favouring the students' experience with the learning platforms throughout the pandemic, as well as the quality and consistency of data generated by such platforms; which in turn has supported the development of learning analytics research at [blinded] (see e.g. (Authors, (2023) and Authors B, (2023)). Nonetheless, although the programme and the resources created are crucial in ensuring the success of the practices adopted, additional resources, including IT support for classroom facilities for livestream and digital annotation devices, are needed to support successful online teaching practices.

Lessons learned throughout the development of the programme, along with its limitations, advise on recommendations for future programme improvements. In instance, unavoidable pandemic-related limitations in the initial adoption, such as the difficulty to get teachers involved into the programme, were addressed in the following terms through a workshop for introducing the programme and the platform, a promotional video, and certificates of participation. We consider similar programmes and workshops could be also advantageous for bigger institutions, allowing them to reach and support a higher number of teachers, and consequently uphold courses, modalities, and students to a wider extent. Future improvements would include teaching assistants and students' involvement, not only for the resources created but also to account for their

feedback as a valuable component in the social subsystem. The technical subsystem could also be extended, to accommodate for teaching practices that were not supported by the initial version of the programme. This could include not only Echo360, but additional platforms that would support these practices.

5.1 Limitations and future work

Regarding limitations, the programme's development was limited by the educational context in which it was designed, restricting its direct benefits to the institution it was tailored for. A second limitation involves the interviews that guided the initial tutorials' creation. With only teachers from [blinded for review]; although teaching the universities' largest courses, their experiences, resources, challenges, and needs during the pandemic may differ from those of teachers in other departments. Future research will address these shortcomings, identify needed materials, assess the effectiveness of the created resources, and explore the long-term impact of the programme, including how the digital platform supports students' learning and their perspectives on the provided guidelines and tutorials.

6. Conclusion

We present the development and initial results of an institutional programme created with three main goals at [blinded]. Previous sections outline examples programme's successful adoptions along with recommendations and actionable insights. In alignment with our RQs, our main contributions include: (i) a teacher viewpoint on technology requirements and challenges related to online and distance teaching throughout the pandemic, and (ii) the programme conceptualisation from a socio-technical perspective, where the teachers' experiences are accounted for the creation of resources to support workplace learning within teaching practices. Furthermore, these elements can serve as a guide for developing similar programmes to support teachers in integrating educational platforms into their teaching practices for different educational contexts and platforms. This can be accomplished by adopting a similar research approach as we presented in this paper, identifying and exploring elements in both social- and technical-subsystems that could be used to support specific teaching practices requirements.

Lastly, [blinded for review] University's learning and teaching strategy emphasises the importance of innovation and improvement of teaching methods to effectively support teaching and learning. To that end, this programme is considered as a key element, as it not only focuses on improving the teachers' competences and skills in knowledge communication, but also on improving the students' experience by providing the educational resources they need to work independently. This programme sets the basis for transitioning from traditional teaching to hybrid and hyflex spaces where on-site and distance learning students at [blinded for review] will interact within a single programme that adequately addresses their personal needs and preferences.

References

Abilleira, M.P., Rodicio-García, M.-L., Rodicio-García, M.L., Deus, M.-P.R. and Mosquera-González, M.J. (2021), "Technostress in Spanish University Teachers During the COVID-19 Pandemic", *Frontiers in Psychology*, doi: 10.3389/fpsyg.2021.617650.

Ahmed, V., Anane, C., Alzaatreh, A. and Saboor, S. (2023), "Faculty perception of online education: considerations for the post-pandemic world", *Frontiers in Education*, Frontiers, Vol. 8, doi: 10.3389/feduc.2023.1258980.

Akram, H., Yingxiu, Y., Al-Adwan, A.S. and Alkhalifah, A. (2021), "Technology Integration in Higher Education During COVID-19: An Assessment of Online Teaching Competencies Through Technological Pedagogical Content Knowledge Model", *Frontiers in Psychology*, undefined, Vol. 12, doi: 10.3389/fpsyg.2021.736522.

Aucejo, E.M., French, J., Araya, M.P.U. and Zafar, B. (2020), "The impact of COVID-19 on student experiences and expectations: Evidence from a survey", *Journal of Public Economics*, Vol. 191, p. 104271, doi: 10.1016/j.jpubeco.2020.104271.

Bednar, P.M. and Welch, C. (2020), "Socio-Technical Perspectives on Smart Working: Creating Meaningful and Sustainable Systems", *Information Systems Frontiers*, Vol. 22 No. 2, pp. 281–298, doi: 10.1007/s10796-019-09921-1.

Benito, A., Yenisey, K.D., Khanna, K., Masis, M.F., Monge, R.M., Tugtan, M.A., Araya, L.D.V., *et al.* (2021), "Changes That Should Remain in Higher Education Post COVID-19: A Mixed-Methods Analysis of the Experiences at Three Universities", *Higher Learning Research Communications*, Vol. 11 No. 0, doi: 10.18870/hlrc.v11i0.1195.

Code, J., Ralph, R. and Forde, K. (2020), "Pandemic designs for the future: perspectives of technology education teachers during COVID-19", *Information and Learning Sciences*, Vol. 121 No. 5/6, pp. 419–431, doi: 10.1108/ILS-04-2020-0112.

Dario, N., Mollo, M., Savarese, G. and Carpinelli, L. (2024), "Through teachers' eyes: adaptability and transformations in their practices and relationship with students during COVID-19 pandemic", *Frontiers in Education*, Frontiers, Vol. 8, doi: 10.3389/feduc.2023.1322103.

Dewangan, R.L., Longkumer, I., Gupta, S. and Pathak, S. (2024), "Beyond (COVID-19) lockdown: faculty experiences in the post-pandemic academic landscape", *Frontiers in Education*, Frontiers, Vol. 9, doi: 10.3389/feduc.2024.1348775.

"Echo360". (2024), *Echo360*, available at: https://echo360.com/.

Fair, N., Harris, L. and Davis, H. (2016), "COLLABORATIVE SOCIAL LEARNING: SOCIO-TECHNICAL MODULE DESIGN IN UK HIGHER EDUCATION – A CASE STUDY", *EDULEARN16 Proceedings*, presented at the 8th International Conference on Education and New Learning Technologies, IATED, Barcelona, Spain, pp. 8370–8380, doi: 10.21125/edulearn.2016.0830.

Gaebel, M., Zhang, T., Stoeber, H. and Morrisroe, A. (2021), *Digitally Enhanced Learning and Teaching in European Higher Education Institutions*, European University Association absl.

Găină, L. and Bălos, I.-D. (2021), "Socio-Technical Challenge in the Selection of the Remote E-Learning Platform", *International Conference KNOWLEDGE-BASED ORGANIZATION*, Vol. 27 No. 2, pp. 125–132, doi: 10.2478/kbo-2021-0060.

Garcia, A.S., Jeon, S., Kwon, K.-A. and Horm, D.M. (2024), "Examining the interplay of teacher well-being, executive function, and adaptability in virtual instruction during COVID-19 disruptions", *Frontiers in Education*, Frontiers, Vol. 9, doi: 10.3389/feduc.2024.1399854.

Graneheim, U.H. and Lundman, B. (2004), "Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness", *Nurse Education Today*, Vol. 24 No. 2, pp. 105–112, doi: 10.1016/j.nedt.2003.10.001.

Hodges, C., Moore, S., Lockee, B., Trust, T. and Bund, A. (2020), "The Difference Between Emergency Remote Teaching and Online Learning", *EDUCAUSE Review*.

Hult, H.V., Islind, A.S., Östlund, C.M., Holmgren, D. and Wekell, P. (2020), "Sociotechnical Co-design with General Pediatricians: Ripple Effects through Collaboration in Action.", presented at the Americas Conference of Information Systems.

Islind, A.S., Norström, L., Vallo Hult, H. and Olsson, S.R. (2021), "Socio-Technical Interplay in a Two-Sided Market: The Case of Learning Platforms", in Metallo, C., Ferrara, M., Lazazzara, A. and Za, S. (Eds.), *Digital Transformation and Human Behavior*, Vol. 37, Springer International Publishing, Cham, pp. 33–53, doi: 10.1007/978-3-030-47539-0_4.

Islind, A.S. and Vallo Hult, H. (2024), "Guest editorial: The tables have turned: socio-technical perspectives are influential for the future of digital work", *Journal of Workplace Learning*, Emerald Publishing Limited, Vol. 36 No. 3, pp. 205–208, doi: 10.1108/JWL-04-2024-200.

Kapoor, K., Ziaee Bigdeli, A., Dwivedi, Y.K., Schroeder, A., Beltagui, A. and Baines, T. (2021), "A socio-technical view of platform ecosystems: Systematic review and research agenda", *Journal of Business Research*, Vol. 128, pp. 94–108, doi: 10.1016/j.jbusres.2021.01.060.

Kitto, K., Whitmer, J., Silvers, A. and Webb, M. (2020), "Creating Data for Learning Analytics Ecosystems", *Society for Learning Analytics Research (SoLAR)*.

Leitner, P., Khalil, M. and Ebner, M. (2017), "Learning Analytics in Higher Education—A Literature Review", in Peña-Ayala, A. (Ed.), *Learning Analytics: Fundaments, Applications, and Trends: A View of the Current State of the Art to Enhance e-Learning*, Springer International Publishing, Cham, pp. 1–23, doi: 10.1007/978-3-319-52977-6_1.

Leonardi, P.M. (Ed.). (2012), *Materiality and Organizing: Social Interaction in a Technological World*, Oxford Univ. Press, Oxford.

Li, M. and Yu, Z. (2022), "Teachers' Satisfaction, Role, and Digital Literacy during the COVID-19 Pandemic", *Sustainability*, Multidisciplinary Digital Publishing Institute, Vol. 14 No. 3, p. 1121, doi: 10.3390/su14031121.

Lizana, P.A. and Vega-Fernadez, G. (2021), "Teacher Teleworking during the COVID-19 Pandemic: Association between Work Hours, Work–Family Balance and Quality of Life", *International Journal*

of Environmental Research and Public Health, Vol. 18 No. 14, p. 7566, doi: 10.3390/ijerph18147566.

Lizana, P.A., Vega-Fernadez, G., Gomez-Bruton, A., Leyton, B. and Lera, L. (2021), "Impact of the COVID-19 Pandemic on Teacher Quality of Life: A Longitudinal Study from before and during the Health Crisis", *International Journal of Environmental Research and Public Health*, Vol. 18 No. 7, p. 3764, doi: 10.3390/ijerph18073764.

López Flores, N.G., Islind, A.S. and Oskarsdottir, M. (2022), "Exploring study profiles of Computer Science students with Social Network Analysis", *The 55th Hawaii International Conference on System Sciences (HICSS)*, doi: 10.24251/HICSS.2022.214.

Martin, F., Kumar, S., Ritzhaupt, A.D. and Polly, D. (2023), "Bichronous online learning: Award-winning online instructor practices of blending asynchronous and synchronous online modalities", *The Internet and Higher Education*, Vol. 56, p. 100879, doi: 10.1016/j.iheduc.2022.100879.

Means, B., Neisler, J., and Langer Research Associates. (2020), *Suddenly Online: A National Survey of Undergraduates during the COVID-19 Pandemic*, Digital Promise.

Mishra, L., Gupta, T. and Shree, A. (2020), "Online teaching-learning in higher education during lockdown period of COVID-19 pandemic", *International Journal of Educational Research Open*, Vol. 1, p. 100012, doi: 10.1016/j.ijedro.2020.100012.

Molebatsi, M. (2015), "Socio-Technical Factors that Influence Learning Management Systems' Adoption in Developing Countries", *International Conference on Mobile and Contextual Learning*, doi: 10.1007/978-3-319-25684-9_29.

Moskal, A.C.M., Stein, S.J. and Golding, C. (2016), "Can you increase teacher engagement with evaluation simply by improving the evaluation system", *Assessment & Evaluation in Higher Education*, doi: 10.1080/02602938.2015.1007838.

Nations, U. (2020), *Policy Brief: Education during COVID-19 and Beyond*.

Nikolopoulou, K. and Kousloglou, M. (2022), "Online Teaching in COVID-19 Pandemic: Secondary School Teachers' Beliefs on Teaching Presence and School Support", *Education Sciences*, doi: 10.3390/educsci12030216.

Niu, Y. (2024), "Exploring workplace learning experience in work transition among K-12 teachers during COVID-19", *Journal of Workplace Learning*, Emerald Publishing Limited, Vol. 36 No. 2, pp. 164–185, doi: 10.1108/JWL-09-2023-0154.

Nworie, J. (2021), "Beyond COVID-19: What's Next for Online Teaching and Learning in Higher Education?", *EDUCAUSE Review*, available at: https://er.educause.edu/articles/2021/5/beyond-covid-19-whats-next-for-online-teaching-and-learning-in-higher-education (accessed 20 November 2023).

Olney, T., Walker, S., Wood, C. and Clarke, A. (2021), "Are We Living In LA (P)LA Land? Reporting on the Practice of 30 STEM Tutors in their Use of a Learning Analytics Implementation at the Open University", *Journal of Learning Analytics*, doi: 10.18608/jla.2021.7261.

Patricia Aguilera-Hermida, A. (2020), “College students’ use and acceptance of emergency online learning due to COVID-19”, *International Journal of Educational Research Open*, Vol. 1, p. 100011, doi: 10.1016/j.ijedro.2020.100011.

Prior, L. (2020), “Content Analysis”, in Leavy, P. (Ed.), *The Oxford Handbook of Qualitative Research*, Oxford University Press, p. 0, doi: 10.1093/oxfordhb/9780190847388.013.25.

Sarker, S., Chatterjee, S., Xiao, X. and Elbanna, A. (2019), “The sociotechnical axis of cohesion for the IS discipline: its historical legacy and its continued relevance”, *MIS Quarterly*, Vol. 43 No. 3, pp. 695–720, doi: 10.25300/MISQ/2019/13747.

Schreier, M. (2012), *Qualitative Content Analysis in Practice*, SAGE, Los Angeles London New Dehli Singapore Washington DC.

Schreier, M., Stamann, C., Janssen, M., Dahl, T. and Whittal, A. (2019), “Qualitative Content Analysis: Conceptualizations and Challenges in Research Practice—Introduction to the FQS Special Issue ‘Qualitative Content Analysis I’”, *Forum: Qualitative Social Research*, Vol. 20, doi: 10.17169/FQS-20.3.3393.

Tannehill, D.B., Serapiglia, C.P. and Guiler, J. (2018), “Administrative or Faculty Control of Online Course Development and Teaching: A Comparison of Three Institutions”, *Information Systems Education Journal*, Vol. 16 No. 3, p. 26.

Trust, T. and Whalen, J. (2020), “Should Teachers be Trained in Emergency Remote Teaching? Lessons Learned from the COVID-19 Pandemic”, *The Journal of Technology and Teacher Education*, Vol. 28 No. 2, pp. 189–199.

Tsegay, S.M., Tsegay, S.M., Azeem, M.A., Ashraf, M., Perveen, S. and Zegergish, M.Z. (2022), “Online Teaching during COVID-19 Pandemic: Teachers’ Experiences from a Chinese University”, *Sustainability*, doi: 10.3390/su14010568.

Wang, J., Solan, D. and Ghods, A. (2010), “Distance learning success - a perspective from socio-technical systems theory”, *Behaviour & Information Technology*, doi: 10.1080/01449290903544645.

Widiaty, I., Ana, A., Suciati, D.K., Achdiani, Y. and Mubaroq, S.R. (2021), “Development of Augmented Reality Technology In Vocational School: A Socio-Technical Curriculum Framework”, *Journal of Engineering Science and Technology*, Vol. 16 No. 4, pp. 3094–3103.

Willermark, S., Gellerstedt, M. and Nilsson, P. (2023), “Surviving or thriving? Exploring school leaders’ perception of initiated digital transformation”, *School Leadership & Management*, pp. 1–23, doi: 10.1080/13632434.2023.2282618.

Willermark, S. and Islind, A.S. (2022), “Adopting to the virtual workplace: identifying leadership affordances in virtual schools”, *Journal of Workplace Learning*, Vol. 35 No. 9, pp. 22–37, doi: 10.1108/JWL-05-2022-0052.