

Getting Ahead of the Curve—Insights from SE and HE Teachers’ Digital Transformation Experiences for Future Post-Pandemic Challenges

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Abstract

The digital transformation in education is an ongoing process that was accelerated by the COVID-19 pandemic. In the post-pandemic era, this transformation is still far from complete and remains an ongoing challenge for many educational institutions. Based on the experiences of secondary and higher education teachers, this study offers insightful information about how educational institutions should continue a sustainable digital transformation without repeating past mistakes. Qualitative data was collected in online focus groups using a semi-structured interview guide based on the principles of appreciative inquiry. Respondents are 42 secondary (n = 20) and higher education (n = 19; or a combination of SE/HE n = 3) teachers from three regions in EU-region Meuse-Rhine. In addition to experiences related to teaching, students, and support, the topic of well-being emerged from the interpretative phenomenological analysis. Results show that a sudden change in digital technology noticeably impacts the emotional and mental well-being of teachers. The school’s digital policy is the key concept that aligns teachers’ well-being to digital learning, including facilitating factors such as a clear vision, adequate technical/practical facilities, professionalization, and training while maintaining a social connection with colleagues and students. To stay ahead of impending challenges, this holistic and systemic study emphasizes the importance of balancing different stakeholders’ interests within the complexity of digital transformation as a way to guarantee a sustainable implementation of the appropriate application of digital technology for learning.

Keywords

Digital Transformation, Digital Technology, Policymakers, Teacher Perceptions, Well-Being, Secondary Education, University

1. Introduction

Digital technology has undeniably become an integral part of education. For decades now, new technologies have been presented with great optimism, providing new opportunities to improve the teaching-learning process (Bowen, 2015; Bryan & Volchenkova, 2016; Last & Jongen, 2021). On the other hand, the importance of developing the digital competency of teachers and students is widely recognized as a necessity to prepare individuals for modern society (Reisoğlu & Çebi, 2020; Rubach & Lazarides, 2021; Siddiq et al., 2016). The emergence of the COVID-19 pandemic in 2020 further underscored the urgency of digitalization efforts that had been advocated for years. At all educational levels, the use of technology has become essential, forcing teachers to adapt their classroom practices to a suitable format for distance learning (Korkmaz & Toraman, 2020; Sidi et al., 2023). This unprecedented shift not only highlighted the need to harness the existing technological possibilities, but also emphasized the pressing requirement for digital competency like never before.

Prior to the COVID-19 pandemic, the implementation of technology in education developed slowly, bringing little to no significant changes to teaching methods in schools and universities (Howard et al., 2020; Sidi et al., 2023; Tondeur et al., 2017). This slow progress can be attributed to the complexity of technology integration, which involves overcoming numerous barriers for successful implementation (Aditya et al., 2021; Bingimlas, 2009; Tondeur et al., 2017). These barriers encompass various factors, such as infrastructure, skills and knowledge, teacher attitudes, leadership, support, and more. The onset of the COVID-19 pandemic exacerbated these pre-existing challenges, as the continuation of education became entirely reliant on digital technology and necessitated a rapid adaptation of the teaching-learning process accordingly (Allen et al., 2020a; Huber & Helm, 2020; Zhang et al., 2020).

This also means that now all teachers have gained some experience in using digital technology and should have developed some degree of digital competence. Given their pivotal role, the perspectives and experiences of teachers are invaluable in guiding and contributing to the improved handling of similar situations in the future (Alenezi et al., 2022). Although the pandemic has been a unique event, it is unlikely to be the last disruptive phenomenon impacting education significantly. For example, the emerging trends in the utilization of artificial intelligence (AI) in education introduce new challenges for teachers (Trust et al., 2023). Exploring the impact of this sudden shift towards digital learning through teachers' subjective experiences helps to gain insight into how to prepare teachers for future

transitions through sustainable change processes, thus making education resilient for future challenges (Hsiao et al., 2023; Pokhrel & Chhetri, 2021; Ryan, 2023; Sidi et al., 2023).

This research contributes to this exploration by presenting a snapshot of teachers' experiences in terms of professional engagement and personal well-being during this period, their future perspectives, and training needs in digital skills. The study was conducted near the end of the lockdowns when teachers had already become accustomed to distance teaching but were also looking ahead to new perspectives. This unique positioning of the study adds relevance to its findings, which serve as a guide for the ongoing growth of digital education based on teachers' perspectives. In particular, it informs on the necessary conditions for the continuous advancement of digital education into the future.

2. Literature Review

The pandemic has evoked interest in distance education, and consequently, the challenges faced by educational institutions in effectively implementing technologies have significantly increased during this period (Alenezi et al., 2022; Ferri et al., 2020). These challenges primarily encompass psychological, emotional, attitudinal, social, and pedagogical aspects, technological competence, as well as school-university and peer support (Alenezi et al., 2022; Pedro & Kumar, 2020; Sidi et al., 2023). Therefore, the following sections synthesize existing research on these distance learning challenges and cover the research gap related to teachers' experiences in digital teaching, teachers' digital skills, and teachers' well-being during COVID-19.

2.1. Teachers' Experiences with Digital Learning during COVID-19

Teaching is known to be a demanding profession. Teachers, before the pandemic, already considered their profession stressful, and many of them suffered from burnout syndrome (Iriarte Redín & Erro-Garcés, 2020). That is, they were exhausted, and this was affecting their well-being, the teacher's quality, and students' outcomes (Klusmann et al., 2016). Due to COVID-19, the teachers' work environment has transformed. Teachers had to use different methodologies and ICT resources, leading to difficulties in their teaching practice (Kim & Asbury, 2020). In this sense, teachers felt a lack of support from their colleagues to prepare the online lessons, labor ambiguity, and the necessity for greater clarity from the government on the current situation and measures to plan for the future (Alenezi et al., 2022; Klusmann et al., 2022).

Digital education needs appropriate digital infrastructures and platforms, robust servers that can support the virtual workload, and methodological training of teachers and students for a digital teaching-learning process (García-Morales et al., 2021). Research reports that not having adequate technical support due to limited technological infrastructure has a negative impact on the quality of teaching

(Gurung, 2021). In this regard, teachers reported the technical difficulties that had arisen during the process of trying to implement digital learning. These difficulties are related to the need to reorganize material from face-to-face to online classes, to develop distance learning materials to continue teaching in the new online format, and to everyday challenges such as caring for their children and family at home (Stang-Rabrig et al., 2022). It was difficult for teachers to balance their work and personal lives during the pandemic (Jones & Kessler, 2020). Combined together, all these experiences affected teachers' perceptions of the usefulness and ease of use of ICT and their motivation to implement them correctly (Farjon et al., 2019; Meisner & McKenzie, 2023; Rasmitadila et al., 2020). On the other hand, students were also affected by their online learning due to technical problems (Mishra et al., 2020). It was difficult for them to maintain attention, and they felt isolated, had a lack of interest and organizational problems (Liang et al., 2020; Mishra et al., 2020). Therefore, educational institutions such as schools and universities must guarantee that all students have access to adequate ICT infrastructures (Carolan et al., 2020). In other words, digital education must ensure equal and quality access to technologies (Council of Europe, 2018). Likewise, infrastructure in schools and universities must be improved to reduce the digital divide that leads to inequality and social exclusion (Fernández Miravete & Prendes Espinosa, 2021; Meisner & McKenzie, 2023).

2.2. Teachers' Digital Skills

The current context of our society promotes the use of technologies in all areas, whether at work, in the family or for entertainment, as well as in different perspectives such as the economy, politics or education (Prendes Espinosa et al., 2021). One of the requirements for teachers in today's circumstances is to adapt to the new teaching environment (Alenezi et al., 2022). Training in digital skills is necessary because of the impact of ICT and because of the widespread and sudden change to online learning through digital media, which has become a key part of ensuring the continuity of education globally (UNESCO, n.d.). All this emphasizes the need for the development of digital skills in both teachers and students (Klusmann et al., 2022; Martinenco et al., 2021).

Teachers' self-efficacy with digital media is relevant in the educational context (Hatlevik & Hatlevik, 2018; Li et al., 2024). Therefore, it is essential to examine how prepared teachers are for digital teaching (Alenezi et al., 2022). Research on teacher training to meet the pedagogical challenges during the pandemic showed that most teachers do not have the necessary training in digital competence (Mahmood, 2021). Carrillo and Flores (2020) reported a lack of knowledge of pedagogical strategies for online teaching, while Sidi et al. (2023) report a low level of technological knowledge, which are both crucial for effective online teaching (Benson & Ward, 2013).

On the other hand, some studies revealed the consequences of having or not having digital skills training. The study by Dolighan & Owen (2021) showed how

teachers who had previous training in digital skills had greater teaching efficacy. However, other studies, such as Rabaglietti et al. (2021) and See et al. (2020), showed that teachers with a lack of training felt stress and that their self-efficacy decreased when they were faced with online teaching. Therefore, being digitally literate is an integral part of teachers' work and can be defined as a resource that helps teachers complete their work, increase efficiency in teaching, reduce work demands, promote personal growth and development, and facilitate meaningful learning for students (Crompton, 2017; Day et al., 2011).

Training opportunities are needed to enable teachers to adapt more easily to digital education (Hebebcı et al., 2020). Training courses for teachers can improve their technological and pedagogical competencies in online learning (Ferri et al., 2020). Some training suggestions by teachers were to acquire didactic digital skills for online teaching, workshops on ICT methodologies, and elements of psychoeducation to support the mental health of teachers (Klusmann et al., 2022; Steigleder et al., 2023).

2.3. Teachers' Well-Being at Work during COVID-19 Confinement

Several studies were focused on different aspects of teachers' well-being at work and mental health during the period of confinement. Most of them revealed that teachers experienced negative emotions as they had too little preparation time and were unable to meaningfully engage their students (Alenezi et al., 2022). In the studies by Aperribai et al. (2020) and Sokal et al. (2020), it was shown that symptoms such as distress or burnout of teachers increased during confinement. On the other hand, in the study by Chan et al. (2021), the authors found that teachers felt high levels of emotional exhaustion and stress. Other studies showed that well-being and mental health were affected as a consequence of isolation (Allen et al., 2020b; Alves et al., 2020; Kim et al., 2022). Teachers indicated that isolation was a significant challenge for classroom design as it was difficult to foster socialization, participation, and collaboration among students (Carolan et al., 2020), which was especially enhanced by the shutting down of cameras and muting of microphones (McGrane, 2022). Finally, during this period of pandemic, teachers had to teach many of their classes from home using real-time video technologies. This exposed personal details of the teachers' lives to students, such as family photos or workspace. This situation resulted in a decrease in their privacy (Majeed et al., 2022). However, the relationship between self-efficacy with digital media, the labor well-being of teachers, and the consequences derived from the confinement of COVID-19 are still not clear. Therefore, it is important to investigate their relationships and interests to define starting points for their training.

3. Research Purpose and Questions

With the current study, we aim to analyze teachers' experiences in both secondary and higher education with digital distance learning during the times of COVID-19 lockdown. Our main interest is to understand how teachers faced these changes

in their teaching practice during the pandemic and their needs, not only in their digital skills but also in their psychological and professional well-being. Thus, the research questions for this study are:

- RQ1: What challenges did teachers have with digital distance learning?
- RQ2: What suggestions did teachers have for future training in digital skills?
- RQ3: How was the well-being of the teachers during the lockdown?

By addressing these questions through the principles of appreciative inquiry, teachers can build on their experiences, using them as a foundation for future growth and development. Therefore, the results can offer the opportunity to develop training to improve digital competence and generate support for teachers in the management of online teaching.

4. Methodology

The study was part of the Interreg Skills4You project, which was created to support the digital skills of teachers and students in secondary and higher education. This project addresses the digital divide by designing and delivering digital skills training to teachers and students. It has received ethical approval by the “Sociaal-Maatschappelijke Ethische Commissie” from Hasselt University under reference number: REC/SMEC/2021-22/10.

4.1. Participants

This research collected data from secondary and higher education teachers in the Meuse-Rhine Euregion (MRE), as they were the target group for the Skills4You project. An open invitation was sent to schools and institutions around the region and through the networks of the Skills4You partners. The invitation contained a link leading to an enrolment form where interested teachers could leave their contact and select a session of their choice. Separate sessions were organized for each region and per educational level where possible, taking into consideration local language and context. Recruitment appeared difficult, with sometimes low response, resulting in the organization of multiple sessions over a longer period of time, sometimes with only a few participants. Recruitment efforts continued until both educational levels within all three regions were reached and adequate response saturation was captured. The latter was monitored both within and between region comparability and variety in thematic responses.

In total, 42 teachers participated, of which 18 came from Wallonia, 13 from Flanders, and 11 from the Netherlands. **Table 1** represents the participation for each region, the level of education they represent, the date, the conversation language, and the length of the focus group.

The three regions each have their own educational system, subject to the Flemish, Walloon, and Dutch governments, respectively, and represent two different languages. A typical similarity between the regions is a government policy based on school autonomy and pedagogical freedom.

Table 1. Overview of participants.

Code	Province	Date	n	SE or HE	Lang.	Length
FG1	Liège (BE)	18/05/2021	9	2 SE/6 HE/1 SE + HE	FR	2:56:39
FG2	Liège (BE)	21/05/2021	9	4 SE/3 HE/2 SE + HE	FR	2:20:32
IN1	Limburg (BE)	26/05/2021	2	SE	NL	2:04:32
IN2	Limburg (BE)	02/06/2021	2	SE	NL	1:55:38
FG3	Limburg (BE + NL)	09/06/2021	3	HE	NL	1:59:31
IN3	Limburg (BE)	10/06/2021	2	HE	NL	1:39:33
IN4	Limburg (BE)	16/06/2021	1	SE	NL	1:18:24
FG4	Limburg (BE)	29/06/2021	5	HE	NL	2:02:23
FG5	Limburg (NL)	07/07/2021	4	SE	NL	2:13:33
FG6	Limburg (NL)	08/07/2021	5	SE	NL	2:00:53
Total			42			

Note: Interviews with 3 or more persons are referred to with the code Focus Groups (FG), interviews that were attended by less than 3 persons are referred to with the code Interviews (IN). The interview protocol is the same for all groups (FG), pairs and individuals (IN). Own elaboration.

4.2. Tool Development and Data Collection

For this descriptive study, a qualitative approach was applied through focus groups based on the principles of appreciative inquiry (Buchanan, 2014; Cooperrider & Whitney, 2001; Cram, 2010). This methodology was deemed most suitable as teaching during COVID-19 forced change in education, while further implementing technology in education is a form of educational change. We are not only interested in the experience of teachers with technology during the crisis, but also in how they see the role of technology post-COVID-19 and how lessons learned can be transmuted towards a durable implementation in the future. Three main questions were formulated following the first three steps of the 4D-cycle to 1) discover their current experiences; 2) dream about the future role of technology in education; and 3) design the ideal organization of future training in digital skills. Each main question was then subdivided into subsequent questions, each focusing on a different aspect of the theoretical framework. The full list of questions can be found in appendix A.

Participants were invited to participate in online panel discussions using a video conference tool and an interactive online whiteboard. The latter was used to present every question on a separate tableau with enough white space for the participants to record their responses as a sticky note with the respective question. At the beginning of each focus group, the participants were informed about the purpose of the study, their GDPR rights, and the functioning of the online tool, and asked whether they agreed with the recording of the session. Once the session was in progress, the interviewer presented one question at a time, giving participants 3 to 5 minutes time to record their answer as a sticky note to then open the discussion.

Respondents were given the opportunity to elaborate on their responses and react to each other's responses in a group debate. Each session was recorded using the video conference tool so both written and oral responses could be used for analysis.

4.3. Analysis

The gathered data was analyzed using an adapted version of the interpretative phenomenological analysis (IPA) methodology, which is specifically suitable for the exploration of human experience (Crawford, 2019; Noon, 2018; Smith, 2004; Smith & Osborn, 2003). The methodology, based on phenomenology, hermeneutics, and idiography, is ideal for interpreting the perspective and experience of an "insider" and giving meaning to subjective phenomena. Different from the original IPA methodology, instead of drawing up tables, a mapping process was used based on the collected written sticky notes as the participants' narrative (Noon, 2018). This approach was opted for as a solution for limited time and resources and was considered adequate for the purpose of this study, as this research is intended as preliminary exploratory research to receive a broad understanding of experiences with digital technology in general. After the themes were identified, the recordings were listened to again to understand the narrative and context behind responses.

First, through reflection on the panel discussions, general impressions were gathered to identify major recurring themes in the responses. Instead of approaching questions one by one, overarching mutually exclusive themes were recognized. From these major themes, a mind map was created with connecting themes in between. The sticky notes from all panel discussions were then gathered and placed one-by-one on this mind map to explore the different responses per theme. Color coding was used to keep track of the responses from each of the three regions and per education level to the extent possible. Labels were used to keep track of the focus group or interview (see codes in **Table 1**) and question (see question numbers in appendix A) of origin. All sticky notes were transferred in their original language, as the multilingual knowledge of the researchers allowed for fluent interpretation. The quotations were later manually translated, supported by Google translate.

Mind Mapping

By further refining and sorting the sticky notes, commonalities and differences between responses became visible, giving an extensive overview of all responses from all panel discussions. As a result, ensuing themes emerged from the major themes, giving an ever more specific and narrowed-down insight. Responses were either generic, specific, or connective. Generic responses would express a theme in general, such as responses expressing how participants felt about using digital technology. Sometimes, these responses were more specific, such as expressing stress or anxiety. In that case, they were placed in a subtheme. The connective type would mention two or more themes on one single post-it, for example, an expression of loneliness

(well-being) combined with less interaction with students (social and students). In this case, the sticky note was placed in between themes, identifying a connection. If many sticky notes contained similar responses, a connective theme was formed. In this way, the mind map allows for a deeper understanding of not only the topics associated with using digital technology in education, but also the connectivity and relationship between these topics. (Figure 1)

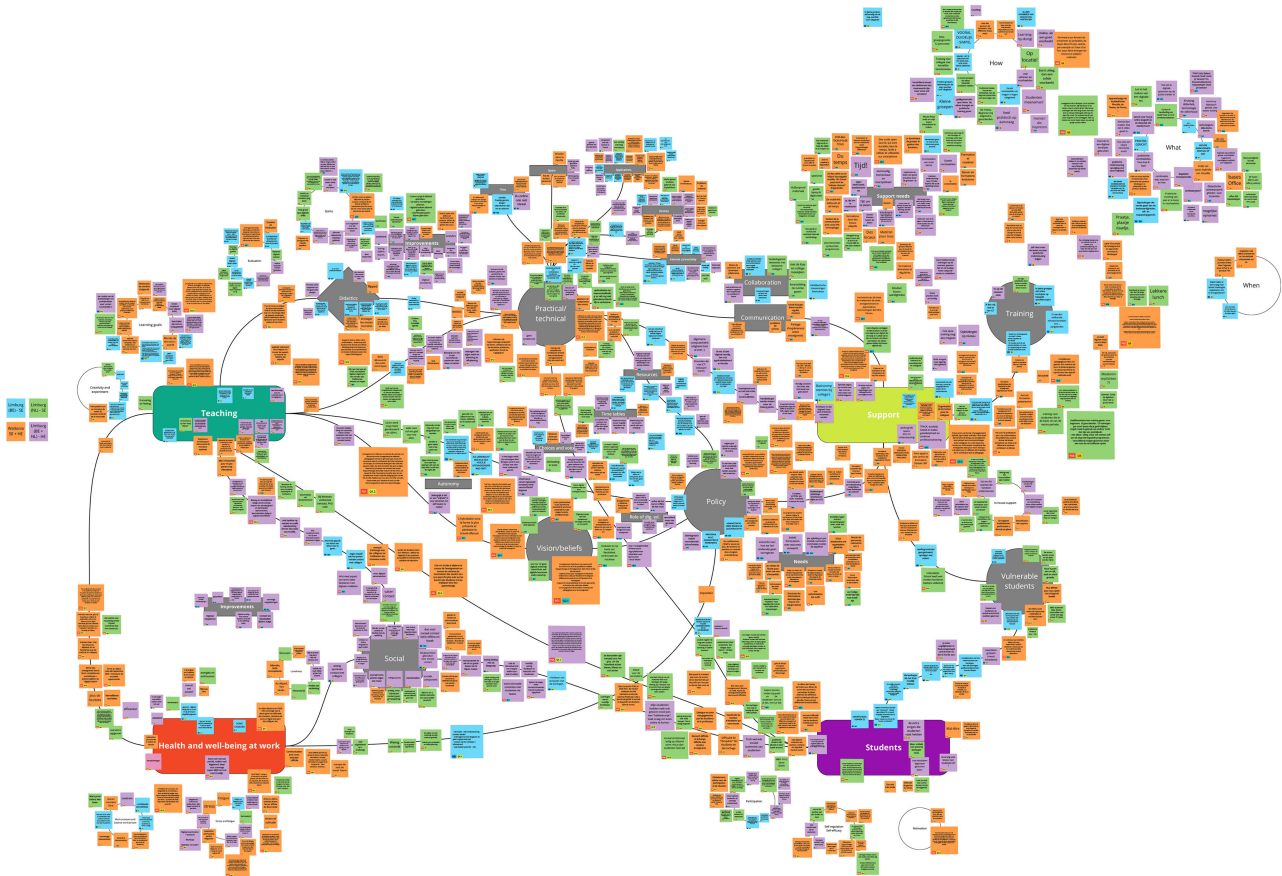


Figure 1. Thematic mindmap as a result of the analysis.

4.4. Emergent Themes

The major and connective themes are presented and discussed below. A full overview of the themes, including subthemes and example responses, can be found in appendix B.

4.4.1. Major Themes

Taking a cross-sectional view of all responses, several recurring themes can be found. Four of these themes can be labelled as mutually exclusive, as there is no immediate overlap between them. These four themes were set up as the major themes of the analysis:

- **Health and Well-Being at Work:** Answers identified as related to health and well-being at work include personal feelings of well-being, such as expressions of stress, anxiety, loneliness, and exhaustion, but also the both negative and positive

influence digital learning has had on health and well-being at work.

- **Teaching:** This broad term refers to everything related to teaching itself, from the views and beliefs teachers hold, the didactics and methodology teachers use, to the influence digital learning has on the practice itself.

- **Students:** Responses mentioning and describing the impact digital distance learning has had on students were categorized as such.

- **Support:** The fourth major theme is related to institutional, collegial, or individual support teachers may or may not have received during distance learning. Answers within this theme either describe the situation or the desire for additional support.

4.4.2. Connecting Themes

The following themes were connected to multiple major themes. There is a noticeable overlap between these themes and the major themes:

- **Social:** The first connecting theme contains responses referring to changes in social contacts, interactions, or cohesion during lockdowns and online learning. There's an overlap between the social component and health and well-being, students, and teaching.

- **Policy:** Situated in the center of the mind map, responses connected to policy and decision-making within the institutions can be located. One question from the interview guide reflected back on decisions made (or lack of decision-making), while a second looked forward to what decisions are needed and who should make them. Following the responses, the policy component connects to teaching, support, health and well-being, and the technical/practical component.

- **Technical/practical:** About every participant expressed problems as well as needs related to technical or practical matters, such as internet connectivity, devices, software, applications, workspace, and time. The technical/practical component can best be located on the axis between teaching and support, as it is the most direct way teaching can be supported. Two ways of providing technical or practical support are through communication and collaboration. Further connections are found between students and policy.

- **Vision/beliefs:** In between teaching and policy, many responses can best be categorized as part of a certain vision or belief. This might either be personal views a teacher beholds or perceived institutional visions or beliefs that influence teaching. A divisive topic related to this component is the matter of teacher autonomy.

- **Vulnerable students:** A more specific sub-theme is that of vulnerable students, directly connected to the major theme "students". Through follow-up questions, the conversations went in-depth on how vulnerable students were affected by distance learning and what support was provided or could be provided in the future.

- **Training:** The last theme is the specific application of support through training. One main question was specifically aimed at determining training needs teachers see for themselves and their colleagues. The analysis will not only look at the direct interpretation of this question but also indirectly interpret responses to other

questions, deducing training needs as a response to reported problems or shortcomings.

To give structure to the results of the mapping process, an abstraction of the thematic results and their relationships was distilled into a comprehensive figure named the rotational discussion disk (Figure 2). The figure shows the main themes on the outer ring, the inner ring contains the themes that connect to the main themes, and in the middle, the theme that connects to all themes. It is simply a visual representation of what teachers talk about when asked about their experiences with digital education. The outer ring consists of mutually exclusive main themes. The inner ring represents the connecting themes that can be rotated to connect with the outer ring. The current position represents the most frequent connection, though other connections can also be made, e.g., vision/beliefs were also connected to support. The piece “vulnerable students” falls out of the figure as it is only connected to the theme “students”.

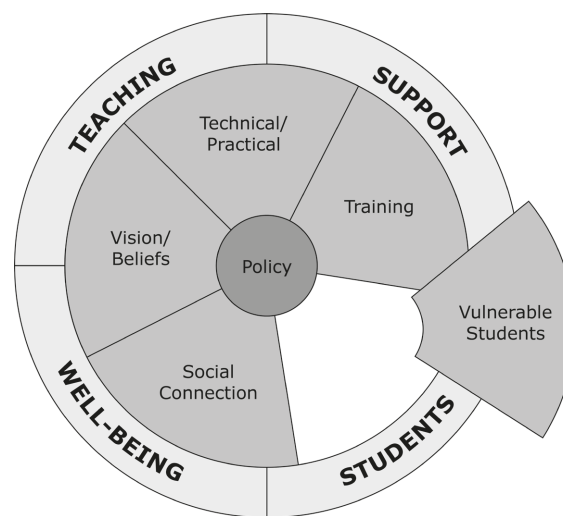


Figure 2. Rotational discussion disk.

4.5. General Impressions

Despite low attendance for certain sessions, the panel discussions were a great success overall. The methods used sparked interaction, leading to rich, in-depth conversations in line with expectations. The information gathered provides a broad overview of the teachers' experiences with digital education, as well as their views, the situations in their schools or institutions, the wins they see in digital learning, and most importantly, their concerns and needs for future development.

4.5.1. Participants

Looking at the participants, it can be remarked that not only teachers were attracted to the sessions, but often also ICT supporters or specialized faculty members. This was mainly the case for higher education. Certain secondary education teachers had a double role, not only as teachers but also as supporting team members. This allowed them to not only speak for themselves but also for their colleagues, as they

often had a clear view of the general situation within their institution due to their overarching supportive role. Among teachers from secondary education, vocational education was presented more than general education.

4.5.2. Questions

Throughout the entire research, question responses led to on-topic answers within expectations. However, very often, answers were cross-topic, as either respondents were already giving answers early in the sessions to questions that still had to follow or, as was often the case, made connections between topics. Examples of this can be found in how the question on the pedagogic topic leads to answers referring to how well students performed, or the question on teacher's affective state very often led to complaints on practical or technical matters.

The question aimed at what teachers had learned during the pandemic did not lead to any new answers but rather a repetition of what they had mentioned before and thus gave little to no new insights. In later panel discussions, this question was therefore skipped to create more time for more effective questions.

5. Results

5.1. What Were Teachers' Experiences with Digital Distance Learning during the Times of COVID-19 Lockdown?

5.1.1. New Opportunities in the Digital Learning Environment

Probably the most unforeseen positive outcome of the Covid-19 lockdown and distance learning is the exposure to digital possibilities, imperative problem-solving, and personal gain in experience with digital instruction. Most, if not all, participants gained new experiences teaching in a digital environment, learning about new applications, approaching instruction differently, or even completely rethinking their ways of teaching. Several participants already had a rich experience with digital learning environments, some as ICT specialists, ICT teachers, or ICT support staff in their schools. A couple of participants clearly indicated they had either no or very little experience using computers, even in their private lives. For them, the struggle was substantial, and the need for support was great, with a considerable gain in digital competence in the long run. If not for the lockdown, they would have probably never had these experiences in the first place. A few participants indicated they had seen new possibilities for teaching where they had not seen them before.

“Good and exciting to be able to teach through digital means” (FG5, Q1.1)

Overall, the gains can be found in increased use of digital media, such as using lesson recordings, videos, or other audio-visual materials; use of new approaches, mostly based on students' individual and independent execution of processing tasks after a short but effective direct instruction; and making use of digital forms of evaluation, mostly formative evaluation. Managing the inevitable situation instigated teachers' creativity in reviewing course content and redesigning course materials in a search for more efficient and effective ways of teaching.

“Improved use of instruction cards so students can work independent” (IN1,

Q1.2)

“Working with digital learning platforms provides opportunities to differentiate—to make tests” (IN1, Q2.1)

5.1.2. The Technical and Practical Challenges of the Digital Learning Environment

Teaching in a digital environment brings along quite a few technical and practical implications that could hinder or even completely paralyze the momentum of the lesson. Problems can be categorized into five groups: internet connectivity, devices, applications, space, and time.

“Internet problems and my pc gave up on me along the way. When we do remotely, everyone does not necessarily turn on their camera and we are never sure that they are following us” (FG2, Q1.3)

Many respondents mentioned bad or unreliable internet connection as a technical problem they experienced and mentioned it again as a condition for more frequent use of digital tools in their lessons.

“Internet problems, unpredictable and unsolvable when it happens” (FG4, Q1.3)

Several teachers indicated some of their students couldn't attend regularly because they did not have a device or had to share devices with family members, even after schools or governments handed out devices. As a solution, smartphones were used.

“Move more towards adaptation to the use of the Smartphone rather than a laptop (because not all students have a laptop at home)” (FG1, Q1.3)

Also, some teachers sometimes couldn't be available online because they had to share their devices with family members at home.

“Sharing computer with my children” (FG2, Q1.3)

“Bad sound despite use of headphones” (FG5, Q1.3)

When computers were available, the sound and image quality of the devices could cause problems due to poor quality. Application management seems to be a challenging and confusing matter and a source for discussion within schools. Having a decent workspace has been challenging for both teachers and students. Working and learning from home means one needs a quiet and comfortable space with minimal distractions and space to maneuver. Switching to online teaching requires time to learn and practice with the newly adopted digital technology, as well as getting organized and prepared for every lesson. For some teachers, too much time was spent behind a computer screen.

“Organizational point of view that takes time, especially for the ‘hybrid version’ (FG1, Q1.2)

“(Needs) Practical, trying things out, time to practice” (IN2, Q2.2)

5.1.3. Teachers' Perspectives on Students' Experiences

According to the teachers, most students could participate. Dealing with the consequences of distance learning demands strong self-regulatory skills, motivation,

and resilience from students. Learning objectives were achieved with the main exception of vocational education due to the absence of workshop classes. Especially vocational education witnessed participation problems with students, in some cases leading to drop-out. The following reasons were mentioned by respondents for students to drop out during distance learning:

- A difficult home situation
- Already struggling in school
- Lacking the proper technical or practical means
- Coming from a socio-economic disadvantaged family
- Language of instruction is not the first language of the student

“Students hard to reach see it as holidays, non-native newcomers, language barrier, instructions difficult to understand” (IN4, Q1.5)

Providing devices for every student was mentioned as a way to support vulnerable students. Two teachers from Wallonia reported difficulties in their region.

“One computer per student. Even if they are available, some students do not dare (or do not want) to go and get the tools available.” (FG2, Q2.2)

“Some laptops were received late to compensate for the lack of equipment for some of our students.” (FG2, Q1.4)

Efforts from teachers to reach vulnerable students proved challenging as certain students posed strong resistance towards adopting digital skills, participating in digital education, or receiving help from teachers or student councilors.

“Difficulties in supporting students. Not all students can be offered equal opportunities” (IN4, Q1.1)

The lack of social connection reappears as a concern in several conversations, while making time for informal contact with students is mentioned as a way to mediate this problem.

“My students often just needed a ‘chat hour’. Often asked to come online for a while” (FG4, Q1.5)

5.1.4. The Social Aspect of the Learning Environment

The social aspect of the school environment has probably seen the most detriment during times of distance learning. The following problems were reported in relation to aspects of the social component:

- Lack of informal conversations with colleagues (e.g., during coffee breaks)
- Lack of informal conversations with students (e.g., during or between lessons)
- Students expressing a need for more individual attention during lessons
- Less social cohesion overall
- Loss of engagement
- Losing contact with students
- Little to no interaction during lessons, difficulties receiving answers in class
- Not being able to see students during lessons
- Increased difficulty in collaborating with colleagues

“Sometimes feeling of loneliness due to poorer social ties with students” (FG1, Q1.1)

These problems were not applicable for all respondents. While some expressed their inability to create a social connection with their students in the online environment—and seemed oblivious to how to facilitate the social aspect of learning during online classes—others reported the exact opposite. A particular teacher explained he would let the class freely interact for the first hour of an online class on Monday morning, as he noticed the students’ need to talk to each other after the weekend. Some teachers gained a more personal connection with students as they took the time to contact every student individually to ask how they were doing. Sometimes, it was also dependent on the student itself, as some asked for more attention while others disappeared by turning off their camera and not interacting in class.

“Pleasant, more individual contact, less group behavior” (FG6, Q1.1)

The same contrast in social impact can be found among teachers as well. While some felt isolated and soundly missed the informal and spontaneous interactions with their colleagues, some actually experienced more interaction as they found sending text messages for quick work-related questions had a lower threshold than finding the appropriate person in the hallways of the school buildings. Also, the need for assistance for some and the offer of assistance by others lead to more interactions. Then again, some found it hard to ask for help and felt like a burden to others.

“the chat during the coffee break was missing: no good feeling” (IN3, Q1.1)

“More cohesion in the teacher team, we had a joint task” (FG3, Q1.2)

5.2. What Experiences Are Valuable for Teachers and Their Teaching Practice in the Future?

5.2.1. Improvements to the Work Environment

Making use of digital technology can bring improvements to the work environment for teachers. One immediate and broadly shared benefit is replacing physical meetings with online meetings. It cuts travel time and increases efficiency. Also, in the classrooms and related to teaching, benefits were identified.

“As part of efficient teleworking for certain course coordination and management tasks.” (FG1, Q3)

Problems lead to problem-solving, and thus, many teachers found technical or practical solutions that proved valuable for continuous use in their teaching practice.

“I am someone who looks for solutions myself, this has given me new experiences such as making videos, recorded PowerPoint, but my ICT skills are still too minimal, e.g., book widget... These would be good techniques to use in the future to differentiate among students.” (IN4, Q1.3)

The following improvements were mentioned across different panel discussions:

- Lesson recordings as complementary learning materials
- More frequent use of (audio-)visual materials
- Digital projects with students, both synchronous and asynchronous

- Online cooperation between departments or locations
- Interdisciplinary cooperation
- Interactive and activating digital work forms and assignments
- Digital quizzes and tests
- Digital annotation
- Use of digital learning platforms
- Self-regulated and independent processing of learning materials
- Digital workbooks instead of paper copies.
- Online communication
- Gamification
- Asynchronous learning paths, self-testing, recordings, and knowledge clips
- Blended or flipped classroom principles

5.2.2. Teacher's Visions and Beliefs on Digital Education

A majority of respondents were convinced distance education has brought some useful changes to the practice. Some indicated that change was already needed before the lockdown. In some cases, teachers were even relieved that these new dynamics in education were finally taking place where they were thought impossible before the lockdown. They see a positive trend and evolution that should be continued in the future.

“Online when you can, offline when you have to” (IN3, Q2.1)

Some nuanced this, saying these are valuable experiences, but they think this should not become the standard way of teaching, but rather an extension to direct classroom teaching and to create more variety in the learning environment. Many do see themselves using more hybrid or blended forms of education in their own teaching practice. In general, most respondents were proponents of the idea of more integration of digital ways of learning in their schools. A few were even in favor of installing a digital lesson week once every month or trimester.

5.2.3. Balancing Teacher Autonomy

Teachers find it important to maintain freedom of choice when it comes to organizing not applicable for and integrating digital education into their teaching practice. It was expressed as a fear, a condition, a prerequisite, and as a need. Two contrasting situations demonstrate the tension field between absolute freedom on the one hand and rigid decision-making on the other.

In some schools, teachers experienced an almost anarchical approach where they were left to their fate going into distance education. This led to a wide diversity of teaching styles and learning approaches.

“As a teacher you decide yourself how you to provide distance education” (IN1, Q1.3)

For the student, such a situation is far from ideal, as there is hardly any harmony between classes and teachers.

“A difficulty last year was for students to know what tasks were due when and where. Every teacher did its own thing. This has been changed this school year,

namely a template for the digital diary” (IN4, Q1.4)

The benefit some teachers experienced was the absolute freedom to experiment, enriching themselves with new insights into their personal teaching practice. Some would share their results with colleagues. However, at staff meetings, the attempt at decision-making led to discussions and disagreements, which in turn had a negative impact on the school culture.

“It’s important there’s a ‘freedom’ for teachers to make their own choices” (FG4, Q2.1)

A counter-example is a testimony from a rigid school where the school board-imposed platforms and a selection of teaching applications while rejecting alternative solutions coming from teachers. A teacher did not find the selection of applications suitable for their needs, found an alternative, and requested the board to accept their choice and add it to the list. While colleagues supported the alternative choice, the board refused, leading to harsh discussions, dissatisfaction, and a tense relationship between teachers and the school board.

“Standardization in means, while maintaining space for unique application” (FG5, Q2.3)

This contradiction was also displayed by the reactions from other participants, either cherishing their personal autonomy or requesting more clarity and stability through policy decision-making.

“There must be 1 policy, regularity and structure provide peace and guidance” (FG5, Q2.3)

Overall, the discussion came down to finding a balance between the two.

5.2.4. Helpful Support Measures

Other useful experiences can be linked to the support teachers receive during distance learning within their institution. To identify what works, this research looks at acknowledged functional support measures and expressed support needs. Participants mentioned the following supportive measures:

- Manuals on how to use tools or software
- Overview of potential tools, applications, or tech-solutions
- Webpage with tips and tricks for online teaching
- Instruction videos
- Creation of a supportive team of teachers with an affinity for ICT
- Hired ICT support for on-demand technical problem-solving
- Hired blended learning experts
- Establishing hybrid classrooms for mixed f2f and online lessons
- Team meetings for instruction on software functionalities
- Sharing experiences among teachers
- Sharing learning materials
- Observing colleagues teaching classes
- Practical examples from colleagues
- Q&A-sessions
- Work sessions guided by competent colleagues as part of in-service training

5.3. What Suggestions for Future Training in Digital Competencies Do Teachers Have?

Training needs refer to the acquisition of new knowledge and skills that can be provided either internally by the school or by an external organization focused on training teachers or students. The analysis focuses on the what, how, and when of in-service training.

While a few respondents would like to receive more training in basic text processing skills, such as the MS Office pack, most respondents were interested in digital design skills of the blended learning environment, digital didactics, and practical examples and inspiration for the didactical use of digital technology. Preferably, training is provided in practical hands-on sessions in small groups composed of like-minded teachers of similar skill levels. According to the respondents, content should be based on problems or questions from their own teaching practice, with clear examples and exercises. Several teachers would like to receive these courses online, by means of a good example, while others would rather receive them on location and face-to-face. Also mentioned is learning by means of collaboration and by making mistakes during trial-and-error. The latter might indicate they would like to feel safe to experiment and try out things that might not work and learn from these experiences. Participants indicated they'd like to receive basic training on how to use tools selected by the school at the beginning of the academic year to go further in detail during the school year. There was also a request for "on-demand" training when experiencing a problem or the need to learn something new.

5.4. What Does It Mean to Transition to Digital Education?

5.4.1. Health and Well-Being at Work

The sudden changes to online teaching had a noticeable impact on teachers' emotional and mental well-being. Reported negative consequences are related to stress, fatigue, loneliness, and increased work pressure.

"Stress in the beginning, loneliness in front of the screen, difficult to disconnect" (FG2, Q1.1)

Stress was mainly caused by constant changes in the work environment, unstable policy, and technical problems such as loss of internet connectivity or problems with the software. Spending long hours behind a computer screen drains energy and becomes a cause for fatigue over time. This is often in combination with a disrupted social life, feelings of loneliness, and an increased workload. Some reported they had no more free time as all their time went into preparations, getting to know the applications, creating adapted assignments, problem-solving, corrections, following up on students, and so on. This was especially the case for teachers with families who combined working at home and running the household, including children who had to attend online learning as well. Teachers who were already transitioning to blended learning before the Covid-19 pandemic felt more prepared and experienced fewer negative consequences. Positive side effects

are related to increased flexibility, creativity, and feelings of self-worth and satisfaction linked to increased challenges.

“It was working pleasantly for me because I was well prepared through LessonUp.” (FG5, Q1.1)

“A sentiment of pride also to have been more creative than face-to-face” (FG1, Q1.1)

Working from home, sometimes asynchronous, allowed teachers to become more flexible in their work and planning. Several teachers spoke of an overall positive experience, for some after the initial stress and once adapted to the new methods. To some, the challenge was experienced as an opportunity to be creative and reinvent their methods. Despite the increased pressure and stress, the personal gains and supportive efforts worked encouraging and gave a strong feeling of self-worth and satisfaction.

5.4.2. Time to Change

Migrating toward a blended or online learning environment takes time. Time to prepare, time to (re)write lesson materials, time to learn new skills, time to get to know the software, time to find appropriate applications, time to search for ideas, time to communicate, and so on. The switch to digital learning environments takes time, and many teachers felt they didn't have enough time. Often, teachers had to invest their own free time to get all the work done, increasing work pressure and stress. More time to prepare, learn, and adapt was also mentioned as a dire need when shifting toward a digital learning environment.

Teachers who had already shifted towards blended learning before the COVID-19 crisis felt more prepared and experienced less work pressure. Some even experienced more free time and an improved work-life balance while working from home. These teachers already had digital versions of their handbooks and learning materials, were already making use of online sources, and were making frequent use of online applications for assignments. As a result, they experienced less of a negative impact and even found time to support their colleagues.

5.4.3. Stability in Policy

There was a noticeable need for a clear, uniform, stable, and transparent policy on digital education. Especially looking back at the early days of lockdown—but also at the current situation and looking forward to the upcoming school year—many teachers expressed their dependency on strong policy and clarity from school boards on what exactly is expected from them as teachers. While some expressed the negative consequences of individual approaches, others complained about the lack of direction, the instability, and the impromptu changes school leaders (and governments) created. Changing policy also led to frustration as often time invested in preparations one week became redundant for the next. Most teachers agreed that a school-wide organization is needed to set a clear digital teaching and learning policy. Structural coordination and clarity within the domains were mentioned as salvation during difficult times. When asked what policy should focus

on, the following was mentioned:

- The type and role of digital education in the school
- Providing the necessary technical and practical support
- Reliable internet
- Adequate devices
- Software applications available to use (e.g., licenses)
- Adapted workspaces
- Adequate time
- Communication—support and stimulate open, constructive, and safe communication between all members of the school community
 - Collaboration—support and stimulate the exchange of good practices and experiences within and between schools
 - Possibility for detachment to become an ICT-support teacher

5.5. Comparison of Secondary and Higher Education

The reported experiences from secondary and higher education were surprisingly similar. One difference can be found in the institutional support teachers receive. Teachers from higher education described institutionally embedded professional services they could contact when needed through websites, email, chat, or phone. Teachers from secondary education relied rather on collegial support and only one or two staff members for technical support. Other than this, all discussed themes were answered in a similar fashion for both target groups.

6. Discussion

The purpose of this study was to analyze teachers' experiences with digital distance learning during the COVID-19 lockdown period. The data collected consisted of sticky note responses, which were thematically analyzed by creating a mind map and identifying connections between different themes. Notably, the analysis revealed that policy occupied a central position in the mind map, with a significant number of responses directly or indirectly mentioning policy while discussing various themes.

In this study, the challenges teachers experienced are comparable with previous studies that have identified similar barriers when implementing digital technology in education amid the pandemic (Aditya et al., 2021; Alenezi et al., 2022; Ferri et al., 2020; Sidi et al., 2023; Steigleder et al., 2023). However, even before COVID-19, the importance of adequate resources, professional development, and support was widely acknowledged (Bingimlas, 2009). Policy was often recognized as having a crucial role in those studies as well, although typically alongside other components. In contrast, we argue that policy is not simply another component alongside the others but plays a key role, exerting a strong influence on all aspects of technology integration in education. This centrality of policy was visually represented in the rotational discussion disk (Figure 2), illustrating its relationship with the connective themes (technical/practical, vision/beliefs, training, social connections, and

vulnerable students) and four main themes (teaching, support, well-being, and students). Here, policy refers to the decision-making process by school leadership, whether in consultation with teachers or not.

A digital learning environment is reliant on the necessary technical equipment and infrastructure (Huber & Helm, 2020). The results showed that teachers and students depend on the infrastructure and resources provided by the school leadership. This finding aligns with Gurung's (2021) study, which highlighted the negative impact on teaching quality due to limited technological infrastructure. Similarly, studies by Liang et al. (2020) and Mishra et al. (2020) found that students experienced a lack of interest in learning and organizational problems due to insufficient technological support. However, material resources alone, such as internet connection, devices, and applications, are not sufficient. Most studies revealed that teachers experienced negative emotions due to insufficient preparation time and the inability to effectively engage their students (Alenezi et al., 2022; Meisner & McKenzie, 2023). Furthermore, teachers experienced ambiguity in their work and longed for clearer guidance from the government regarding the circumstances and future planning measures (Alenezi et al., 2022; Klusmann et al., 2022). In our findings, time emerged as a valuable resource guided by policy, as strategic plans can provide feasible time frames for teachers to implement digital technology and adapt the teaching-learning process accordingly in a workable manner. Strategic plans should be based on a clear and shared vision that outlines how digital technology should be integrated into the learning environment. Digital transformation should be viewed as a gradual and drawn-out process preceded by a planning and envisioning phase that involves teachers and students in shaping a digital strategy plan for their school. Further policy efforts may contain the installment of dedicated work groups led by innovation-driven team members, seeking engagement in the school, performing a needs analysis, and making agreements with teachers on the use of digital technology in the classroom.

Existing literature emphasizes the need for training opportunities to enable teachers to adapt to digital education (Hebebcı et al., 2020) and improve their technological and pedagogical competencies in online learning (Ferri et al., 2020; Li et al., 2024). While our results align with these studies, from our analysis, it can be argued that the professionalization of teachers starts at the policy level. Firstly, align the school's digital strategy with professionalization goals, and secondly, provide adequate professional development opportunities. Simply allowing one-off training courses falls short of ensuring sustainable skill development. Facilitating collaborative networks and support systems within institutions is strongly recommended as part of teachers' professional development of digital competency and ICT-integrated pedagogical approaches.

Concerning the social aspect of learning, which is often inherent in traditional classroom teaching, distance learning has revealed challenges in generating social interaction in an online environment. Overall, our findings underscore the negative impact on well-being resulting from the loss of social engagement among teachers

and between teachers and students. These findings are consistent with studies indicating that teachers found it difficult to foster socialization, participation, and collaboration among students during isolation (Carolan et al., 2020), particularly when cameras were turned off and microphones muted (McGrane, 2022).

Post-pandemic, not only does the implementation of digital technologies continue to be a relevant and ongoing undertaking, but newly arising technological advancements, such as AI, put pressure on the educational system (Trust et al., 2023). To stay ahead of the curve, policymakers and educational leaders bear a huge responsibility in leading educational institutions through a continuous digital transformation. While carrying out these ambitious duties, policymakers should carefully consider the implications on the social well-being of teachers and students when determining the format of digital learning in their institutions. For example, incorporating social activities as a formal part of the learning environment becomes crucial when increasing the use of technologies in the teaching-learning process, which may promote more individual and isolated learning practices. Unfortunately, the connection between policy and vulnerable students has been found to be weak, represented by a sideways dangling piece in **Figure 2**. We would argue, however, that when formulating a policy for digital education, vulnerable students should be examined and accounted for to ensure their inclusion. It's not always visible who the vulnerable students are. Therefore, it is important for teachers to proactively reflect on who may be negatively affected. Human connection is crucial again since teachers' efforts to personally reach out to students were mentioned as an effective measure. To better include vulnerable students, digitalization may not be the solution, but people are.

We are convinced that the absence of any of these elements within policy will have a negative effect on the organization, leading to frustration and negative experiences, followed by resistance towards innovation. Therefore, for the sake of the well-being of teachers and students, policymakers and school leaders should refrain from taking rash decisions but instead engage in strategic planning that considers the complexity of the change process and builds upon a shared vision, implemented strategically in all directions. This approach is especially crucial for developing positive experiences with digital technology, which should be shared and supported throughout the teacher team, gradually evolving towards meaningful applications of ICT technology in the learning environment. Technology and innovation should always deliver added value to teachers and students to justify investments. Most importantly, teachers should not have to face these challenges on their own but rather receive institutional support that prepares them through dynamic and collaborative processes for challenges yet to come.

Limitations and Recommendations

The relatively small sample size ($n = 42$) linked to three regions poses limitations for this paper. Nevertheless, despite many differences in terms of languages and countries represented in this paper, the bordering regions are comparable in

their educational approach, characterized by pedagogical freedom. This adds diversity to the sample, reducing bias related to homogeneity. However, we do not pretend these results are generalizable in every context, but we expect similar research in countries with less pedagogical freedom, which may yield different results. Furthermore, this is a qualitative study with its limitations in representability. Nonetheless, we are convinced the presented results provide a valuable contribution to research in digital transformation and consider the results plausible, given the circumstances. The tipping point for AI integration in education means that more research for this specific context is desirable, especially verification of results.

Furthermore, as this paper took a holistic and systemic approach, it lacks depth in the specificity of its findings. Especially regarding the specific use of digital technology, the findings in this paper do not provide much detail, nor do they discuss what digital transformation strategies are desirable for school leaders to pursue. Further research on sustainable management strategies for digital transformation, as well as on the effects of improving the conditions for digital education on the attitudes of teachers, is recommended.

7. Conclusion

In conclusion to the findings presented in this paper, we emphasize the key role of policy in the process of integrating digital technology into education. The policy serves as a guiding force by strategically envisioning and planning the implementation of digital technology while also creating conducive conditions and providing essential support to teachers. Furthermore, policy should prioritize the social and physical well-being of both teachers and students, with particular attention to the needs of vulnerable students. In order to foster sustainable change, it is crucial for teachers to have positive experiences when utilizing meaningful applications of digital technologies in the learning environment. Moreover, they should be encouraged to share their knowledge and experiences within their institutions. As we reflect on lessons learned from the COVID-19 pandemic for a post-pandemic era, it becomes evident that school leaders play a pivotal role in shaping dynamic, collaborative, and supportive institutions capable of effectively addressing any future challenges.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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