



Pre-service Teachers' Digital Experiences through Digital Pedagogical Practices in Norway

Pattamawan Jimarkon¹

University of Stavanger

Phalangchok Wanphet

Nord University

Kenan Dikilitas

University of Stavanger

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Abstract

Digital skills are one of the key competences outlined in The European Reference Framework of Key Competences for Lifelong Learning prescribed by the EU in 2006. Integration of digital tools and resources into the classroom results in more platforms for teaching and learning activities. Teacher training programmes prepare pre-service teachers with pedagogical competencies and skills necessary for their future practices. This paper shows that pre-service teachers could overcome the pedagogical challenges during COVID-19 teaching by updating their present and future classroom teaching strategies around digital literacy. To explore further how these new teaching circumstances are understood and reflected on by pre-service teachers, the researchers collected written reflections of 52 pre-service teachers in Norway using an open-ended survey about their digital integration experiences in their practicum. This paper offers analyses of the reflections inductively to reveal the teachers' process of development of their classroom teaching strategies as influenced by new digitalisation-related experiences. The findings show low levels of digital integration according to the SAMR model but moderate to high levels of satisfaction among pre-service teachers of digital practices. In the light of these findings, this study offers pedagogical technological implications for teachers and teacher educators who work with teacher education curricula.

Keywords: pedagogical digitalisation, pre-service teachers, digital integration

¹ Corresponding author: pattamawan.jimarkon@uis.no

Introduction

The COVID-19 pandemic has echoed the importance of digital teaching and learning in terms of the urgency and level of integrability into the education system. As many practitioners and policymakers have observed since the pandemic, online education has become an important platform to allow teaching and learning to take place and continue. The pandemic has changed basic assumptions in education in the core concepts and practices of teaching and learning where classroom-based education and face-to-face classroom activities were once the default environment for teaching and learning. In some cases, due to school closures, electronically mediated teaching has partially, if not completely, replaced traditional classroom teaching (Iivari et al., 2020; Tomasik et al., 2020; Williamson et al., 2020). Another major party affected by this fundamental change is teacher training institutions, not least because in the long term, they must prepare future teachers who can adapt to such change. However, the pandemic has not given these institutions much time for preparing their pre-service teachers for accelerated digital learning changes in their upcoming teaching practicums (la Velle et al., 2020).

One of several immediate changes in education that the pandemic has caused increased use of online and digital tools for pedagogical purposes. The Norwegian Centre for ICT in Education stresses that technology affects how people learn, teach, and acquire knowledge, therefore, pre-service teachers, through continuous education and development, must advance their professional digital competence (Kelentrić et al., 2017). Teaching and learning during the COVID-19 pandemic can be organized using technology so that human interaction is minimized to protect the health of teachers and students (Lashley et al., 2020).

While teachers and students are known to be directly affected by the pandemic, another group of education personnel impacted by the pedagogical challenges of COVID-19 is pre-service teachers (Donitsa-Schmidt & Ramot, 2020; Ellis et al., 2020; Kidd & Murray, 2020), who are currently expected to go through their formal training online and teach online courses during their teaching practicum. Therefore, pre-service teachers are expected to have digital competence. The extent of this competence is the focus of this current study. This study, therefore, aims to explore pre-service teachers' knowledge of, reflection on, attitude towards, and engagement in digital pedagogy during their teaching practicum at Norwegian secondary schools. The resulting information will contribute to a greater understanding of the necessity of online and digital tools for pedagogical purposes for educators and offer insights into how digital pedagogy can be included in teacher education programs.

To address these issues and reveal the experiences of pre-service teachers with digital integration in practicum, the researchers seek insights into the following research questions:

1. How did the participants' self-report use, purposes, and experiences of digital pedagogical tools?

2. How did they learn, develop and experience digital integration in their professional environment?

Literature Review

The Nordic countries are advanced in digital infrastructure, well-equipped with educational technologies, and could develop online education further (McGrath, 2020). In Norway, in particular, digital skills within education are valued highly enough to be one of the five basic skills in the national curriculum. These skills are fundamental to learning in all subjects, as well as a prerequisite for learners to be able to demonstrate their competences and qualifications. For Norway to head towards an information society and knowledge society, new technologies in education and improving learning are encouraged to be put in place and practiced (Erstad, 2006). In 2016, Norway's National Council for Teacher Education (NRLU) produced the National Guidelines for the Primary and Lower Secondary Teacher Education Programme (Aam et al., 2017). These guidelines emphasise professional digital competence for teachers in Norwegian schools. However, a study employing three national questionnaire surveys conducted among teacher educators, mentor teachers, and pre-service teachers in Norway (Instefjord & Munthe, 2017) found that the curriculum documents barely provided tangible structure and working methods of instructional technology use and only occasionally mentioned them as part of the intended learning outcomes. Educators are expected to provide high-quality learning from the high-quality resources available to them. Advances in technology, including the internet, mean educators require appropriate and efficient digital literacy skills to navigate pedagogical practice.

A framework created by Puentedura (2012) in evaluating teaching digital practice can be the starting point. It categorizes the integration of instructional technology into the classroom into four varying levels; Substitution and Augmentation as *Enhancement*, and Modification and Redefinition as *Transformation (SAMR)*. Crompton and Burke (2020) conducted a systematic review of studies involving mobile learning using the SAMR model from 2014 to 2019. The review found that in almost half of the 186 empirical studies, the mobile technologies were only used in a manner that could have been done without technology at the enhancement level and that in the other half the technologies were used to transform learning.

A subsequent problem of this rapid technology shift is the need to keep up with advances and determine appropriate strategies for choosing, using, and acquiring knowledge. Platforms and tools such as Zoom, Microsoft Teams, Skype, Padlet, Kahoot, and Blackboard, etc., have made teaching online possible and manageable. For teachers, choosing the most pedagogically appropriate online platform from these many available platforms is the first step. Indeed, online learning and teaching require a variety of tools, resources, pedagogical approaches, organizational arrangements, and forms of interaction, support, and feedback to

compensate for interactions in the physical classroom (Rapanta et al., 2020). Therefore, teachers working in online classrooms and with other aspects of online education need support and guidance in planning instruction to cope with such intricacies.

Vygotsky's (1981) sociocultural theory is appropriate in the analysis of teachers' cognitive activities during the processes of professional development. As a social activity, teaching practicum is an interaction that plays an important role in a pre-service teacher's learning, pedagogical practice imparting, and behaviour modelling. Engen (2019) reviews two empirical studies and concludes that considerations of the use of digital technology must be based on practicality, normative beliefs, and cultural practices and that technology use is effective when it is well incorporated into meaningful classroom activities. He also highlights "the teachers' need for competencies in translating and converting technology into an object on its own terms within the framework of a school, as opposed to the outside world" (p. 13). Practice-based pre-service teacher education should be a temporal and spatial arena for teachers to enhance their professional competence through the process of interacting with digital technology, testing their hypotheses and practices, developing digital competence, and implementing and researching their educational practices (Engeness, 2021).

It is common practice that teacher training programs merely provide the knowledge "through various, often fragmented courses, while the schools provide the setting where pre-service teachers are expected to apply those theories. Pre-service teachers are required to integrate it all by themselves." (Schepens et al., 2009, p. 362). In Norway, it was reported that novice teachers perceived their digital proficiency as poor because of inadequate training during their teacher education, stressing a need for more preparation of student teachers for digital integration in teaching practice (Gudmundsdottir & Hatlevik, 2018). It is argued that pre-service teachers' expectations to fit the demanding job descriptions of the modern and competent teacher are responsible for threatening their own identity (Al-Hazza, 2017). Beijaard and Meijer (2017) posit that with the beliefs and knowledge that they bring with them from their teacher education courses, internal and external forces from their teaching practice will form their new teacher identities derived from the process of sense-making and contextualized learning. Beijaard (2019) also notes a change in the identity of the teacher towards being more a student-centered identity and with the teacher as a learner to maintain a balance in their practice.

Forces that have impacts on pre-service teachers' identity can be external. Such external forces can be, for instance, the practicum settings, which consist inclusively of school policy, school culture, in-service teachers, or students (Maclean & White, 2007; Teng, 2017; Trent, 2018; Yuan & Lee, 2015; Zhao & Zhang, 2017). The first three studies reveal how pre-service teachers, through social, collaborative, and dialogic interactions with more experienced teachers or school-based mentor teachers, construct and develop their professional teacher identity. Yuan and Lee (2015) witness three pre-service teachers who became "student-centred teachers" (p. 485) and "co-learners of student" (p. 486) through the

social interaction between themselves and pupils. In addition, Yuan and Lee find that a political factor at the same school impedes two of these pre-service teachers' identity formation. Rather than being viewed as members of the school community, they feel they are perceived merely as secretaries or outsiders.

Forces that influence pre-service teachers' identity formation and development during the pandemic can be internal, that is, the teachers' psychological states. A study from Taiwan found that teachers with few teaching years (1–10 years) reported being more confident and ready in employing computer-mediated instruction than those with many teaching years (21 or more years) (Hung, 2016). Teachers' attitudes and acceptance also play a crucial role in the successful pedagogical integration of technology (Yuen & Ma, 2008). Not every teacher is willing to develop their use and understanding of technology. Madsen (2020) stresses that teachers' motivation is likely to drop when they cannot make meaning of the educational value and the policies in place are not in line with their educational convictions. However, such internal forces can be found to be tightly and causally connected with external factors. For instance, teachers may struggle with the disruptions technology might cause, while some teachers have relatively little practical experience in using and integrating technology. These factors result in these teachers' negative attitudes about using technology for educational purposes and from other external factors such as pupils' absenteeism, inattentiveness, and incomplete work that teachers experience more when using technology in online classrooms than in physical classrooms. These attitudes should not go unnoticed and intervention is needed to alter them (Kreijns et al., 2013). Confidence and practice are found to be strongly related to Information and Communication Technology (ICT) competence in a study drawn from teacher surveys, interviews, and document analysis in Australia (Prestridge, 2012). Prestridge, in this study, concludes that a greater competency with instructional technology corresponded with the confidence in using ICT in the classroom but the level of competence or confidence did not contribute to the types of technology used.

Methodology

To explore how new teaching circumstances are understood and reflected on by pre-service teachers, the researchers distributed a survey to elicit digital integration experiences during pre-service teaching practicum. This allowed the researchers to identify major issues regarding the pre-service teachers' practice, experience, and recognition of digital integration, as well as their insights into and experiences with digital integration. The researchers put a particular focus on analysis and interpretation using the interplay of this study's mixed-method elements. The goal of this study is to uncover the participants' reported use, practice, and level of ICT competence, based on the SAMR Model, from the participants' articulated learning experiences and professional practices during their teaching practicum.

Context and Participants

The participants in this study were in-service teachers at a Norwegian university, ranging from year 1 to year 4 in 5-year BA/MA programs (the first group of intakes admitted into the teacher education programs were in their fourth year at the time of the data collection; as a result, no fifth-year students were participating in this study). To be qualified to participate in this study, participants must have undertaken a teaching practicum at schools, as specified by their teacher education program (see the Norwegian National Guidelines for Primary and Lower Secondary Teacher Education Program for more information about this requirement). All the participants, including the first-year students, whom the researchers preliminarily contacted, had undertaken their teaching practicum, at least twice (one in autumn 2020 and the other in spring 2021), and therefore are qualified to participate in this study. Their year of study, although not taken as a variable in this study, suggests that the participants were different in three domains, i.e., their amount of time in the teacher education programs, their teaching practicum-related experience, and the length of each teaching practicum they had to undertake. In general, these participants conducted their teaching practicum once a semester, for five years, starting in their first semester in the teacher education program. The length of the teaching practicum varied, ranging from two weeks to four weeks, though the majority of the teaching practicums last three weeks.

The study is qualitative and based on what the participants reported about their experiences of digital integration into teaching and learning during the time of COVID-19. Our questions did not elicit data that included sensitive issues of teaching but were about digital practices and reflections on them. The proposal underwent ethical research assessments and was approved by the Norwegian Centre for Research Data based on data protection and privacy. The participation was voluntary and free of coercion by the researchers and the responses in the self-report mode of the data were anonymized.

Tool: The Survey

The online questionnaire consisted of five open-ended questions, sent by email to 200 pre-service teachers. Fifty-two pre-service teachers returned the questionnaire. The participants were asked to respond in writing to the following questions about their experiences in using digital tools during the practicum period with the researchers.

1. Year of study
2. The range of digital tools used in their teaching
3. How they and their students used the digital tools
4. How well they thought they integrated the digital tools in their teaching
5. How they were influenced by these digital experiences over time, such as from their formal training, informal training, or from actual use

The low response rate to the questionnaire may result from the following reasons. First, those pre-service teachers who did not respond might believe they did not implement digital tools during their practicum and therefore that participating in this current study would be irrelevant. Second, one part of the questionnaire consisted of open-ended questions, which some participants might view as time-consuming and wanted to opt-out. Third, the questionnaire was distributed before the start of the practicum, a busy period during which there are adjustments and practicality issues for some participants, rendering the questionnaire a low priority.

Data Analysis

The researchers analysed written reflections inductively to reveal the process of transformation, as influenced by new digitalisation-related experiences, in which knowledge, practice, and experience are fundamental. From the first section of the questionnaire, the researchers presented the pre-service teachers' overall use of technology and basic understanding of digital integration. The responses to the open-ended questions from the second section of the questionnaire include several mentions of pre-service teachers' teaching practices. Data from the five open-ended questions were coded in three levels. The first level of coding was to assign categories from the points of interest by one researcher. The second level of coding was a negotiation of the categories by two researchers. The third level of coding was the negotiation for agreement. The categories in Table 1 are those agreed upon by all three researchers in this study. The researchers compared the data against the four levels of digital integration from the SAMR model. For the second research question, the researchers coded and categorized the written data where the researchers induced the overarching theme as '*Reflection on meanings of experiences*' which was sub-themed with five categories as shown in Table 1. The researchers adopted a simultaneous coding practice where two of the researchers elaborated on participants' meanings and negotiated the emerging codes, which was followed by confirmatory analysis practice by the other author. This collaborative debriefing among the researchers contributed to the strengthening of the codes to reflect the participants' actual meanings.

Findings

Representational categories are derived from the 52 pre-service teachers' written responses. First, the integration levels will be presented and justified against the SAMR Model (Puentedura, 2012), irrespectively of quantification of use. Our re-interpretation focuses on the orientation of digital use, from teacher-led to pupil-led. It is also associated with the shift of teacher agency to student agency.

To answer the questions, the researchers first give an overview of the tools the participants reported using in their teaching practices.

Research Question 1: How did the participants' self-report use, purposes, and experiences of digital pedagogical tools?

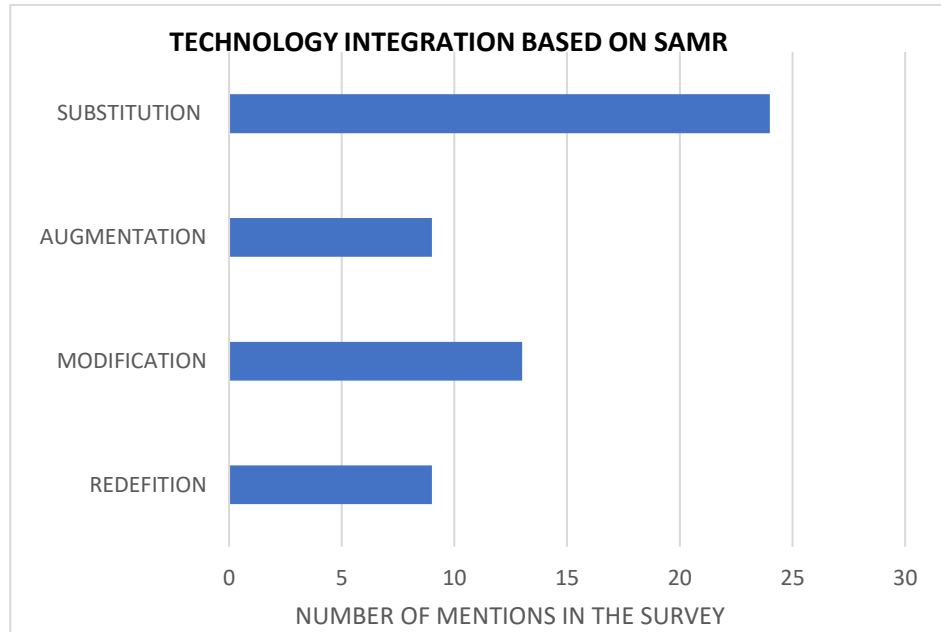
Table 1. Categories Derived from 3 Layers of Coding

| Themes | Categories |
|--|---|
| <i>Range of digital tools</i> | App, Communication tool, Device, Hardware, LMS, Media channel, Search engine, Software, Video hub, and Website |
| <i>Use of digital tools</i> | SAMR MODEL Substitution Augmentation Modification Redefinition |
| <i>Levels of satisfaction of digital Integration</i> | Unsatisfactory Acceptable Satisfactory Projecting future use |
| <i>Reflection on meanings of experiences</i> | Asserting acceptance and openness Expressing impacts Positioning technology Reflecting critically Reflecting uncritically |

The list in Table 1 ranges from apps, websites, platforms, Learning Management Systems (LMS), and pedagogical aids available to them. The researchers then employed the SAMR Model to categorize levels of digital integration. In general, Substitution and Augmentation, (enhancement levels) make up almost two-thirds of all the mentions. The third in the analysis is the participants' reported satisfaction levels which can illustrate their confidence in using the tools and possible awareness for further development. The last part of the analysis is their reflections of learning experiences on becoming teachers with regards to digital integration.

Levels of Technology Integration

Figure 1 Pre-service teachers' digital integration based on SAMR



From Figure 1, we can see that *substitution* was the most frequent level in the data. Thirty-four pre-service teachers reported extensive use of digital tools without changing the format of the function. These purposes and functions are what the researchers normally find with traditional tools such as the display and visualization of handouts and pictures. For example, participant 8 used the word “look” which implied the replacement of a handout with its digital format where s/he said “*I use document reader to look at pictures, etc.*” Similarly, participant 40 noted s/he uses digital resources to help pupils view input rather than engage in the input and actively work on it. S/he said: “*Smart Board is used to view videos and presentations*”.

Nine pre-service teachers expressed relatively frequent digital integration which could be categorized as a level of *augmentation*. This includes employing tools with additional functions which allow some manipulation, such as using a pdf file with a hyperlink where it can be elaborated on. These functions are not possible in a traditional classroom without digital integration. Participant 22 wrote “*Activities on the web and some activities on their OneNote, which they just fill in*” which implies the use of OneNote to activate their pupils to engage in the online activity. Participant 9, on the other hand, reports “*I use digital textbooks to present input in more accessible and varied ways*”.

Thirteen pre-service teachers mentioned the use of digital tools where they created additional features to the digital features. These tools are recognized in this study as ones that allow pupils to have control over the learning activities in pupil collaboration, peer support,

and feedback. There is a certain extent of teachers' manipulation of the process, i.e. *modification*, such as employing some additional features in YouTube. Participant 32 described a video activity where pupils engage and says: *"I create a video and integrate some questions before I email it to other practice teachers for their pupils to watch."* Similarly, Participant 11 integrated mobile phones to engage pupils more in competitive games and activities. S/he said: *"Something else to mention is a mobile phone in connection with teaching. Personally, I see mobile phones as very helpful when used to make arrangements easier, such as a quiz on Kahoot"*.

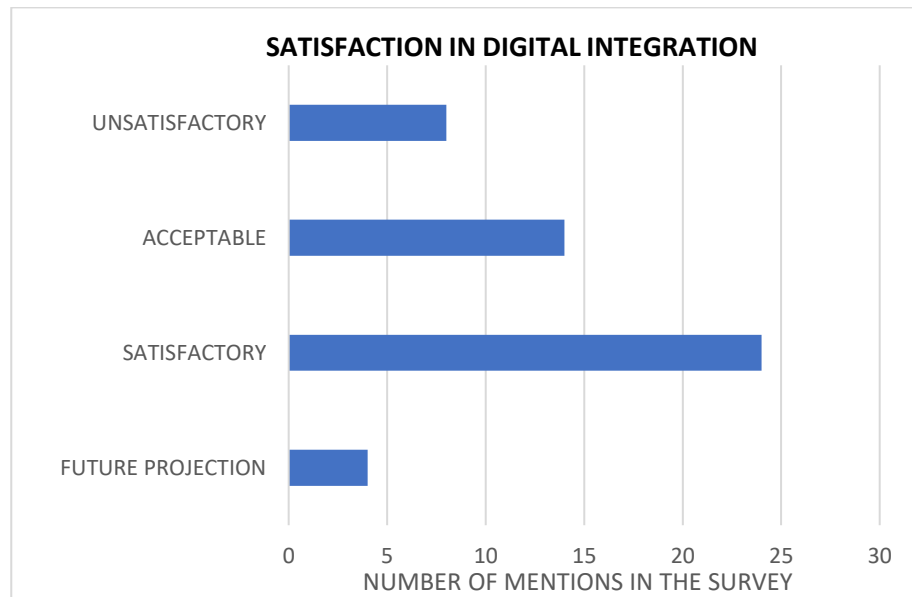
Nine pre-service teachers described activities that imply technology integration at this level entailing role change and responsibility shift. Students transform from users to creators where they become more like the producers of their work and their learning, i.e., *redefinition*. Participant 27 highlighted this aspect clearly by saying *"We encourage the pupils to research subjects online"*. Similarly, Participant 10 also stressed the importance of their pupils' active engagement of technology integration where s/he says, *"The pupils do research on their laptops, and phones can be used in outdoor activities."*

Having identified the levels of integration based on the SAMR model, the researchers now categorize the level of their satisfaction with these activities the pre-service teachers described. As Figure 1 shows, most of the activities were grouped under the level of substitution and Figure 2 shows the more satisfactory and acceptable levels of technology integration, which allows us to argue that even a low level of technology use is seen as satisfactory and acceptable by the participating teachers.

Satisfaction Levels

From Figure 2, we can see that almost half of the participants mentioned they were satisfied with their practice of digital integration.

Figure 2. Pre-service teachers' levels of satisfaction in digital integration



The high satisfaction level implies the participants were content with their digital integration at the basic levels of Enhancement. Participant 39 said, *“I use all digital aids available. It is very easy for us student teachers, but also for the pupils (who have their own student PC).”* (Participant 39). Participant 4 reported, *“Think they are used well when needed and not overused.”* Some participants thought their use of digital tools was acceptable as Participant 37 and Participant 14 mentioned, respectively, *“It was okay, it wasn’t anything ground-breaking.”* and *“A little of the time, about 50%.”*

A small number of participants said they were unsatisfied. This suggests that these pre-service teachers were aware of their limited use of the digital tools available to them. Participant 2 commented, *“Should have had more knowledge of this, feel that pupils can do more than me.”* Similarly, Participant 17 voiced his/her apprehension, *“Very insecure, that is, sometimes I am better than other times.”* The limited number of mentions referred to future use shows the researchers that there was little consideration of future practices concerning learning about pedagogical digitalization. Participant 8 said, *“Can certainly use it even more and get better at using digital tools in teaching.”* Participant 28 saw his/her potential in becoming more comfortable with digital integration, *“I think I can get better at letting pupils learn good computer use and the use of digital tools.”*

Research Question 2: How did the pre-service teachers learn, develop and experience digital integration in their professional environment?

To address the second research question, the researchers used the last set of the survey's reflection responses from the pre-service teachers about their digital experiences in both their practicum and their practice. To the question about how they were influenced by digital experiences over time, such as from their formal training, informal training, or actual use, the pre-service teachers reported an array of opinions. The researchers shall present this part of the findings in the following ranges of dispositional reflections.

The first categorisation is based on how the pre-service teachers reported their evaluation of the technology integration experience during their practicum. Participant 4 noted "*The school day is becoming more and more characterized by digital aids, but as long as they are used with care, it is a nice tool*", which implies an openness to digital use and integration in teaching. Participant 4 shows a favourable attitude towards the use of digital tools in the classroom. On the other hand, Participant 12 expressed cautious acceptance for digital tools in the classroom by saying "*I'd let myself be influenced by digital tools to a small extent*". Participant 12 showed a strong dispositional cautiousness regardless of what digital experience they might have. Similarly, participant 1 also expressed an open stance towards using digital resources by saying: "*You are always inspired to do new things, both digitally and analogously. Where and what the inspiration comes from is a little to and from.*" This displays participant 12's positive attitude to their practice both with and without technology use. From these three pre-service teachers, there were varying levels of acceptance and openness to digital integration.

The participants reported differing opinions on the impact of their use of technological tools in class. Participant 23 positively evaluated their digital integration and sees technological resources as a benefit, saying: "*It makes the work easier and a time one can create better arrangements that help pupils reach their level.*" Participant 44, on the other hand, expresses that digital integration in the classroom has negative aspects, noting that, "*Less contact with the teacher, peers, writes more on pc and sits more with screen and not books and people I feel that most of the pupils often do other things than only the activities we ask them to do.*" Both of these pre-service teachers related their perceptions to their responsibilities of classroom arrangements. On the contrary, participant 5 reported no disposition towards aspects of technology use and their teaching practice where s/he says: "*I feel that I am not affected to such a large extent by the digital tools in practice.*"

This categorisation outlines the participants' considerations of what should be prioritised in their teaching practice. From the following excerpts, the researchers can see that Participant 9 is motivated to use technological resources in their classroom because of their pragmatic personal technology use. S/he said "*I use digital tools in my everyday life and that makes it more natural to use them while teaching.*" Participant 52, on the other hand, did not appear keen to adopt technology and thought digital materials may not suffice in certain disciplines by saying: "*Little to no focus on digital tools depending on the subject.*"

Some participants reflected critically that experiences with technology use in practicum are a learning process. Participant 16 showed their state of readiness and ability to use technology in the classroom, saying “*Long time use and fascination of digital technology has given me many competences in its use.*” Interestingly, Participant 11 reported the need to seek out more knowledge of technology use in the classroom despite the help they had received during the practicum by noting: “*I have received some tips from certain subjects at school, but I would like to like more information and tips regarding digital resources.*”

Out of 52 participants, 11 reported no reflections on their experience and learning about digital integration during practicum. These pre-service teachers described uncertainty and/or lack of knowledge about digital integration by either responding as ‘Unsure’ (e.g., Participant 22) or ‘I don’t know’ (e.g., Participant 36). This lack of reflections likely stems from little exposure to digital practice or lack of awareness of the link between what they had learned regarding digital integration in the classroom and how they could make use of it during the practicum. For these pre-service teachers, there is a gap between understanding of digital teaching practices and therefore their growth towards becoming professional teachers who will be competent in online classrooms or settings. Many pre-service teachers know how to use digital resources and tools. However, their self-reflections on their abilities, skills, and competence during practicum are contradictory to the knowledge of digital tools they possess. The perceptions will help the researchers discuss these pre-service teachers’ dispositional identities about their attitudes towards digital integration during teaching practicum.

Discussion

To understand the depth and breadth of technology integration in the pre-service teachers’ practicum, the researchers shall summarise and discuss the pre-service teachers’ reported knowledge, experience, and reflections in light of sociocultural perspectives of learning where interaction stimulates problem-solving skills and is the basis of teacher development and learning. Guided learning is needed for pre-service teachers to go beyond their current levels of knowledge, skills, and competence.

Pre-service teachers’ levels of digital integration and satisfaction illustrate that they were aware of their rudimentary use of digital instruction. A study presenting case studies from China and Norway (Hoel et al., 2020) suggests that teachers’ digital preparedness will result from improving a country’s economy. The claim is debatable. Though instructional technologies are available in a well-resourced country like Norway, not every pre-service teacher is prepared to use them in their teaching practicum. The researchers in this study argue that, in Norway, pre-service teachers’ digital literacy should be continuously developed because the current challenges of COVID 19 have shown its critical significance for

pedagogy. Pre-service teachers can improve and develop as technology users as articulated by some pre-service teachers in this study.

This study's findings illustrated that some pre-service teachers were reluctant to integrate digital tools during practicum and found it difficult to make full use of the digital tools. The researchers propose a process of acknowledging the use of digital technology both for pre-service teachers and pupils as suggested by Gran et al. (2019) wherein digital competencies are two-way interactions and pre-service teachers are allowed to work with pupils to develop digital tools appropriate for digital classrooms and online learning environments. Pre-service teachers who are reluctant adopters of technology in the classroom can increase their digital skills and knowledge by incorporating simple digital tasks or skills in their classrooms initially. Ongoing digital integration training, which should be an integral part of degree courses and, therefore, can start as early as when these pre-service teachers get admitted into the teacher education programs, will ensure pre-service teachers have time to implement, evaluate and reconsider their professional dispositions in the evolving world of digital instruction.

From the responses in this study, the researchers can identify the pre-service teachers' self-reported competence levels in using digital tools. There is a possible relationship between the level of digital tool complexity and the pre-service teachers' digital competence levels. For example, a pre-service teacher's successful classroom integration of a complex digital tool might stem from their high confidence and competence with digital tools, both within and outside the classroom. A low level of competence, on the other hand, might be because a pre-service teacher's knowledge of technological tools was rudimentary. The researchers support Instefjord and Munthe (2017) in that digital competence must be made explicit and aligned with the digital literacy principle as learning outcomes for students. In addition, this digital competence must be made explicit for pre-service teachers in Norway. National educational standards can also emphasize pre-service teachers' ICT competence and integration of digital learning into physical and online classrooms. The researchers put a particular emphasis on the meaningful practice of national guidelines. A comparative study illustrates that Norwegian teachers' lack of motivation was responsible for the lower application of digital integration in teaching (Madsen, 2020). This suggests that, when educational curricula that include aspects of digital literacy and technology use in the classroom are given to teachers, the teachers do not practice digital integration. Pre-service teachers are encouraged to evaluate their knowledge and use of new technologies and appropriate types of digital classroom technology to engage pupils and improve their professional competence. Since the start of the pandemic, pedagogical technology has played an essential role in providing students with a new learning platform and teachers with new roles. Pre-service teachers are no exception. Pre-service teachers in Norway should be encouraged to be aware that, through their competence in pedagogical digitalization, they will become facilitators who guide and provide students with a true agency. Pre-service

teachers can achieve this by immersing themselves in new digital learning experiences and developing new digital skills, thereby upgrading their digital practices from SAMR's level of Enhancement to the higher level of Transformation.

Conclusion and Pedagogical Implications

This section provides some pedagogical implications for pre-service teacher education programmes in Norway about digital pedagogy skills. The National Council for Teacher Education (NRLU), a government section that has had the responsibility for planning, developing, and revising national guidelines for teacher education programmes in Norway, highlights the importance of digital pedagogy skills and requires that teacher training institutions include digital skills in all subject area programmes to align with the European Framework for the Digital Competence of Educators. In addition, NRLU expects the teaching practicum to include the teaching and use of digital resources, aiming ultimately to develop school students' digital competence. This current study reveals how such goals have been approached during pre-service teachers' teaching practicum. As seen from the data, most participants in this study possess relatively basic digital pedagogy skills. These skills can be characterized either as website browsing (e.g., YouTube or NRK news website), information searching (e.g., use of search engines), or software or hardware handling (e.g., use of PowerPoint or tablets). Beyond knowing and using digital tools in teaching, the digital skill must also include using the technologies to change the experience of education (Croxall & Koh, 2013). These relatively basic digital pedagogy skills found in our findings are not sophisticated in terms of domains, requirements, and educational outcomes.

The SAMR framework helps researchers see the actual digital skill level of participants, such as pre-service teachers, concerning pedagogical purposes. Responding to the questionnaire, these pre-service teachers reflected on their digital competence versus digital pedagogical competence critically. An analysis of their responses helped the researchers see the disparity between these two types of competence where the latter, though it can be built on the former, is deemed more directly beneficial to the teaching context. These pre-service teachers, though considered digitally native or digitally literate, possess a level of digital competence that may not be fully pedagogically applicable. As a result, during their initial teacher education, pre-service teachers need to be equipped with the pedagogical aspects of digital tools. This is reflected in the Professional Digital Competence Framework for Teachers (Kelentrić et al., 2017), which expects the future teachers of Norway to be able to make use of digital tools successfully to engage the pupils either individually or collectively, both cognitively and socially, in the process of their learning.

Although the Professional Digital Competence Framework expects pre-service teachers to be well-equipped with professional digital competence, digital skills that are needed for pedagogical purposes are, at best, a marginal component of five-year teacher education

programmes in Norway. In other countries, pre-service teachers take several courses related to educational technology (other names include instructional media, e-learning, designing technology-rich curricula, blended learning environments, or multimedia-aided teaching and learning) as required for their degrees. For teacher education programmes in Norway to meet the standard in today's technology-facilitated fast-changing world, educational technology should receive more attention and be inseparable from study plans and programmes regardless of the subject areas on which one wants to focus. While technology courses as such can serve such a purpose, these courses can be customized to pre-service teachers' specific subjects or majors, e.g., *technology-enhanced language learning* for English-teaching major students, *digital technologies in mathematics education* for mathematics education students, or *social science education in the digital age* for social science education students, etc.

Current university courses in learning theories can be updated and linked closely to issues and trends in educational technology research, while the applications of digital and internet technology in classroom settings should be part of pre-service teachers' ongoing evaluation. It is undeniable that competent pre-service teachers not only possess the appropriate subject knowledge for their teaching practicum classrooms but also provide environments in which teaching and learning can take place, whether traditionally or electronically mediated.

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