



Student teachers and their attitudes towards ICT: Lessons learned from three different countries

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Abstract

This paper explores the attitudes that student teachers in Malta, Norway, and Spain convey to digital technologies in formal educational settings as they start the 1st semester. A number of studies look at educational inclinations and employment of digital technologies (Granić & Marangunić, 2019; Ritter, 2017; Scherer & Teo, 2019). We have chosen to examine student teachers' attitudes towards the professional use of digital technologies within a pedagogical framework. In this respect, a comparative qualitative analysis of one open-ended question that forms part of a more extensive questionnaire distributed to all participants is considered. The employed analytical lens subsequently centres on four concepts: 'adaptability', 'creativity', 'critical thinking', and 'understanding of technology'. In this regard, our findings support arguments for asserting 'attitude' as a kind of teacher-specific digital competence for guiding their practice. We conclude by suggesting our analytical framework as a potential point of initiation for further development to understand attitudes as forming part of teachers' specific digital competencies within teacher education and professional practice.

Keywords: attitudes, initial teacher education, professional digital competence, student teachers, technology integration

Introduction

Digital society has been described as a distinctive social formation based on technology and innovation, and is characterised by globalisation, new socio-cultural patterns, and rapid change. For educational institutions, technological development represents challenges in new and

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changing competence requirements. Also, as technology contributes to the development of forms of learning, it consistently challenges the dominant understanding of education, learning, and competence. Based on these beliefs, teachers' competencies in using and facilitating teaching with digital technologies have been a topic of public discourse and a field of research for more than two decades. Ever since Mishra and Koehler (2006) introduced their technological pedagogical content knowledge (TPCK) model, there has been a general consensus that professional teachers need relevant technical competencies and pedagogical and content knowledge to guide their practice. Professional teacher knowledge and competencies in dealing with ethical issues that arise with the presence and use of complex digital technologies have been increasingly emphasised as an issue for attention.

While acknowledging teachers' needs for digital pedagogical, technical, and ethical knowledge and competencies, our claim is that teachers' professional attitudes towards the use of digital technologies is an issue that needs careful attention. It is not only an important aspect to how they assess the relevance of digital technologies in their teaching practices, but it also brings into focus their willingness to explore and experiment with new and emerging technologies to critically evaluate the digital practices they employ. The latter is of equal importance (if not greater) when looking at student teachers and teacher education. Not only because the pre-service period constitutes the domain for the formation of teacher-specific professionalism in general, but also because through their future professional life, they will be exposed and introduced to technologies and learning platforms that are currently unknown.

Therefore, this paper addresses the emerging attitudes that our chosen cohort had towards digital technologies in formal educational settings. Rather than entering into this study with predetermined ideas, we conducted it with an open mind. We were ready to accept and let attitudes shape the analytical framework that led us to our research questions, namely: What characterises student teachers' attitudes towards digital technology, and what do student teachers report about issues related to creativity, critical thinking, adaptability and, understanding of digital technologies? We start with a presentation and discussion about relevant research concerning student teachers' attitudes towards the use of ICT to establish an overview of the present research. Thereafter, we describe our methodological approach before presenting and discussing our findings.

Perspectives and relevant research

The abundance of peer-reviewed literature and empirical data directed to establish better teacher relations with technology integration in formal educational settings is evidence of the strong commitment to integrating technology in teaching and learning (Granić & Marangunić, 2019; Ritter, 2017; Scherer et al., 2018). Scherer and Teo (2019) expressed that the relationship between technology and ensuing teacher use is a complex process. It is consistently being influenced of several processes that go beyond the schools' working conditions to include contextualised beliefs by the teachers themselves and eventually manifested digital competencies. Yet when it comes to defining users' motivations, it is important to distinguish between the identification and mapping of displayed attitudes and their causality. In our case, this paper is directed towards mapping self-beliefs in initial teacher education (ITE) programmes. Specifically, we will be looking at and cataloguing attitudes that student teachers

in Malta, Norway, and Spain embrace and exhibit as part of their manifested attitudes towards digital technology in formal educational contexts.

This study was initiated by searching through peer-reviewed publications that looked into student teachers' attitudes towards using digital technologies for teaching and learning. The employment of Google Scholar, Web of Science, Mendeley group database, and open search rendered hundreds of results. Search criteria were narrowed down by combining keywords like attitudes with student teachers and pre-service teachers (years 2005 – 2020). This rendered a total of 37 articles about attitudes towards digital technologies for teaching and learning. After reading their full text, the articles were then categorised according to relevance. Papers that did not explicitly address attitudes and student teachers were categorized as not relevant. Papers addressing student teachers and perceived ease of use and perceived usefulness were categorised as of some relevance. Papers addressing attitudes and student teachers were categorised as very relevant. Thirteen (13) articles were categorised as only slightly relevant and therefore removed from the review. We ended with 24 relevant articles that addressed student teachers' attitudes to technology for teaching and learning.

Apart from two papers based on systematic literature reviews, all papers included a quantitative research component. Ultimately, the relevant papers were classified within two broad categories. It is worth noting that with the observed overlap between categories and nuances within each category, papers were not exclusive of each other but were demonstrated to be useful in directing research. Thus:

- Five (5) papers were classified under **knowledge** and directed to enhance the knowledge base on digitally mediated attitudes within ITE programmes.
- Nineteen (19) papers included **use** or **employment** of digital technologies for student teachers.

Knowledge

In a systematic literature review, Starkey (2020) identified three types of competencies. These included generic digital competence, digital teaching competence, and an emerging concept of professional digital competence. Starkey (2020) believed that this would underpin future research on teacher digital competencies. Likewise, Cochran Smith et al. (2015) identified blind spots within teacher education research literature and suggested new directions for research.

Using quantitative methods, Lambert and Gong (2010) focused on 21st-century skills with 100 student teachers. They observed how students' computer attitudes, skills, and self-efficacy before and after instruction improved their aptitudes for technology integration in formal educational contexts. Lee and Lee (2014) reported similar results at a teacher education university in South Korea. In addition, they reported positive direct correlations between student teachers' attitudes to computer self-efficacy beliefs and technology integration in school.

McGarr and McDonagh (2020) considered knowledge as crucial for understanding student teachers' attitudes towards digital technologies. They emphasised that student teachers reported positive views of digital technology use in education. They also argued that students

could be complying with the dominant techno-positive discourses globally concerning digital technology use in schools and parroting such positivity to fit in. However, it could also be that this reflects student teachers' genuine belief and commitment to digital technologies in teaching.

Use or Employment

All studies presented in this section are quantitative. They are directed to investigate student teachers' attitudes towards digital technology. Yet, as will be portrayed, they also present their own nuances. The most prevalent approach employed was the technology acceptance model (TAM). Teo et al. (2008) employed TAM in themes such as perceived usefulness, computer confidence, training, and knowledge about computers. Data collection took place within a Singaporean context. Outcomes from a questionnaire to 239 student teachers indicated perceived usefulness, perceived control, and behavioural intention attitudes as significant determinants of student teachers' computer attitudes. The similar employment of TAM with 380 student teachers in Ghana by Gyamfi (2017) showed that student teachers' attitudes towards ICT usage was a key determinant of technology acceptance and the integration of digital technology in education systems. Organising relevant ICT training programmes to enhance the student teachers' skills to use ICT with ease and knowing the benefits of using ICT could help the student teachers develop positive attitudes and pedagogical purposes for using digital technology in their future classrooms. The same was observed in a study conducted within the Turkish context (Baturay et al., 2017). Comparing the relationship among 476 student teachers' computer competences, attitudes towards computer-assisted education, and intention of technology acceptance supported the idea that more practice would lead to enhanced computer competence and use.

Teo et al. (2016) employed TAM to survey perceived usefulness, perceived ease of use, attitudes towards computer use, subjective norms, facilitating conditions, technological complexity, and demographics questions. Perceived ease of use was highlighted as a significant predictor of attitudes towards computer use among student teachers. Awofala et al. (2019) observed a direct correlation between the boxed or hidden attitudinal motivations and the apparent outcomes. Essentially, their research with 2,100 student teachers showed that perceived self-efficacy and developed attitudes around self-beliefs of competence directly correlated to effective computer use. Our review also showed that several other publications addressed attitudes without using TAM. Besides TAM, digitally mediated attitudes were also framed within the TPCK model by Scherer et al. (2018). Their study was conducted with 688 Norwegian student teachers. They highlight that student teachers exhibited positive attitudes towards technology across all three core dimensions, including ICT and educational ICT attitudes and ease of use. More educational attitudes were related to the pedagogical content of TPCK. In contrast, technological attitudes showed a stronger relationship to technical knowledge (TK).

Farjon et al. (2019) investigated whether newly educated Dutch teachers were being prepared to integrate digital technologies. The attitudes and beliefs towards technology were measured by three different instruments: teachers' attitudes towards computers (TAC), the attitude towards computers in education (ACE), and the attitude towards the integration of ICT

(ATI). Again, their findings showed that a positive experience helped student teachers develop positive attitudes and skills towards technology use.

One of the earliest studies we considered on attitudes within ITE groups was that conducted by Mcalister et al. (2005) with 259 undergraduate student teachers in Northern Ireland. Results showed that student teachers' attitudes towards computers differed between using computers as a tool for teaching and as college support. Likewise, it was observed later by Baturay et al. (2017) that positive attitudes towards using computers to teach mathematics and support in ICT required schools to explore better ways to encourage computer use. Similarly, with 55 South Korean student teachers, Han et al. (2017) observed how lack of preparation of students' digital skills was attributed to university-level teacher education programmes being more directed to teach basic computer skills than technology integration lacked content-area relevance. In a study conducted with 247 Swedish student teachers, Karlsudd (2018) categorised future teachers' acceptance of digital tools into three groups: those with positive attitudes towards instruction and use, those who were hesitant towards the use, and those who were openly negative towards using ICT in school.

Student teachers' attitudes towards digital technology have also been framed around exclusion. Beacham and McIntosh (2014) discussed the interrelationship between education and social exclusion and between digital and social exclusion. The study investigated Scottish student teachers' attitudes towards using ICT for equality in inclusive education and practice. Results indicated that student teachers with the greatest experience of disability and diversity were more inclined to reflect on attitudes towards inclusive education and practice. Experiences, however, were not reflected in their attitudes towards using ICT as part of inclusion.

By focusing on Korean and Singaporean student teachers' attitudes around the concept of digital natives or the 'Net Generation', So et al. (2012) concluded that the Net Generation profile presents a more heterogeneous composition than expected. They expressed cautiousness in making generational assumptions on how the new generation experiences technology. ICT experiences appeared to be somewhat related to student teachers' computer efficacy and computer use in education, but not with personal use.

The review shows that various frameworks such as TAM, TPACK and TAC are used in combination with student teachers' attitudes. Admittedly it is difficult to select one framework that can cover attitudes across all the reviewed publications. We, therefore, decided not to go into any of these frameworks explicitly but as expressed further, leaving our options open to suggestive traits. However, this literature review provides a clear link between teachers' attitudes, digital competencies, and how they are exhibited within formal educational contexts. Observed attitudes were also dependent on the geographical location of the studies, making this study more intriguing for investigation.

Method

In autumn 2019, a questionnaire was distributed to first-year student teachers at the University of Malta, University of Valencia (Spain), University of Limerick (Ireland), and both the University of Oslo and Oslo Metropolitan University (Norway). In this context, it is important to stress that we were dealing with a group of student teachers that had no classroom teaching

experience, neither from placement nor as professionals. The questionnaire included 76 questions in total, with two questions presented as open-ended to the students. The researchers developed the questionnaire in English and thereafter translated into Spanish and Norwegian before distribution to those students. The analysis that follows, however, examines data from Malta, Norway, and Spain.

The unit for analysis is the open-ended statement ‘ICT enhances and/or distracts pupils from learning’ Subsequently, it was formulated as a statement and the students were asked to reflect on. The question (variable) belongs thematically to the attitude dimension within the PEAT model (Authors, 2021). The total number of respondents in this study was 148 Maltese student teachers, 622 Spanish student teachers, and 563 Norwegian student teachers (200 and 363 from the two universities). The questionnaire received a response rate above 80%.

Analytical strategy

Using the CAQDAS software HyperResearch, we developed joint codes in English that were used to code all 1241 text answers. Our approach to the data was retroductive to achieve an interplay between our analytical framework and images constructed from our data. We started our analysis by creating codes taken from the operationalisation of the attitude dimension in the PEAT model (McDonagh., et al, 2021). This paper addresses four (codes) concepts: 1) adaptability, 2) creativity, 3) critical thinking, and 4) understanding of technology. These are preliminary assumptions that we will scrutinise through the analyses.

Taking a top-down approach, we started with queries to identify instances and expressions that could be categorised within the above-mentioned analytical framework. Some expressions were rather easy to identify, such as different occurrences and synonyms for adaptation, creativity, source criticism (within critical thinking) and efficiency (within understanding of technology). Other kinds of expressions and responses demanded a more interpretive strategy to be identified as belonging to one of the four codes in our analytical framework. For example, we discovered that many students used phrases like ‘easy’ and ‘important’ as an expression of how they understood technology with regards to a teaching and learning situation. In this case, they related phrases like ‘future work’ and ‘schoolwork’ to ‘adaptability’.

At this point it is important to accentuate that identifying these different phrases and choice of words for expressions was deeply embedded in the cultural-linguistic context that each member represented. It was also part of a process where, when contextualised within a specific member’s mother tongue and due to language barriers, the researchers depended on that particular member’s judgement. For instance, the Spanish team had no prerequisites to understand answers written in Norwegian, and vice versa. The same can be said when it came to identifying and analysing nascent traits. Again, the research team members were totally dependent on blindly trusting each other’s identifications made across languages, which made our research and comparison between Maltese, Norwegian and Spanish student teachers possible. When looking at the data source, 47% of the answers are written in Spanish, 42% are written in Norwegian, and only 11% are written in English. This happened as the Maltese student teachers were the only group that had English as a native language. Therefore, to ensure a reliable analysis, several online discussions were held between the authors involved.

Ultimately, after several re-code exercises, this led to an intersubjective understanding and thereby secured the reliability of the shared code meanings for all three countries.

Having identified and categorised expressions used, we turned to an inductive approach to construct images of what had been identified and coded, expressed as positive, negative, or neutral. Each code was then recoded with a plus sign (+) for a positive attitude or a minus (-) representing a negative attitude. Ambivalent answers that represented both positive and negative were coded as neutral. The purpose of categorising the codes as either positive, negative, or neutral went beyond identifying the valence of the nascent attitudes. As a matter of fact, for each code connected to specific phrases, we wanted to establish a framework directed to looking closely at the student's responses regarding the statement: 'ICT enhances and/or distracts pupils from learning'.

Results and Discussion

There were different lengths of answers to the open-ended statement 'ICT enhances and/or distracts pupils from learning'. In the Maltese sample, 142 out of 149 student teachers responded to this question with an average of 27 words per answer. The length of answers varied from 1 to 364 words. In the Norwegian sample, 518 out of 561 student teachers responded (average of 28.1 words per answer). The length of answers varied from 1 to 170 words. In the Spanish sample, 581 out of 622 student teachers responded to this question (average of 24.5 words per answer). The length varied from 1 to 120 words.

Responses were coded once for each student teacher, even if words were repeated. Our coding of answers showed that the majority of student teachers repeated the terms strengthen (N=295) and enhance (N=324), or a combination of both terms. Thus, an important premise for approaching the qualitative data was also to exclude those answers that were either too short and vague for interpretation or were just confirmation or denials of the statement.

Adaptability

Issues regarding adaptability from our top-down approach were sorted around the concepts 'adapt' and 'competence'. In the sorting and interpretation process, the concepts 'schoolwork' and 'society' emerged as something the students connected to issues about adaptability.

The Norwegian student teachers mostly framed their answers within concepts like 'competencies', importance for 'schoolwork', and importance for 'society', as well as explicitly addressing 'adaptability' as either a positive or negative factor for pupils' learning outcomes. With regard to 'competence', the Norwegian students stressed the necessity for professional teachers to have digital competence. However, it is important to be aware that the Norwegian educational context is largely shaped by public discourses around the importance of digital competence and having it explicitly defined in curriculums from kindergarten to teacher education. Nevertheless, their answers were balanced, where most emphasised the need for professional teachers as the most crucial factor for facilitating learning processes. The same balance was noted in answers regarding 'schoolwork'. On the negative side, the student teachers expressed concern about ICT's potential for disrupting pupils' learning. On the positive side, they highlighted the importance of learning about pupils' digital skills to prepare

them for the future digital society. For the category ‘society’, a link was observed between technology and participation in future society. Overall, we observed how the respondents highlighted this issue as important for preparing pupils for the future labour market.

The educational validity for ‘adaptability’ prompted balanced responses from most Maltese student teachers. The most commonly expressed position was that ICT could enhance but also distract students from learning. When adaptability was neutrally insinuated, reasons for and against were provided in the context of how ICT can be helpful if controlled, such as the ‘broader access of knowledge’ and unhelpful as a source of negative time management. For the more positive interpretation of ‘adaptability’, the most common quality was if the teachers themselves facilitated learning. Thus, the maturity and pedagogical insights that teachers had were seen to go hand in hand with the digital technologies' positive qualities. For those who reported ICT as having exclusively negative qualities, ICT equated to social media, playing, and lack of focus.

In the Maltese data, ‘adaptability’ as ‘competency’ came up twice. It was positive where the respondent in question compared ICT competencies to success on individual and socioeconomic levels. A more cautious correlation reflected on how competencies were facilitated to lead to constructive outcomes. Adaptability was perceived as instrumental in educational outcomes in schools and in the formation of future workers in an ICT-imbued society. For ‘schools’ and related work, replies were spread out. Again, those with a positive outlook linked ICT to learning enhancement, future employment opportunities, and integration with work itself. Those who expressed a more balanced interpretation attributed ICT with opportunity but also to distraction and waste of time. The only negative comment focused on disruption. The respondent pointed out how ICT can potentially distract the students from their work and studies to become a waste of time.

For ‘adaptability’, in the case of Spanish students, they emphasised the importance of competencies associated with the practice of digital resources and applications. In this case, Spanish students, strongly influenced by the competency-based educational model derived from Spanish policies, linked information and communication technologies with them. This competence was associated with performing schoolwork. The teacher seemed less relevant as they emphasised technology as instrumental tools. Spanish students believed that the advantages of using ICT for homework outweighed the disadvantages of possible distraction or misuse.

Spanish students did express concerns regarding technology failure and how this might lead to a loss of unsaved work. With the Norwegian student teachers, regarding the term ‘society’, there was a link between technology and participation in future society. They also highlighted this issue as important for students to be prepared for the future labour market.

Comparing the Maltese, Norwegian, and Spanish groups, their responses differed in their emphasis. While a balanced view characterised the Norwegian students’ responses regarding ‘schoolwork’ (both positive and negative), they expressed a positive attitude towards ICT when it came to pupils’ competency development and importance for society. The Maltese students expressed a very positive view regarding using digital technologies for teaching. The Spanish students positively emphasised competencies development as important for a future society.

Creativity

Creativity was framed around the concepts of ‘create’, ‘idea/belief’, and ‘promote’. As explained in the methodology section, we approached the data with the analytical strategy to search for words and expressions that could be linked to issues around creativity. In the Norwegian data, none of our respondents mentioned creativity explicitly. But when we shifted to a more inductive strategy, we found that many of the student teachers used the term ‘create’ to imply using ICT creatively to enhance learning.

In the Norwegian data, issues around ‘create’ were framed positively, highlighting the potential for ICT to promote variation in learning processes, deepen or support pupils’ understanding, and support pupils’ creative development. In the Norwegian data, there were no responses that could be directly linked to the concepts of ‘idea/belief’. This might be more a question of language rather than context, and the student teachers’ opinions around such issues were implicitly covered in other concepts. For the concept ‘promote’, which linguistically could be a synonym for ‘enhance’, the student teachers used that term in relation to promote learning and pedagogical development and increase pupils’ motivation. However, there were no indications to interpret the Norwegian cohort’s use of the term ‘promote’ to imply ‘creativity’. That being said, it is important to remember the point of departure for this comparative analysis. At the beginning, we were facing large amounts of data representing answers from 1241 student teachers distributed over three different countries. Being independent of expectations, our analytical strategy was developed to adapt accordingly to what we would find. That neither ‘idea/belief’ or ‘promote’ was present in the Norwegian data could therefore be explained both as a linguistic and a contextual social issue.

For the Maltese student teachers, ‘creativity’ in all its variations was encountered only once. It pointed directly towards the beneficial employment of digital applications to enhance productivity and research and instigate group work. The creative employment of ICT as perceived by the named cohort provoked interesting outcomes. For most, when taken in conjunction with a digitally mediated culture, the creative use of digital technology was taken as a plausible window of opportunity where, through the employment of specific productivity applications such as PowerPoint, Excel, and Word, students would not only learn ‘in’ but also learn ‘from’. On the other hand, it must not be ignored that the high frequency by which the use of Microsoft productivity tools was related to creativity may also be attributed to the fact that Windows-powered PCs are the prevalent machines in Malta. This is further augmented by the local government having a standing agreement with Microsoft for the official employment of company-related applications and platforms in schools.

Creativity in the use of digital technologies was understood to enhance learning experiences: ‘stimulating intellectual curiosity’. The creative qualities of employed digital tools were also described in terms of the accessibility that digital tools could afford for the creative employment of technology and media: ‘to widen the scope of knowledge.’ Yet this was not seen in isolation. Going beyond what ICT can provide, there were those who believed that this could not be appropriately performed unless students in schools were equipped with the right technology-enhanced skills, such as doing research and sifting through unwanted material. Therefore, creativity was also attributed to the enabling qualities of ICT that define the nature

of ICT itself. Overall, most believed that digital technology already enhances learning; however, its inherent qualities contributed to enhancing learning skills.

Spanish students linked creativity to the ability to create work in new computer media, which leads to a series of innate facilities for the transmission of information.

Technology, for Spanish students, had a positive, creative capacity that was reformed by the new media in the transmission of information. Many of the student teachers also emphasised the convenience of creativity to create information in a fast and dynamic way, which has an impact on this positive conception of technology. However, as in the Norwegian cohort, Spanish students did not link creativity to the ability to have new ideas, but rather to develop existing ones. Technologies were therefore not strongly linked to an idea of creativity, which, as in the Maltese case, was related to new learning environments and technology. As in the other contexts analysed, these learning environments have developed with the implementation of computers in the classroom, as seen in Spain from the 1990s onwards.

With regard to creativity, the Norwegian student teachers' responses were centred on the benefits of using ICT to promote variation and thereby enhance learning experiences. They also emphasised ICT's potential as a motivating factor as well as a catalyst for pedagogical development. The Maltese students mainly focused on the employment of digital applications, which allowed them to be more creative in their work. Likewise, the Spanish students interpreted creativity in terms of sharing and distribution of information.

Critical thinking

Critical thinking was classified through the concepts information, source criticism, and anxiety. While source criticism was a concept we selected and agreed upon to look for at the very start of our analysis, the concepts of information and anxiety appeared as important issues through bottom-up interaction with the data.

From the Norwegian data, the concept of source criticism was closely linked to information, but at the same time, it dealt with their attitudes regarding if and how such information should be managed critically, and how the quality of information should be evaluated. A total of 18 student teachers explicitly mentioned that applying source criticism can be a strength for pupils and provide opportunities to access credible information. For information, the picture was somewhat different. There were 52 student teachers reporting that ICT makes it easier for pupils to find, access, comprehend, and evaluate information. However, as a nuance of the positive connotations to information availability, 13 other student teachers reported that pupils could find unnecessary and irrelevant information, which causes them to lose track of their schoolwork. Regarding anxiety, there were not many occurrences in the Norwegian data besides a few student teachers pointing at negative consequences of failing to make use of proper pedagogical use of ICT in the classroom.

For information, 14 of the Maltese respondents perceived a direct and positive relationship between the use of digital technology and education. Twelve expressed a balanced outlook, while two took a negative stance. None of the respondents manifested or conveyed any sense of anxiety concerning themselves and/or their students using technology in class. On the contrary, all believed that it improved the way information could be accessed and portrayed through the applications themselves. This is interesting because in accessing, portraying, and

ultimately conveying information, the use of ICT was envisaged as an opportunity for fostering critical thinking. We believe that digital technology can aid students in becoming better decision-makers. Thus, as expressed by the participants, when students at school learn to objectively sift through information, they can also learn how to indicate what they need and eventually learn what to use and discard.

As in the case of the Norwegian cohort, information was closely linked to how ICT was cogitated to elicit critical thinking. As it happened, all 26 respondents manifested a certain sense of objective judgement. They agreed that ICT facilitated the access of information. However, all 26 contended that the process for access may be the same cause of student distraction while working on their ICT devices. Participants also recognised that this could potentially lead to a waste of time and decreased focus on the things that matter. Two conveyed a negative outlook, and they only focused on aspects of distraction that could be conveyed through ICT.

Most Spanish students (119) related ICT to the access of information. Only ten mentioned that information could be false. Therefore, the critical feeling or perception of technology was limited for most participants surveyed.

In contrast to the Norwegian students, many Spanish students reinforced the positive aspects of the information instead of the negative. Many Spanish students emphasised that the internet provided information that was useful for schoolwork regardless of its validity.

On critical thinking, the Norwegian cohort revealed positive attitudes and highlighted the positive aspects of access to information. However, a large amount of information and the possibility of losing focus were to a greater extent described as negative. Opportunities for source criticism were highlighted as a strength of ICT. Similarly, Maltese students envisaged ICT as a window of opportunity to access and share information. Yet while information was closely related to the enhancement of critical thinking and there was a positive inclination to ICT as a source of information, all agreed that students may also get distracted and waste time in the process of access.

Understanding of technology

We framed understanding of technology around the concepts of ‘easy’, ‘efficient’, ‘important’, ‘social media’, and ‘useful’. As with the previous aspects, understanding of technology was conceptualised through top-down and bottom-up processes. In preparing our analysis, we developed the concepts efficient and useful as terms we would likely find across Norway, Malta, and Spain. After looking more deeply into our source material across all countries, the concepts easy, important, and social media appeared as terms used and connected to and understanding of technology.

In the Norwegian data, there was a connection between easy and efficient, as some student teachers felt that ICT could make the learning process more easy and efficient. It seems that the inductive concept easy supports our pre-assumptions about efficient learning when using technology. The term efficient appeared to be connected with the term useful. The perception that ICT is useful, can contribute to efficiency. The term important seemed to build on a duality related to ICT and learning. Learning about ICT is important in itself, but it is also important for pupils because they can learn more effectively about other topics through ICT. Over 30

Norwegian student teachers mentioned that ICT in schools provided access to social media. When we take a closer look at how the student teachers described pupils' access to social media at school, they appeared to be concerned that social media could contribute to derailment and distraction.

For the Maltese cohort, easy had different connotations and did not align with efficiency. Easy and related words such as easily appeared 13 times. They appeared twice in positive comments, 11 times in neutral comments, and three times in negative comments. Out of these, the words easy or easily were contextualised nine times within a negative context, such as 'Using PowerPoint and programmes can easily distract kids from what is important' and 'Messages could constantly be coming in and it is easy to get distracted or scroll around on social media.' On the other hand, when referred to within a positive perspective, ICT was contextualised as enabling, thus students could 'visit websites or play games that can distract them, but on the other hand it can also help them to understand more easily.' The word efficient did not appear in their replies. Yet there were implications where ICT was envisaged as efficiently facilitating learning, especially when it comes to having readily available resources at hand. This prevailed in most comments except where negative implications pointed again to the fact that certain elements, mainly social media, could lead to distraction. Even when considering the importance and usefulness of technology to learn, none considered social media helpful, but all described it as a source of distraction.

Most Spanish students felt that ICT could be a distraction for learners in itself. This is in contradiction with other responses analysed that highlight the usefulness of technology for learning. Many Spanish students considered technology to be detrimental due to its high distraction component, but, on the other hand, they did not deny its usefulness when taking into account the previous elements analysed.

One of the terms most frequently emphasised by Spanish students was the concept of easy, which appeared in a positive context in most answers given. Very few responses were linked to the concept of not being efficient or easy. In this case, students positioned themselves as digital natives, where they did highlight the capacity of this technology to distract and falsify information present on the net.

Findings from the Maltese and Spanish groups identified that ICT could contribute to distractions. Emphasis was also placed on social media, which overall was seen as negative. In line with what the Norwegian group confirmed that the ease of technology employment did not help towards constructive productivity. This was also in line with findings where social media was seen as a source of distraction in the process of teaching and learning. Finally, the Norwegian student teachers expressed how a well-planned ICT program would be important for instruction and learning.

Conclusions and implications

This paper has examined student teachers' attitudes towards digital technology. Specifically, it has underlined how student teachers have related creativity, critical thinking, adaptability and understanding to digital technologies in formal educational settings. By comparing students' self-reported survey results from Malta, Norway, and Spain and employing an open-ended questionnaire, participants were able to express their beliefs on whether ICT can enhance or

distract pupils' learning. While still in the beginning of their professional development with little (if any) classroom experience, their reflections represented their attitudes towards the use of ICT to support teaching and learning activities in schools.

To our knowledge, and based on our literature review, the bulk of the research about student teacher and associated digital competencies has shown that the attitudinal element is not central. The studies about student teachers' attitudes we accessed in our literature review are mostly quantitative. There is, however, an interesting common feature to highlight. All previous studies presented show a clear link between student teacher attitudes and digital competencies and how it is understood within formal educational contexts. These studies also reported how attitudes had different cultural and contextual dependencies. However, the clear connection between attitudes and competencies that these previous studies exhibit, being the point of departure for this study, strengthens our argument that attitudes should be regarded as one aspect within the conceptualisation of a teacher-specific digital competence.

Our findings show some contextual differences between the three countries. But it is important to emphasise that the similarities between student teachers in Malta, Spain, and Norway are greater than the differences. An obvious reason for this similarity is that all three countries share a common European cultural and political context that implies similar organisational and structural educational systems. The differences we have presented and discussed could also be methodologically connected to at least two issues.

The first issue is about reliability and treating self-reported information as facts. There is no way we can know with certainty if their responses are attitudinal or normative oriented. They could be expressing their personal beliefs, popular opinion or what they think is expected of them. If 'digital competence' is a greater part of the Norwegian public educational discourse than in Malta or Spain, this could raise the question of whether the Norwegian students are somehow more exposed to the term and, therefore, more biased. The second methodological issue is connected to language and the nature of everyday natural talk, which makes such a comparison more difficult. Even though the same question was given to the three groups of students, they related their choice of words and phrasing to their situated linguistic, sociocultural context. Therefore, taking these issues into account, and within our analytical framework, there are some findings that we want to highlight.

Regarding adaptability, the Maltese students expressed a very positive view on using ICT for teaching and learning. The Spanish students highlighted digital technologies and digital competencies as important issues for the present and the future labour market. They therefore indicated they should be a part of everyday school practices. The Norwegian students also expressed a positive attitude regarding the importance and relevance for present and future society. The Norwegian and the Spanish students provided some critical reflective opinions regarding negative consequences of unguided and uncritical use of ICT in the classroom. There was quite a different categorisation of the term 'creativity'. While the Spanish students focused on digital technologies, capacities to provide new methods for sharing information, the Maltese students were more focused on the potential for digital applications to trigger creativity. The Norwegian students emphasised how digital technologies could provide variation and motivation as well as be a catalyst for the development of pedagogical practices.

With critical thinking, all three groups expressed that digital technologies represented a positive element in relation to easy access to information. At the same time, they addressed the

need to teach pupils' competencies in source criticism and provide strategies for dealing with an overwhelming flow of information.

Our fourth analytical frame was understanding of technology. All shared the perception that using digital technologies in the classroom could lead to distractions with access to social media. However, the students also expressed a nuanced view, pointing to the importance of the teacher's skills in organising ICT use.

To summarise our findings, there is no evidence to claim substantial differences regarding attitudes towards using ICT for teaching and learning activities among student teachers from the three countries analysed in this paper. As previously mentioned, the similarities are greater than the differences, and some of what may have been highlighted as differences might well be understood in broader cultural context rather than school-or teacher-specific issues. One final question is directed towards our analytical framework for attitudes.

Regarding our guiding analytical framework, our interpretations of the student teachers' answers showed that they were more explicitly aware of issues connected to critical thinking and understanding of technology, while implicitly, they showed awareness about issues related to adaptability and creativity. Our point of departure by connecting 'attitude' to a specific form of digital competence led to a need to define what distinguishes attitudes from other well-established understandings of what the notion of digital competence means. There is little controversy that digital competence in teacher education is about student teachers' technical skills. We can also assume the same regarding student teachers' pedagogical competencies, as well as their knowledge about ethical issues regarding the use of digital technology in formal educational settings. However, the attitudinal dimension is more diffuse and less well defined. Therefore, it is important to stress that our analytical framework must be regarded more as a suggestion for further research. However, taking our analysis of previous research into account, there is a basis to connect attitudes to both a kind of knowledge and practical use. In our analytical framework, it is reasonable to relate our concepts critical thinking and understanding of technology to a kind of knowledge and relate the concepts creativity and adaptability to more practical use. Furthermore, it is possible to investigate this in more detail through interviews with student teachers themselves.

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