



## Student teachers' responsible use of ICT: Examining two samples in Spain and Norway

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### ABSTRACT

Information and communication technology (ICT) has become an important component of initial teacher education (ITE) in Europe and in the continuous professional development of practicing teachers. The development of professional digital competence (PDC) is emerging as an essential part of teacher education. Due to the increasing use of ICT and the growing number of online teaching and learning resources, the *responsible use of ICT* has become one of the key aspects of PDC. For the purpose of this paper, the *responsible use of ICT* includes privacy issues, cyberbullying and the ability to evaluate digital content. We examine Spanish and Norwegian student teachers' perceived competence in privacy issues and in handling cyberbullying and their ability to evaluate digital content. In a survey conducted in autumn 2017, 681 Spanish and 563 Norwegian first-year student teachers in Spain and Norway answered questions on the responsible use of ICT. The findings show that in both countries the three concepts are recognised as distinct and that there is a positive relationship between student teachers' perceived understanding of the concepts. This implies that these concepts should be taught as separate components of PDC. However, it is challenging to compare student teachers' perceived knowledge of the concepts across two countries and to create an integration model that fit both countries. This is partly due to cultural and language differences. The study provides a baseline in terms of knowledge about responsible use at the participating universities. It also details general implications for policy, practice and ITE programmes.

### 1. Introduction

Information and communication technology (ICT) has become an important part of both society and the everyday lives of people. The way information is retrieved, used and disseminated has been transformed (Tondeur, Forkosh-Baruch, Prestridge, Albion, & Edirisinghe, 2016), and ICT influences competence development, learning and a person's employability (Martínez-Cerdá, Torrent-Sellens, & González-González, 2018). Within the education sector, this applies to students as well as teachers, school leaders and teacher educators. Digital technology is incorporated in every aspect of young peoples' lives, and a great part of their social lives

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has moved from physical spaces to digital spaces. Therefore, it is necessary to ask whether young people are digitally competent and using ICT responsibly (Frau-Meigs, O'Neill, Soriani, & Tomé, 2017) and whether future teachers are prepared to meet and overcome the challenges following greater digitalisation.

Public discourse reveals a growing concern about the risks young people encounter in their online lives. Policy makers emphasise the importance of the responsible use of ICT that will enable young people to navigate the complexity of permeating technologies (European Commission, 2016; Vuorikari, Punie, Carretero, & Van den Brande, 2016), and school leaders and teachers alike are concerned about the online risks youth are exposed to. Such risks are related to, for example, online harassment and online bullying, privacy issues, being able to evaluate online content and the proper use of information in line with copyright rules (Livingstone, Haddon, Görzig, & Ólafsson, 2011; Livingstone, Mascheroni, & Staksrud, 2015). In addition, parents are concerned about the online behaviour of their children and partly rely on schools to be active players in their children's online explorations.

For Choi, Cristol, and Gimbert (2018), an important purpose of education is to raise digitally active and responsible citizens who are able to make informed decisions in a globalised and networked society. Research has nuanced the claim that young people are digitally native in their use of ICT (Bullen & Morgan, 2011). Recent research indicates that young people are active and eager users of ICT, but at the same time they need training in the use of ICT when it comes to, for example, dealing with privacy issues, cyberbullying and evaluating information (Choi, 2016; Mason, Junyent, & Tornatora, 2014; Metzger & Flanagin, 2013). Overall, they need support to develop an understanding of the role of digitalisation in a democracy. Knowledge about privacy issues is important to emphasise the responsible use of personal information. Knowledge about cyberbullying is important to detect and avoid risks and harassment. The capability to evaluate digital content is important in order to reveal and prevent the spread of misleading information and fake news.

Furthermore, professional digital competence (PDC) is of great importance for student teachers because a) they need this proficiency and awareness in their studies (Gudmundsdottir & Hatlevik, 2018; Instefjord & Munthe, 2017; Fernández, Fernández, & Rodríguez, 2018; Romero, Castejón, López & Fraile 2017) and b) as future teachers, they have to support their pupils' development of digital competence (Choi et al., 2018; Vuorikari et al., 2016). Student teachers and teachers alike need digital competence to use ICT as part of their learning and teaching process, but they also need digital competence to participate in and sustain a democratic society. Misleading information, fake news, bullying, threats and the irresponsible use of personal information can jeopardise democratic processes.

Research has revealed that teachers are not adequately prepared to deal with the challenges surrounding privacy issues, cyberbullying and the evaluation of digital content (Macaulay, Betts, Stiller, & Kellezi, 2018; Shin, 2015). In a time of harassment, cyberbullying and fake news and in which personal information may be massively exposed online, digital competence regarding the responsible use of ICT and the Internet cannot be ignored. Online information is easily accessible and easily manipulated. Therefore, there should be increased awareness of how students and teachers can learn to manage and evaluate digital content. In addition, parents look to schools for guidance. When it comes to the moral and ethical use of online resources, teachers should be convincing role models (Kim & Choi, 2018). Parents and schools need to work in partnership to increase the responsible use of digital technologies (Monks, Mahdavi, & Rix, 2016) because there is no distinction between the responsible use of ICT at home, during leisure time or in school-related activities. Therefore, the research calls for examples of better sharing between schools and homes (Tejedor & Pulido, 2012). Both parents and teachers need to be able to assist young people manoeuvre online, to distinguish reliable information from fake news and to consider issues of privacy whether they relate to their own exposure and online reputation or to that of another. In this regard, we argue that initial teacher education (ITE) has an important role to play in providing future teachers with the necessary know-how and competence to be good role models and responsible online citizens. Student teachers need to be familiar with and capable of managing ethical and privacy issues. They must also be able to act on challenges, such as cyberbullying, that their pupils may face in or outside classrooms (Pusey & Sadera, 2011).

The widespread use of ICT has various consequences for teacher education. It is essential for teacher educators and other school staff to include PDC and the responsible use of ICT in campus courses, student teachers' practical training and teacher education programmes in general to provide relevant teacher education for student teachers. Accordingly, student teachers need opportunities to actively apply and combine their technological and pedagogical knowledge together with reflection on ethical aspects when using ICT as a resource in their studies on campus and during their practice placements in schools. ICT use and teachers' PDC are already significant components of ITE in Europe (Eurydice, 2011) and in the continuous professional development of practicing teachers (Prestridge & Tondeur, 2015; Tondeur, Aesaert, Prestridge, & Consuegra, 2018), but the different elements of teachers' PDC are not always given equal importance (Gudmundsdottir & Hatlevik, 2018). Contemporary teachers are experiencing increased access to technology and ICT use (Prestridge & Tondeur, 2015). This technology-rich environment influences how teachers learn about and engage with subject content and pedagogical practices (Burden, Aubusson, Brindley, & Schuck, 2016); however, studies on the responsible use of ICT are particularly limited.

This study builds on data collected in the Erasmus + funded project called Developing ICT in Teacher Education (DICTE) (Dicte, 2019). The DICTE project is a cooperative effort between four European countries—Spain, Norway, Ireland and Malta. For the purpose of this paper, we compare Spanish and Norwegian student teachers and their responsible use of ICT. Further, we aim to examine how Spanish and Norwegian student teachers understand the concepts of privacy, cyberbullying and digital content evaluation. Our objective is to determine how Spanish and Norwegian student teachers perceive these concepts and the ways in which these concepts relate to each other. In addition, this paper seeks to address the extent to which student teachers are digitally competent to use ICT in responsible ways. This knowledge can provide teacher education institutions a proper starting point when it comes to the relevant preparation of student teachers in the digital age. Therefore, prior to presenting our sample and study design, we will discuss perspectives on the professional digital competence of teachers.

## 2. Perspectives on digital competence in the teaching profession

The concept of digital competence is widely examined and discussed among European educational researchers (Ferrari, 2013; Krumsvik, 2014). Digital competence is defined as ‘the critical, responsible and efficient understanding and use of media, digital tools and digital resources in order to solve a case or a task, and in a more general sense, being a responsible citizen’ (Hatlevik & Tømte, 2014: 719). In order to develop a student’s digital competence throughout K–12, schools require digitally competent teachers. Within the relevant research literature, professional digital competence is a relatively recent term. It includes an extended understanding of *digital skills* by adding a competence dimension, an attitudinal dimension and an ethical dimension to a more technical or mechanical understanding of the concept (Gudmundsdottir & Hatlevik, 2018). In Norway, several researchers have studied what PDC entails (Brevik, Gudmundsdottir, Lund, & Strømme, 2019; Gudmundsdottir & Hatlevik, 2018; Instefjord & Munthe, 2017; Krumsvik, 2014; Lund et al., 2014). In Spain, researchers such as Ezquerro, De-Juanas, and Ulloa (2014) have discussed teachers’ ICT competency during classroom activities as the most necessary pedagogical skill to develop. Prendes, Castañeda, & Guitérrez (2010) have explored the ICT competencies of future teachers and found that collaboration skills, classroom leadership and the ability to manage work in groups as they relate to ICT use are in short supply among primary school teachers. In addition, when university students were asked about perspectives on the digital competence of teachers in higher education, Guzmán-Simón, García-Jiménez, and López-Cobo (2017) found that the lack of digital competence is problematic because it does not answer to the digital competence requirements of the labour market. They noted a clear distinction between the digital practices within formal learning setting in universities and the digital practices developed in informal learning settings (Guzmán-Simón et al., 2017). In Spain, we face two problems. The first is that PDC is reduced to mostly the technological and instrumental dimension of ICT use in the classroom. The second is that the teachers are not sufficiently qualified in ICT use and do not have sufficient PDC (Fernández et al., 2018; Romero, Castejón, López, & Fraile, 2017).

Gudmundsdottir & Hatlevik (2018) have described PDC as comprising three components. The first component is *generic digital competence*, which concerns general ICT knowledge, skills and attitudes towards ICT that teachers, teacher educators and student teachers require in order to teach and learn in digital school environments. This dimension of teacher PDC is closely connected to the basic skills of pupils (The Norwegian Directorate for Education and Training, 2013). For pupils to learn, it is necessary that a teacher be able to undertake simple use of ICT. These skills include the responsible and safe accessing of information and an adequate knowledge of privacy issues. The second component is *subject-related digital competence*, which deals with the distinct nature of each subject and the teaching of that subject’s content with and through ICT. To enhance student learning outcomes, technology may be used in different ways, and the characteristics of each subject should be taken into account when teaching with ICT. For example, a science course may use the replication of a DNA simulation, while a foreign language lab may rely on pronunciation technology. The third component is *profession-related digital competence*, which deals with other different aspects of a teacher’s workday apart from subject teaching. This includes, for example, communication between homes and school; the psychosocial learning environment and relational skills connected to online presence and use; dealing with cyberbullying; classroom management in technology-rich environments; and the teacher’s own continuous professional development in ICT-related competencies. In addition, a fourth dimension has been added to the PDC model involving the agency that a teacher needs to acquire through teacher education. In particular, this includes how to deal with the landscape of ever-changing technology-rich learning environments and online information that is easy to manipulate, copy and/or change (Lund, Furberg, & Gudmundsdottir, 2019; Brevik, Gudmundsdottir, Lund, & Strømme, 2019).

Perceived competence regarding privacy issues, the ability to handle cyberbullying and evaluating digital content can be viewed as transversal skills that are important across all three components. These skills are important in both generic digital competence during basic use of the Internet and in advanced professional and subject-related digital competency. Brevik, Gudmundsdottir, Lund, & Strømme (2019) called for the fourth dimension in the understanding of PDC. This additional dimension they name *transformative agency*. Such a transformative aspect is particularly important when managing challenging issues concerning privacy, cyberbullying and digital content and goes beyond the generic digital competence of a student teacher.

Developed by the European “Developing ICT in Teacher Education” (DICTE) project (2017–2020), the Pedagogical, Ethical, Attitudinal and Technical Dimensions of Digital Competence in Teacher Education or PEAT model (Dicte, 2019) attempts to conclusively synthesise various models and frameworks to address teachers’ PDC. Building on a literature review, the PEAT model highlights four equally important dimensions that appear in most of the existing models and frameworks targeting ICT and the digital competence of teachers (Dicte, 2019). As a taxonomy-type model, it contains pedagogical, ethical, attitudinal and technical dimensions. This paper draws on the attitudinal and ethical parts of the PEAT model along with the transversal elements of the responsible use of ICT from the PDC conceptualisation. We have made this delimitation in order to go into depth of the attitudinal and the ethical portion of the PEAT model.

## 3. Responsible use of ICT

For the purpose of this study, we chose to focus on the attitudinal and ethical portions of teachers’ PDC which includes teachers’ perceived usefulness of ICT and their view on responsible use of ICT. The two models (PDC and PEAT) mentioned above employ different approaches to understand how to use ICT responsibly. The first model views the concept as an integrated portion of different pillars in PDC, while the second model focuses on different areas within existing models of digital competence and identifies attitudes as one distinctive area and ethics as another. Before presenting our research design, methods and findings, it is necessary to explain the concepts that define responsible use in this study, which are *privacy*, *cyberbullying* and *the evaluation of digital content*.

### 3.1. Perceived competence in privacy issues

The concept of privacy has been interpreted in several ways. In this paper, we address privacy from the perspective of safety. As such, privacy refers to the ability to use digital tools, digital media and digital resources in a responsible manner. This includes being aware of and acting in accordance with privacy rights and the rules and regulations of using the Internet ethically.

The concept of privacy also includes an ethical dimension that has been referred to as digital citizenship by a number of researchers (Atif & Chou, 2018; Kim & Choi, 2018). Digital citizenship refers not only to a person's awareness of how to manoeuvre online but also their ability to discern what is appropriate to publish online about themselves and others. Martin, Wang, Petty, Wang, and Wilkins (2018) refer to the National Educational Technology Standards (2016) and the Ribble (2014) framework in their study on social media use in middle school. Ribble (2014) discusses *digital etiquette* as the standard for electronic conduct and procedure, *digital law* as a person's responsibility for electronic actions and deeds and *digital rights and responsibilities* as the freedoms extended to everyone in the digital world. Atif and Chou (2018) state that the ethics surrounding digital citizenship suggest what online behaviour is suitable and the importance of protecting one's own privacy and that of others. In Norway, Gjaever, Mifsud, & Gjølstad, (2016) have found that Norwegian teachers primarily address these aspects and to a lesser extent the legal aspects of privacy as they relate to laws and regulations.

### 3.2. Perceived competence in handling cyberbullying

Cyberbullying is related to the responsible use of ICT because it relates to online behaviour. Cyberbullying is closely connected to the growing number of online resources used by young children. Cyberbullying can be done both directly and indirectly (Gladden, Vivolo-Kantor, Hamburger, & Lumpkin, 2014). There are various forms of cyberbullying, but most researchers agree that in order to be defined as bullying and not harassment it needs to involve certain features. These features are a) an imbalance of power between the perpetrator and the victim that leaves the victim unable to defend him or herself, b) a certain frequency in which the bullying is done repetitively and lasts over a significant period of time, and c) a level of aggression and intention while the act is being carried out by a group or an individual (Smith et al., 2008). According to Navarro and Serna (2016), there is not one particular term for the English concept *cyberbullying* in Spanish but several different ones.

Regardless of the definition, it is incredibly important that teachers and student teachers are able to identify and prevent cyberbullying as well as to act when cyberbullying has occurred (Choi, 2016; Giménez-Gualdo, Arnaiz-Sánchez, Cerezo-Ramírez, & Prodócimo, 2018; Murphy, Tubritt, & O'Higgins, 2018). Murphy et al. (2018) state that teacher education is particularly important in this respect. They explain how empathy can create a positive school climate and directly combat bullying. According to del Rey-Alamillo, Mora-Merchán, Casas, and Ortega-Ruiz (2018), intervention programmes designed to focus on cyberbullying, reduce the risk of online aggression in Spanish secondary schools. This is in line with (Choi et al., 2018), who emphasise how important it is 'to teach students to avoid trolling and cyberbullying, to respect others online' (p. 144).

### 3.3. Ability to evaluate digital content and information

Due to the increased access to excessive amounts of information online, the ability to evaluate the quality and reliability of digital content is increasingly important. The ability to evaluate digital content found on websites and apps requires assessing a source's trustworthiness. An evaluation of digital content includes considering from where that information comes and taking the responsibility to further communicate valid information to the wider online community. Metzger and Flanagin (2013) argue that due to the increased access to overwhelming amounts of digital information, discerning the credibility of digital content is becoming a burden to individuals. Metzger (2007) names five different aspects as imperative when evaluating digital content. These are a) the accuracy of the information, b) the authority of the source (who is the author), c) the objectivity of the source (the purpose of publishing the information), d) how current the information is (whether the information is out of date) and e) what the information covers (how comprehensive the information is). Each of these aspects is important for students to consider when evaluating digital content. Consequently, a teacher must master these aspects so they can help students properly evaluate digital content. However, Gutiérrez-Gómez and Serrano-Sánchez (2018) have found that student teachers seldom use some of these tools, strategies and techniques when evaluating digital content. They primarily check for coherence, grammar and how current the information is. McGrew, Breakstone, Ortega, Smith, and Wineburg (2018) examine whether students can properly evaluate online sources and the students' civic reasoning. They have found that students need to be explicitly taught to evaluate online sources and to develop online reasoning skills.

## 4. Present study

In the first part of this paper, we discussed how to understand the concepts of privacy, cyberbullying and evaluating digital content within a PDC framework. The aim of the next part is to examine how to measure Spanish and Norwegian student teachers' perceived competence in privacy issues, perceived competence in handling cyberbullying and their ability to evaluate digital content. The following research questions are addressed in this paper:

RQ 1: How can perceived competence in privacy issues, perceived competence in handling cyberbullying and the ability to evaluate digital content among a sample of Spanish and Norwegian student teachers be measured?

RQ 2: What is the relationship between perceived competence in privacy issues, perceived competence in handling cyberbullying and the ability to evaluate digital content (see Fig. 1) among a sample of Spanish and Norwegian student teachers?

RQ 3: When it comes to the concepts of perceived competence in privacy issues, perceived competence in the handling of cyberbullying and the ability to evaluate digital information (see Fig. 1), to what extent is it possible to describe the similarities and differences across the samples of Spanish and Norwegian student teachers?

## 5. Method

### 5.1. Participants and procedures

At the beginning of the autumn 2017 semester, first-year student teachers from three universities in Spain and Norway were invited to participate in an online survey on Webquest. We used a non-random sampling method and invited all the student teachers entering the first year at the three teacher education institutions to participate. The student teachers from the Spanish university are certified to teach grades 6–12 (preschools and primary schools). The student teachers from one of the universities in Norway are certified to teach grades 1–10 (primary and lower secondary schools) and the student teachers from the other university in Norway are certified to teach grades 8–13 (lower and upper secondary schools) (see Table 1).

At the Spanish university, the survey was conducted face to face in 18 groups during a 3-week period at the beginning of the semester. The classroom teacher gave students time to complete the survey. At one of the Norwegian universities, the students took the survey in small groups of about 20–30 students in connection with obligatory classes. At the other Norwegian university, student teachers were provided the link to the survey in an introductory lecture. All student teachers who attended the introductory lecture got time during the lecture to complete the survey. They were encouraged to participate but were told that participation was voluntary and that they could withdraw at any time. The student teachers used their own devices or available devices in the rooms and got 15–30 min to complete the survey.

In total, 1244 student teachers answered the survey. We received 681 responses from student teachers at the Spanish university (response rate of approximately 95%). We received 311 responses (response rate of approximately 80%) from student teachers at the Norwegian university where the survey was completed during obligatory classes, and we received 252 responses from student teachers at the Norwegian university where the survey was completed during the lecture (response rate of approximately 85%). The majority (82%) of the Spanish student teachers were 18–20 years old, whereas 45% of the Norwegian student teachers were in the same age range. Additionally, 46% of the Norwegian student teachers were 21–25 years old. In terms of gender, 77% of the Spanish participants are female and 64% of the Norwegian participants are female.

### 5.2. Instruments

The survey was developed in English by the DICTE project (Dicte, 2019) and translated into Spanish and Norwegian. The three concepts investigated were perceived competence in privacy issues, perceived competence in handling cyberbullying and the ability to evaluate digital content. The questions were partially adapted from previously validated scales (Egeberg et al., 2012; Fraillon et al., 2013). The scales for perceived competence in privacy issues and handling cyberbullying were adapted from the 2013 International Computer and Information Literacy Study (ICILS) questionnaire (Fraillon et al., 2013). The scale for the ability to evaluate digital content was adapted from the Norwegian Monitor study 2011 (Egeberg et al., 2012). We were greatly concerned about concept validity

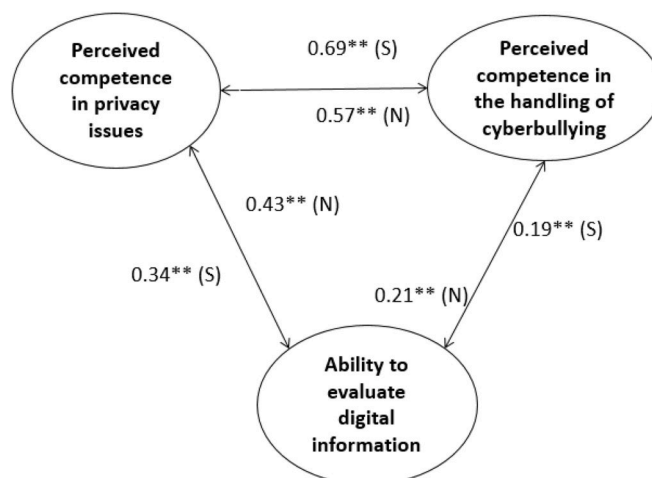


Fig. 1. Relationship between perceived competence in privacy issues, perceived competence in the handling of cyberbullying and ability to evaluate digital content (N=Norwegian sample, S=Spanish sample).



**Table 1**  
Gender and age.

Type	Spanish sample (N = 681)	Norwegian sample (N = 563)
<b>Gender</b>		
Females	77.7%	63.6%
Males	22.3%	36.4%
<b>Age</b>		
18–20	82.7%	44.6%
21–25	13.1%	46.0%
26–30	2.3%	6.2%
31 -	1.9%	3.2%

and how accurate the survey was in measuring the concepts. During two pilots of the survey tool, we adjusted and further developed the survey questions to fit the context of the three universities and the PEAT model. This primarily took the form of changing wording and examples given in the questions that were easily generalisable across contexts, as well as deleting unclear questions and adding new ones that better addressed the various PDC elements. However, we recognise that a limitation of the survey tool may be that the items used to measure perceived competence of cyberbullying consist of two-sided question about both cyber bullying and online harassment. Despite that these concepts are related and can be placed on a scale of a continuum, there may be student teachers that agree with one aspect of the question and not the other.

*Perceived competence in privacy issues* was measured by responses to three statements: ‘I know how to protect my privacy online’, ‘I know how to apply privacy rules’ and ‘I know how to apply copyright rules’. Responses were provided using a four-point scale (1 = strongly agree, 4 = strongly disagree). *Perceived competence in handling cyberbullying* was measured by responses to two statements: ‘I know how to detect cyberbullying and online harassment’ and ‘I know how to deal with cyberbullying and online harassment’. A four-point scale was also used (1 = strongly agree, 4 = strongly disagree). *Ability to evaluate digital content* was measured using responses to three statements focusing on how student teachers conduct online searches for study purposes: ‘I cite the source in order to ensure that the original source is credited’, ‘I check the source behind the information’ and ‘I am concerned about the reliability of the information’. The same four-point scale was used (1 = strongly agree, 4 = strongly disagree).

### 5.3. Analytical strategy

Initially, the data was analysed to identify distribution, means and standard deviations. To answer RQ1 and RQ2, the three concepts model (Fig. 1) was tested using structural equation modelling (SEM) (Kline, 2016). Using the confirmatory factor option in SEM it is possible to identify if the three concepts in Fig. 1 are supported by the data (RQ1). Simultaneously, it is possible to analyse the relationship between the three concepts (RQ2).

To compare the similarities and differences across the samples from each country (RQ3), it is necessary to examine if the items work the same way in each sample (measurement invariance). The concept of measurement invariance is based on the assumption that ‘scores of measures are equivalent if they capture the same construct with the same measurement precision’ (Schroeders & Wilhelm, 2011, p. 855). It is possible to use multigroup confirmatory factor analysis to examine how the items and concepts work across groups. When strong measurement invariance is found, the results from the two samples can be compared directly.

### 5.4. Relevance of the study

The study addresses issues that appear to be internationally relevant. Responsible use of ICT is included in sub-scales of the ICILS (Fraillon, Schulz, & Ainley, 2013, 2019) and in the European Union’s Digital Competence Framework (Ferrari, 2013) and is seen as an aspect of digital citizenship (Heath, 2018; Choi, 2016).

The samples are representative of first-year student teachers at the participating universities. However, we cannot say that the study is representative of all student teachers in Norway or Spain. At the same time, there are national guidelines and regulations for ITE in Norway that contribute with themes related to responsible use that should be emphasised and included in ITE curriculum. In Spain, the Common Digital Framework for Teachers (2017) is the frame of reference most frequently used. There are also some similarities between Nordic ITE programmes on one hand and Spanish and other Southern European ITE programmes on the other. Therefore, the findings of this study can have a certain relevance and transfer value across universities and countries. On the whole, the study addresses key concepts, and the implications of the study can play a critical role in shaping policy, in developing teacher education and in further research in the field.

## 6. Results

Prior to starting our analysis, the eight survey items were tested for normality by investigating skewness and kurtosis. In other words, a comparison was done between the distribution of items and a normal distribution (skewness), and it was identified whether there was a flat or pointed distribution (kurtosis). All items in the study had reasonable levels of skewness (Lau & Yuen, 2015). In addition, there were no missing responses for any of the eight items.

### 6.1. Measuring the concepts and the relationships

Using data from both samples, it is possible to illuminate RQ1 and RQ2 by testing the associations in Fig. 1. The model converged with an acceptable solution for the Spanish sample: Chi-square ( $\chi^2$ ) = 22.15 ( $p > 0.13$ ), degrees of freedom = 16,  $N = 681$ , CFI = 0.996, TLI = 0.994, RMSEA = .024 and SRMR = .024. The model also converged with an acceptable solution for the Norwegian sample: Chi-square ( $\chi^2$ ) = 13.63 ( $p > 0.62$ ), degrees of freedom = 16,  $N = 563$ , CFI = 1.000, TLI = 1.000, RMSEA = .000 and SRMR = .015.

In both samples, the factor loadings are above 0.60 for the three items measuring perceived competence in privacy issues. These are acceptable levels. In the case of perceived competence in handling cyberbullying, the factor loadings are high (above 0.80) for the Spanish sample (Table 2) and are between 0.59 and 0.78 for the Norwegian sample (Table 3). In this category, loadings above 0.60 are recommended; however, we approve levels slightly below 0.60. In the case of the ability to evaluate digital content, all factor loadings are above 0.60 in the Spanish sample and are between 0.57 and 0.71 in the Norwegian sample. Overall, the measures from the confirmatory factor analysis using SEM seem acceptable.

The model with eight items and three variables (Table 4) provides support for the three distinct concepts in both samples—*perceived competence in privacy issues* (three items), *perceived competence in handling cyberbullying* (two items) and *ability to evaluate digital content* (three items).

The results show a positive relationship between all three concepts. In both samples, there is a strong correlation between perceived competence in privacy issues and perceived competence in handling cyberbullying (Table 5). There seems to be a moderate correlation between perceived competence in privacy issues and the ability to evaluate digital content. In both samples, there is a weak correlation between perceived competence in the handling of cyberbullying and the ability to evaluate digital content among the Spanish ( $r = 0.19$ ,  $p < .01$ ) and the Norwegian ( $r = 0.21$ ,  $p < .01$ ) student teachers.

### 6.2. Similarities and differences in the samples of student teachers from different countries

When describing the similarities and differences of student teachers from different countries, it is recommended to examine measurement invariance between the groups. The results from a SEM with an analysis of the two groups indicate that the same model with an identical factor structure (see Fig. 1) is supported. The fit of the model is above the acceptable level when it comes to CFI, TLI, RMSEA and SRMR measures. However, when restricting the model with equal indicator means, the data from the samples does not support the model. The fit of the more restricted model with equal factor loadings and equal indicator means has acceptable levels of CFI (0.929) and TLI (0.905). However, the levels of RMSEA and SRMR are higher than acceptable. It is therefore not recommended to compare the means of the three factors (perceived competence in privacy issues, perceived competence in handling cyberbullying and the ability to evaluate digital content) across the samples from two countries.

Despite this uncertainty in comparing the mean score of the factors across the two countries, we still choose to present the results of our comparison. Norwegian student teachers tend to report higher levels of perceived competence in privacy issues, whereas Spanish student teachers report higher levels of knowledge of how to handle cyberbullying. When it comes to evaluating digital content, Norwegian student teachers tend to report higher levels of steps taken to evaluate digital content. As mentioned above, these findings must be taken with caution.

## 7. Discussion

To prepare student teachers for the digital age, it is necessary to ensure they are responsible online (Macaulay et al., 2018). ITE can provide student teachers with information about responsible online actions and activities (Krumsvik, 2014). However, to do so it is necessary to know the aspects of privacy, cyberbullying and online content evaluation in which student teachers are already competent. It is also necessary to know where more competence is required so that student teachers may use ICT responsibly both in their own learning and when teaching.

**Table 2**

Results showing means, standard deviation, skewness and kurtosis from Spanish sample (681 student teachers).

Spanish sample (681 student teachers)	Mean	St dev	Skewness	Kurtosis
<u>Perceived competence in privacy issues</u>				
I know how to: protect my privacy online	3,11	0,91	-0,79	-0,21
I know how to: apply privacy rules	2,99	0,96	-0,62	-0,59
I know how to: apply copyright rules	2,10	1,05	0,45	-1,06
<u>Perceived competence in the handling of cyberbullying</u>				
I know how to: detect cyberbullying and online harassment	3,09	0,89	-0,80	-0,06
I know how to: deal with cyberbullying and online harassment	2,91	0,94	-0,55	-0,58
<u>Ability to evaluate digital content</u>				
<i>When I search for information on the internet for study purposes:</i>				
I cite the source in order to ensure that the original source is accredited	2,80	0,95	-0,35	-0,79
I check the source behind the information	2,83	0,96	-0,35	-0,85
I am concerned about the reliability of the information	3,32	0,75	-0,97	0,62

**Table 3**

Results showing means, standard deviation, skewness and kurtosis from Norwegian sample (563 student teachers).

Norwegian sample (563 student teachers)	Mean	St dev	Skewness	Kurtosis
<u>Perceived competence in privacy issues</u>				
I know how to: protect my privacy online	3,09	0,79	-0,61	-0,03
I know how to: apply privacy rules	3,09	0,75	-0,50	-0,06
I know how to: apply copyright rules	2,86	0,85	-0,40	-0,42
<u>Perceived competence in the handling of cyberbullying</u>				
I know how to: detect cyberbullying and online harassment	2,95	0,76	-0,53	0,20
I know how to: deal with cyberbullying and online harassment	2,63	0,81	-0,10	-0,49
<u>Ability to evaluate digital content</u>				
<i>When I search for information on the internet for study purposes:</i>				
I cite the source in order to ensure that the original source is accredited	3,51	0,67	-1,26	1,38
I check the source behind the information	3,33	0,72	-0,81	0,19
I am concerned about the reliability of the information	3,79	0,44	-1,94	2,91

**Table 4**

Factor loadings and standard errors from SEM. Model fit in Spanish sample: Chi-square ( $\chi^2$ ) = 22.15 ( $p > 0.13$ ), degrees of freedom = 16 and  $N = 681$ . CFI = 0.996, TLI = 0.994, RMSEA = .024, and SRMR = .024. Model fit in Norwegian sample: Chi-square ( $\chi^2$ ) = 13.63 ( $p > 0.62$ ), degrees of freedom = 16 and  $N = 563$ . CFI = 1.000, TLI = 1.000, RMSEA = .000, and SRMR = .015.

	Spanish sample		Norwegian sample	
	Factor loadings	Standard error	Factor loadings	Standard error
<u>Perceived competence in privacy issues</u>				
I know how to: protect my privacy online	0.62	0.04	0.66	0.04
I know how to: apply privacy rules	0.69	0.04	0.75	0.04
I know how to: apply copyright rules	0.62	0.04	0.67	0.04
<u>Perceived competence in the handling of cyberbullying</u>				
I know how to: detect cyberbullying and online harassment	0.81	0.03	0.59	0.05
I know how to: deal with cyberbullying and online harassment	0.81	0.03	0.78	0.05
<u>Ability to evaluate digital content</u>				
<i>When I search for information on the internet for study purposes:</i>				
I cite the source in order to ensure that the original source is accredited	0.61	0.03	0.65	0.04
I check the source behind the information	0.86	0.03	0.71	0.04
I am concerned about the reliability of the information	0.64	0.03	0.57	0.04

**Table 5**

Relationship between the perceived competence in privacy issues, perceived competence in the handling of cyberbullying and ability to evaluate digital content.

	Spanish sample			Norwegian sample		
	1	2	3	1	2	3
1. Perceived competence in privacy issues	1			1		
2. Perceived competence in the handling of cyberbullying	0.69**	1		0.57**	1	
3. Ability to evaluate digital content	0.34**	0.19**	1	0.43**	0.21**	1

In this study, we ask the question (RQ1) “How can perceived competence in privacy issues, perceived competence in handling cyberbullying and the ability to evaluate digital content among a sample of Spanish and Norwegian student teachers be measured?” Perceived competence in privacy issues concerns both the ability to protect one’s own material, such as photographs or videos, and to respect the intellectual property of others while using it, such as work that has been copyrighted (Ribble, 2014). Perceived competence in privacy issues is a form of knowledge that can be identified in the ITE of both samples. A majority of the Norwegian student teachers reported being competent in this area. This gives Norwegian teacher educators in ITE valuable information on where to begin their input. The majority of the Spanish student teachers reported that they did not feel competent in terms of their ability to ‘apply copyright rules’. If this is correct, then action must be taken in Spanish ITE. It is important that future teachers respect the intellectual property of others and that teachers can help convey respect for intellectual property to their pupils (Giaeve et al., 2016). This respect is much stronger, clearer and genuine when teachers themselves act as role models for their pupils by helping them learn and use the rules of privacy when handling their own digital content and that of others. Another important aspect that can also be viewed as the main limitation of this study is that the different country contexts of ITE do seem to influence what the necessary actions are to improve the responsible use of ICT by student teachers in the different country settings. Furthermore, even though the student teachers perceive themselves as competent when answering the survey, it does not mean they are competent when addressing the issue in their teaching practice.

Perceived competence in handling cyberbullying concerns the ability to identify cyberbullying and then initiate the appropriate



action (Giménez-Gualdo et al., 2018; Murphy et al., 2018). Choi (2016) emphasises that respect of others and responsible behaviour, ‘including reporting cyberbullies and harm, are important issues that should be included in Internet-infused educational contexts’ (p. 577). Cyberbullying is a phenomenon identified as a topic in the teacher education programmes at the three universities in both countries. For the children who experience it, cyberbullying can have severe negative consequences. It is therefore imperative that student teachers can recognise and prevent cyberbullying by implementing appropriate measures. Most of the student teachers in the Spanish sample reported that they were prepared to deal with cyberbullying.

The ability to evaluate digital content concerns the ways in which student teachers are gathering and processing information and then measuring to what extent that digital content can be trusted (Metzger, 2007). There is a vast amount of information available today, but there is also a great deal of deliberately produced incorrect information or fake news. It is therefore necessary that student teachers learn to assess the quality of online information and whether it is trustworthy (Metzger & Flanagin, 2013). Most of the student teachers from both countries take measures to evaluate the digital content they obtain online for school purposes. Student teachers and teachers should be good role models for their pupils and should provide their pupils with guidance as they deal with online content (Gutiérrez-Gómez & Serrano-Sánchez, 2018; Metzger, 2007).

The second research question (RQ2), addresses the relationship between the three concepts and asks ‘What is the relationship between perceived competence in privacy issues, perceived competence in handling cyberbullying and the ability to evaluate digital content?’ There is a clear distinction between each of the three concepts, and each of them has been identified as relevant to teacher education in both countries. Using exploratory and confirmatory factor analysis, Choi (2015) demonstrates how digital citizenship can be nuanced. Choi describes it as comprising five aspects—Internet political activism, technical skills, critical perspectives, networking agency and local/global awareness. Our study also emphasises the importance of critical perspectives in online participation, the use of the Internet and the use of digital information.

The strong relationship between perceived competence in privacy issues and perceived competence in handling cyberbullying can be explained by how both concepts capture the ethical awareness of the responsible use of ICT. The perceived ability to protect other people and oneself is an explicit aspect of both variables. Additionally, ‘I know how to ...’ is the beginning statement of all the questions used to measure these two concepts, which causes the questions to appear quite similar. Despite these concepts being overlapping, the analyses also identified two distinct and unique concepts. This matters in terms of the implications of these findings and how teacher education should address the matter in its programmes. It is not uncommon to find strong links between sub-scales within a theme. For example, in a study of 348 teachers, Choi et al. (2018) have found that critical perspectives as a sub-scale had a significant and strong relationship with another sub-scale measuring Internet political activism.

The moderate relationship between perceived competence in privacy issues and the ability to evaluate digital information indicates there is some overlap between these two variables. One common feature is that both variables deal with understanding the origin of digital information. This is necessary in order to judge how trustworthy information is, meaning evaluating digital information. However, it is also required in order to know what kind of rules to follow, such as rules about privacy or rules about copyright issues. In the case of perceived competence in privacy issues, student teachers must evaluate whether a piece of information is intellectual property and whether digital content is relevant or trustworthy. Choi (2015) has found that one subscale (critical perspectives) had a significant, moderate relationship with two other subscales (networking agency and local/global awareness). This was confirmed in a later publication (Choi et al., 2018). A moderate relationship may reinforce the assumption that the sub-scales are both unique and have some commonalities.

The weak relationship between the ability to evaluate digital information and perceived competence in handling cyberbullying indicates that these concepts have few common features. The latter variable deals with the relationship between people, and the ability to evaluate digital information emphasises source criticism and plagiarism. It seems that both variables deal with sources of information, but there are different perspectives. Content, such as words or pictures, is important when identifying and handling cyberbullying, whereas content is one of many aspects when evaluating online information. When mapping a topic using a set of sub-scales (representing terms or concepts), some sub-scales will have greater overlap with each other and others will have fewer commonalities. The latter is comparable to how Choi (2015) identified that one subscale (technical skills) that had a weak correlation with the three other subscales (critical perspectives, networking agency and local/global awareness). Having weak relationship between some of the sub-scales does not necessarily indicate a methodological problem. One could argue that there are unifying sub-scales and more peripheral sub-scales. One feature of a unifying scale is that it overlaps with many of the others, while a more peripheral scale may overlap with fewer. Nevertheless, the peripheral is important because it helps to nuance and elaborate the theme. When examining the relationships between the sub-scales or concepts included in the responsible use of ICT, it is therefore important to combine a theoretical and an empirical approach.

The last research question (RQ3) addresses to what extent it is possible to describe the similarities and differences across the samples of Spanish and Norwegian student teachers. Before comparing the means of the concepts, we investigated whether the items were working in the same way across the samples from each country or if the items were biased. The models and factor structure of the items are supported by data from both samples (see Tables 2 and 3). Our findings indicate that the three concepts are identifiable and recognisable among student teachers from both countries. However, there are some differences in the measurements taken from each of the two countries. Therefore, it is not recommended to compare the means of the three concepts across both countries. Yet, it is possible to examine the relationship between the concepts and to discuss these relationships across the countries. First, in both countries there is empirical support for the model of the three concepts (Fig. 1). Second, the characteristics of the relationships between the concepts (strong/moderate/weak) are quite comparable across the countries. When testing and scrutinising the model (Fig. 1) with the relationships between the concepts, the findings provide a conceptual contribution to our previous knowledge about what student teachers perceive about the responsible use of ICT.

Gathering data from two different countries may involve further challenges. This is related to different local contexts and different emphasis in each country's teacher education programme. However, our comparison between the two countries does not include differences in cultural elements, such as moral or human values or socio-economic aspects, such as those discussed by [Palladino et al. \(2017\)](#) in their study on cyberbullying across four countries. Comparisons done across cultures and countries are challenging due to different experiences, levels of access to ICT, variations in ways ICT is used and how ICT is integrated into the curriculum. There are, for example, different age distributions in these two samples, and the student teachers are certified to teach different age groups, which obviously indicates slightly different approaches to the three concepts. Cultural comparisons are also challenging due to language variations ([Nocentini et al., 2010](#)) and different understandings of statements and sentence structure. For example, there may be different understandings of the items or response options across the groups. There may be misconceptions when translating items from the original DICTE survey from English into Spanish and Norwegian. This can be improved by the independent back translation of the survey and by conducting in-depth interviews with student teachers from both countries. There are certainly many different paths to achieve the same end; however, the responsible use of ICT is increasingly important in ITE not only in Spain and Norway but in different contexts where ICT is being used in ITE. See, for example, how international research emphasises and relates responsible use to different aspects of digital technology use, for example, 'to share and evaluate information' ([Fraillon et al., 2013, 2019](#)), 'to identify digital competence' ([Ferrari, 2012, 2013](#)), to describe 'a responsible digital citizen' ([Heath, 2018](#)) and to understand 'digital citizenship as ethics' ([Choi, 2015](#)).

### 7.1. Implications

This study addresses three concepts relating to the responsible use of ICT—perceived competence in privacy issues, perceived competence in handling cyberbullying and the ability to evaluate digital content. All three concepts are of interest beyond the countries that participated in the study. Recent international research ([Choi, 2015](#); [Fraillon et al., 2013](#), [Fraillon et al., 2019](#)) emphasises that concepts relating to the responsible use of ICT are central to students and education. It is therefore important to discuss how these concepts can be a greater part of ITE. The implications of our findings for ITE are numerous. Certainly, ITE plays an important role in developing student teachers' PDC. ITE needs to prioritise the responsible use of ICT as a distinct aspect of PDC. All three concepts examined in this study appear as specific concepts. Therefore, ITE needs to commit to all of them separately when addressing student teachers' PDC. This applies to both teacher education on campus and to student teachers' training during school placements. Our study revealed that there are variations in the samples from the two countries, which implies that baseline knowledge of student teachers' competence in the responsible use of ICT is necessary to identify what to prioritise in local contexts.

Moreover, ITE cannot leave this to individual attempts by single faculty staff members but rather must integrate the responsible use of ICT into various seminars, courses and activities during the whole course of study. There is also a need to elaborate on how to understand the content of teachers' PDC. It may be about detailed knowledge, but the key is to help students gain a deeper understanding of the role of digitalisation in social development, democratic understanding and socialisation ([Engen, 2019](#)). ITE needs to equip student teachers through targeted courses that emphasise these different aspects of the responsible use of ICT. This is in order to make them better prepared to deal with the various themes in their own studies and to engage them in addressing the issue with pupils in their professional practice. In placement schools, the mentors need to provide opportunities for student teachers to improve their competence on the matter, to facilitate training opportunities related to privacy and copyright and to prepare them the best they can for handling cyberbullying and online harassment that pupils might face.

Still, in order to ensure a systematic and sustainable emphasis on the responsible use of ICT in ITE, policy makers need to be informed and need to take action. PDC, including the responsible use of ICT, is of continuing importance for ITE, and with greater use and exposure of ICTs in all aspects of teachers' professional practice, guidelines and reforms should highlight the responsible use of ICT.

Finally, this study addresses the benefits and obstacles in examining the responsible use of ICT in two different contexts. It contributes by highlighting some of the needs and shortcomings of ITE in both countries in relation to PDC. The emphasis in ITE programmes, policies and practices and what we can learn from each other becomes evident when we compare the responsible use of ICT in the two countries. This study therefore has implications for future research on the topic. We need research on the responsible use of ICT and what it entails apart from privacy, copyright and bullying and harassment issues, as well as how it appears in different teacher education programmes and in different country contexts.

## 8. Concluding remarks

This paper addresses the responsible use of ICT by student teachers. We investigated the extent to which the Spanish and Norwegian student teachers in our sample perceive themselves as competent in using ICT in responsible ways. There are a number of aspects in the responsible use of ICT, and this paper only focused on three of them—perceived competence in privacy issues, perceived competence in handling cyberbullying and the ability to evaluate digital content.

These items measure how student teachers from both country samples perceive their competence. There is a clear distinction between the three concepts, and in both samples each concept is identified as relevant to ITE. These findings indicate that all three aspects must be addressed in ITE programmes and courses so that student teachers can be better prepared to use ICT in responsible ways both in teaching pupils and in their own studies. The professional digital competence of student teachers and their ability to use ICT responsibly is an essential part of teacher education programmes, and student teachers need to be made aware of these perspectives so that they can better address the challenges they will face in the classroom as they enter the field of education as newly

qualified teachers.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.compedu.2020.103877>.

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