

# Pre-service teachers' perceptions of social media data privacy policies

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## Abstract

Matters of data privacy related to social media are increasingly relevant for educators as happenings such as the 2018 Cambridge Analytica scandal have attracted public attention. Many educators use social media for professional purposes, including with their students and should, therefore, be knowledgeable regarding data privacy issues that impact education. This research explores this issue from an interpretive paradigm based on a mixed-methods approach derived from survey data from an international sample of 148 pre-service teachers who were studying education courses at three universities. Data suggest that pre-service teachers see both educational and distracting potential in social media, but lack knowledge regarding relevant policies and regulations, which reflects trends in the broader population. Attitudes toward educational social media use were not correlated with awareness of data privacy policies. However, comfort with companies' use of personal and student data and faith in governments' capacity to regulate social media companies were correlated. We discuss our findings in relation to the use of social media and related data privacy considerations and the need for data literacy training in teacher education programs. We include recommendations in light of the findings.

**Keywords:** data privacy, personal data literacy, pre-service teacher training, social media

## Introduction

Data privacy matters have provoked increased concerns among Internet users due to data breach scandals and the resulting discussion and creation of new public policies and regulations (Buckingham Shum & Luckin, 2019). Data privacy is especially important in the case of social media services, where privacy policies are unclear for many citizens (Brandtzaeg & Lüders, 2009), who often feel that they have insufficient control over their data (Cobo, 2019).

**Practitioner Notes**

What is already known about this topic

- For educators, social media presents challenges associated with data privacy.
- School policies, public policies and regulations related to social media and data privacy in the education sphere are inadequate and in flux.
- The focus regarding data so far in schools has been mostly on data privacy and safety, and less on data agency and empowerment.
- Pre-service teachers' beliefs and attitudes influence educational practice and innovation.

What this paper adds

- Pre-service teachers' perspectives on data privacy and social media.
- A problematization of assumptions regarding prospective teachers' supposed "digital native" status.
- Quantitative and qualitative survey data drawn from an international sample from three universities.
- Positive attitudes toward using social media for educational purposes are not necessarily related to being more aware of data privacy policies.

Implications for practice and/or policy

- More up-to-date policies and regulations related to educators' social media use are needed.
- Teacher education should help pre-service teachers develop data literacy skills related to social media.
- Data literacy should be considered in the educational design of digital learning activities for pre-service teachers, both as strategy and content.

Social media tools, such as Twitter, have come to pervade many aspects of modern lives and many educators use those tools for professional learning (Carpenter & Krutka, 2014; Robson, 2018) and as a part of teaching and learning activities (Junco, Elavsky, & Heiberger, 2013). When we consider pre-service teachers, their knowledge, skills and dispositions related to data privacy matters in social media services are especially important given that they will educate and can serve as digital role models for future generations of students. Pre-service teachers' perceptions and beliefs regarding ICTs are shown to influence their future technology use for professional development (PD) and pedagogical purposes (Owen, Fox, & Bird, 2001; Prestridge, 2010; Teo, 2009; Teo, Lee, & Chai, 2008). However, the extent to which pre-service teachers are educated about data privacy matters and how privacy concerns affect their social media use, remains largely unclear. In particular, there is a dearth of knowledge regarding pre-service teachers' perspectives on and familiarity with data privacy matters related to social media.

Given how modern society is considered data-rich, data-reliant and even data-driven, personal data literacy is an important part of digital competence (Pangrazio & Selwyn, 2019; Ridsdale *et al.*, 2015; Wolff & Montaner, 2016). Especially prospective teachers should develop knowledge and skills related to data, in order to positively influence future generations. However, no prior studies that have dealt with pre-service teachers' perceptions, concerns and beliefs regarding data privacy in relation to the use of social media in education are known to the authors of the present work. Despite the importance for educators to learn data literacy skills, there is a major

knowledge gap regarding future teachers' beliefs about data literacy and how to develop data literacy skills in initial teacher education and PD (Mandinach & Gummer, 2013).

Therefore, in this study, we seek to illuminate educators' perspectives on data privacy and literacy in relation to social media (Gezgín, 2019) via a survey. Our research questions focus on pre-service teachers' beliefs about educational uses of social media, national data privacy policies and social media companies' data privacy policies. In a further step, we explore the relationship between pre-service teachers' beliefs and awareness about national and social media data privacy policies, and their perceptions of the educational uses of social media. Our study draws upon data from pre-service teachers in three different countries (Germany, U.S. and Spain). We also offer recommendations on directions educational research and practice could take with respect to data privacy, in order to ensure data literacy as part of the digital competence that every citizen and especially, every future teacher should develop.

## Background

Over the years, social media tools have been included in education in innovative ways (Carpenter & Justice, 2017; Carpenter, Tur, & Marín, 2016; Junco *et al.*, 2013). For example, social media services are used to enhance students' roles in information research, content creation, collaboration for learning aims (Prendes, Castañeda, Gutiérrez, & Sánchez, 2016) and reflective skills (Dabbagh & Kitsantas, 2013). Also, social media is used to promote engagement and collaboration, and to extend the social networks of pre-service teachers to connect with peers and other in-service teachers (Carpenter, 2015; Korhonen, Ruhalahti, & Veermans, 2019; Quong & Snider, 2012).

Recently, the massive data generated by users of social media and other web-based platforms have led researchers to explore the possibilities of datafication to support learning (Daniel, 2015; Manca, Caviglione, & Raffaghelli, 2016). In the big data context, it is necessary to highlight personal data, which is any data that concerns information that can identify an individual. Pangrazio and Selwyn (2019) define common types of personal data: data that users—to a high degree voluntarily—give to applications and devices (self-tracking information, social media data, emails and videos), data extracted from users by applications and devices on behalf of others (involuntarily practices, eg, online searches) and data processed by applications on behalf of users (dashboards, analytics pages).

These substantial data and their usage for profit aims by international social media companies have resulted in some researchers becoming more critical in their consideration of the associated costs and benefits to education (Perrotta & Williamson, 2018). Thus, recent international research emphasizes the need for promoting ethical usage (Forbes, 2017), safe practices (Prinsloo & Slade, 2017), users' control of personal data (Kay & Kummerfeld, 2019; Pangrazio & Selwyn, 2019) and ultimately the need to develop skills for data literacy (Bhargava *et al.*, 2015). This awareness of controversial aspects of the datafication of learning aligns with critical approaches to technology-enhanced learning in which the dominance of profit-driven companies is questioned (Kühn Hildebrandt, 2019).

Taking into account these tensions, teachers can find themselves caught between “contradictory technology imperatives” (Leatham & Robertson, 2017, p. 1261), as they are encouraged to both make innovative use of technology in their classrooms and protect students' privacy (Krueger & Moore, 2015). Early adopters of technologies may be praised by some for engaging their students with the latest online tools but admonished by others regarding the need to keep student information safe. Teachers who choose to use social media for professional learning or as a part of teaching and learning activities may, therefore, not benefit from particularly clear or helpful

school policies or guidelines related to social media. Indeed, Muls, Thomas, De Backer, Zhu, and Lombaerts (2019) note that “schools often experience struggles in determining their position within the social media debate” (p.1). The same authors found that many school data privacy policies focused primarily on addressing classroom management issues such as cell phone use and cyberbullying. Apart from privacy policies around the use of images and video that include students, other kinds of privacy were not as commonly addressed (Muls *et al.*, 2019).

Different international and national regulations are related to personal data privacy. In Europe, the General Data Protection Regulation (GDPR) seeks to protect personal data and works against unauthorized disclosure, identity theft and online abuse (European Union, 2016, 2018). The GDPR applies to children and specifies that they need approval from legal guardians to use online services until they are age 16, or younger in particular countries. However, the GDPR does not provide practical educational guidelines for educators. Meanwhile, in the U.S., the Children's Online Privacy Protection Act (COPPA) and the Family Educational Rights and Privacy Act (FERPA) are the main regulations that manage the data protection of children (Topelson, Bavitz, Gupta, & Oberman, 2013). However, critics suggest that U.S. privacy laws do not adequately address contemporary student privacy concerns. Data-related decision making is delegated to schools that provide only limited transparency or accountability regarding data practices (Zeide, 2016). Furthermore, both FERPA (1974) and COPPA (2000) were enacted before the advent of many of the technologies—smartphones, social media, apps, Google Suite—that are major players in education today. Neither the European Union nor the U.S. laws appear to adequately address education-related data privacy concerns.

Future teachers will likely confront issues related to data privacy and may need to help teach their future students about data literacy. Stereotypes of young people as “digital natives” might be cause for optimism regarding prospective teachers' data literacy. However, there is little empirical evidence to support the digital native concept generally (Bullen & Morgan, 2011; Helsper & Eynon, 2010; Margaryan, Littlejohn, & Vojt, 2011) and none related to data literacy. Instead, research shows that supposedly digital native students often are not as tech-savvy as expected. For example, a survey of 2,054 Spanish university students found that the participants showed little evidence of being digital natives and revealed a “poor capability when incorporating technology with learning” (Prendes *et al.*, 2016, p. 176). Regarding data privacy, Obar and Oeldorf-Hirsch's (2020) and Steinfeld's (2016) studies found that although undergraduates consider data privacy important, they typically spend little to no time reading the privacy policies of services they utilized.

Prior research also suggests some correlation between teachers' personal and educational uses of social media (Area, Hernández, & Sosa, 2016). Furthermore, teachers' attitudes and beliefs have been explored as potential barriers to the integration of ICT in schools (Sadaf, Newby, & Ertmer, 2016). Research suggests teachers' attitudes and beliefs have emerged as the “true gatekeepers” (Ertmer & Ottenbreit-Leftwich, 2013, p. 177; Tondeur *et al.*, 2019) regarding the impact of technology on students' learning and performance. Additionally, Tondeur, van Braak, Ertmer, and Ottenbreit-Leftwich (2017) assert that the relationship between teachers' beliefs and technology usage is bi-directional and that school context, students' own abilities and policies may influence technology use.

Findings specific to pre-service teachers similarly call into question assumptions about young people's facility with using technology for more sophisticated educational purposes (Kumar & Vigil, 2011; Lei, 2009). Research by Gallego-Arrufat, Torres-Hernández, and Pessoa (2019) identifies 47% of Spanish and Portuguese student teacher participants ( $n = 317$ ) as being at *medium digital risk*, since they ignore concepts such as digital identity, footprint and reputation. Supposedly digital

native pre-service teachers are expected by some to develop (or innately possess) certain digital competencies as educators. In particular, they are expected to be able to facilitate digital competence in their future students. The Digital Competence for Educators Framework (DigCompEdu) (Redecker & Punie, 2017) in Europe and International Society for Technology in Education (ISTE) in the U.S. both list different competencies that educators should develop, including data literacy. Furthermore, the ISTE standards for students include the following: "Students manage their personal data to maintain digital privacy and security and are aware of data-collection technology used to track their navigation online" as part of being a Digital Citizen (ISTE, 2019). Teachers would logically be implicated in developing such awareness and skills in students. To date, the most common approach to personal data literacy, especially when working in the school context, is that of "data privacy and safety"; however, there are other approaches that advocate for a media literacy approach, which focuses on data competence and the use of data for empowerment purposes (Pangrazio & Selwyn, 2019).

In this study, we aim to address a gap in the literature concerning pre-service teachers' perceptions and beliefs about regulations and data privacy policies when taking into consideration social media use for educational purposes. Therefore, our research questions address the relationship between pre-service teachers' beliefs and awareness about national and social media data privacy policies, and their perceptions of the educational uses of social media. The study contributes to knowledge and understanding regarding the personal data and social media literacies of future educators and their potential influence on future students' digital competence.

## Method

In this section, we present the research questions and the context of the study, the method and instrument used.

### *Research questions*

Our research questions were as follows:

RQ1: What are pre-service teachers' beliefs about national data privacy policies and the major social media companies' data privacy policies?

RQ2: How do pre-service teachers' awareness of and beliefs about national data privacy policies and about the data privacy policies of the major social media companies relate to their perceptions of the uses of social media as a teaching and learning tool with students?

### *Context*

The participants in the study were pre-service teachers in different years of their initial teacher training at a German, a Spanish and U.S. university. Participants voluntarily responded to an online survey.

### *Method and instrument*

The study aims at the exploration of the research questions based on an interpretive paradigm, in order to focus on understanding and interpreting pre-service teachers' subjective perceptions (Farrow, Iniesto, Weller, & Pitt, 2020). The research design is descriptive and interpretive and is based on analysis through mixed-methods using a survey with a non-representative sample of pre-service teachers.

The anonymous survey had 50 items, including both closed questions (measured on the nominal or five-point ordinal Likert scale) and optional open-ended questions to explain the Likert answers.

The questions were addressed at identifying pre-service teachers' beliefs and attitudes regarding the educational use of social media and related matters of data privacy. All Likert scale items included the following response options: "strongly disagree," "disagree," "neutral," "agree," and "strongly agree."

The survey was designed collaboratively by the researchers from the universities in Spain, U.S. and Germany where data were collected and underwent expert review (Olson, 2010) by scholars from the U.S. and Spain. The instrument was created first in English and then translated into Spanish and German. The initial translations were reviewed by native-speakers and minor edits were made based on their feedback.

After an initial question regarding the provision of informed and voluntary consent, the survey included five sections: items regarding (1) participants' characteristics such as age and gender, (2) participants' knowledge regarding social media use by in-service teachers for PD and their own intentions for social media use, (3) participants' knowledge of social media use by in-service teachers for educational purposes and their beliefs concerning who is responsible for teaching about social media, (4) participants' knowledge concerning data privacy policies and (5) participants' comfort levels with the data privacy policies of major social media services. Section (1) with items regarding the pre-service teachers' background and section (3) with some of the items concerning their beliefs regarding social media use for educational purposes were used as basic information on the participants of the study. Sections (4) and (5) were used to answer RQ1 and RQ2. Results for the section (2) about pre-service teachers' knowledge regarding social media use for PD were not explored in this manuscript.

Data were analyzed quantitatively using SPSS Version 25. We generated descriptive statistics for quantitative items, including means, standard deviations, ranges and crosstab tables. We also ran various tests of association to explore relationships between participants' responses to different items. We ran multiple Mantel-Haenszel test of trend procedures to explore associations between various ordinal survey items and Mann-Whitney U tests to investigate associations between dichotomous and ordinal survey items from sections (3) and (4) and (5) (RQ2). The ordinal survey items were all five-point Likert scale type items that were coded for analysis with numerical values from 1 to 5. Four optional open-ended items allowed participants to explain their Likert scale item responses for the second, third, fourth and fifth sections of the survey. Data from these responses were analyzed qualitatively in order to help in the understanding and interpretation of the quantitative data in RQ1.

## Results

In this section, we present the results according to each research question, preceded by background information on the participants of the study.

### *Participants*

The number of completed questionnaires was 148; 47.3% ( $n = 70$ ) were from the University of Oldenburg (Germany), 16.9% ( $n = 25$ ) were from the University of the Balearic Islands (Spain) and 35.8% ( $n = 53$ ) were from Elon University (U.S.). In terms of gender, 74.3% ( $n = 110$ ) identified as female and 25.7% ( $n = 38$ ) as male, which corresponds with the overrepresentation of females in teacher education programs in Germany, Spain and the U.S.

The mean age of the participants was 22.4 years old ( $SD = 3.9$ ), with a range of 18-41 years old. The mean year of university studies was 2.7, with a range of 1-8 years of study ( $SD = 1.6$ ). In terms of the types of schools the participants were preparing to teach at, more than half indicated "Secondary School" (58.1%), while 27.7% selected "Elementary or Primary School," 19.6% "Special Education School," 8.1% "Vocational School" and one individual indicated "Pre-primary school."

Participants appeared to be frequent social media users (Figure 1), with every individual reporting that they accessed at least one social media service on a daily basis and 86.5% reporting daily access of at least two social media. Instagram, Whatsapp and Snapchat were all accessed daily by at least half of the respondents. Facebook, although accessed by the largest total percentage of the participants, appeared to attract relatively less intense use.

Regarding how they used social media services, Instagram, Whatsapp and Snapchat were all reportedly sites of more active, rather than more passive, forms of use by at least half of the respondents. When comparing daily access percentages to active user percentages (Figures 1 and 2), it appears that the participants tended to do relatively more lurking on Instagram and Facebook, while Whatsapp, Snapchat and GroupMe all attracted relatively similar rates of daily access and more active forms of use.

Regarding pre-service teachers' beliefs about educational uses of social media, almost three-quarters of the participants (74.4%) agreed with the general idea that social media can be used in educationally beneficial ways and more than half indicated they were favorable to social media use in schools (57.4%). Moreover, almost two-thirds (64.9%) agreed that social media can function as a distraction from learning. Slightly more than half (51.4%) concurred with the idea that social media use in schools can threaten student data privacy.

*RQ1: What are pre-service teachers' beliefs about national data privacy policies and the major social media companies' data privacy policies?*

Participants indicated their level of agreement with a set of statements pertaining to data privacy policies (Table 1). Just over half of the participants agreed or strongly agreed with the idea that

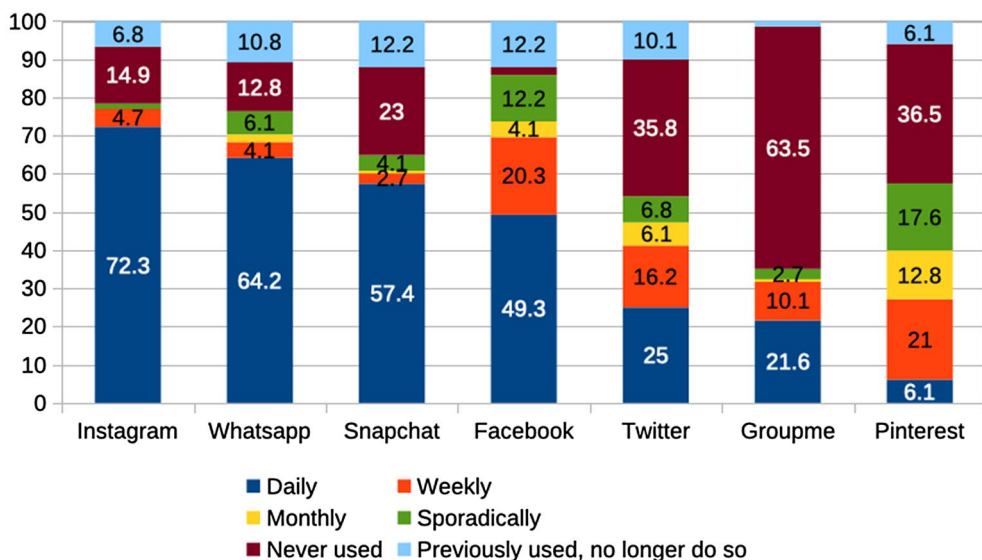


Figure 1: "How often do you login to the following social media?" Note: Percentages may not sum to 100.0% due to rounding. Values below 2 are not shown with data labels due to visibility issues in the chart. Other options could be added through an open text field, without specifying the frequency of use. Manual review of these responses found that YouTube ( $n = 7$ ), Tumblr ( $n = 7$ ) and Telegram ( $n = 6$ ) were the only services mentioned by more than five participants

[Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

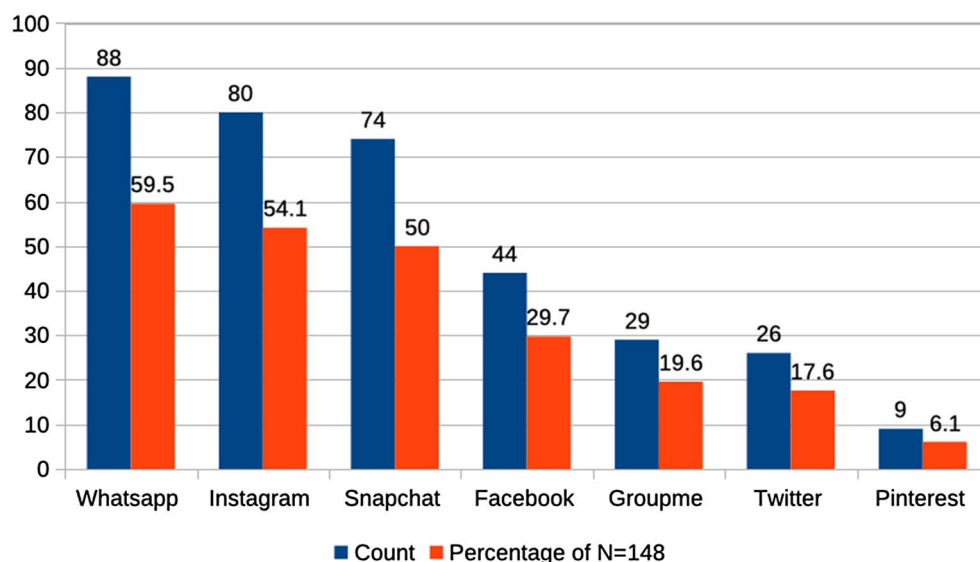


Figure 2: Participants identified as active users who contribute with messages and comments, rather than as passive users who only read what others write  
[Colour figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com/terms-and-conditions)]

teachers should teach students about data privacy policies and practices. However, majorities disagreed that they were actually aware of privacy policies related to their use of social media for personal, professional and educational purposes. In fact, the largest percentage of participants (73%) did not consider themselves familiar with privacy policies related to educational uses of social media with their students. More than half of the participants indicated they were not familiar with the data privacy policies of the popular social media services. The following answer from a participant reflects the few open text comments regarding national data privacy policies: "I know the general rule to err on the side of caution and to not communicate with students over your personal social media. But as far as specific laws go, I'm not quite sure exactly what they say [Participant 42]."

Among the participants, only 8.4% agreed that they were comfortable with how social media companies use their data and 5.6% were comfortable with how their students' data was used (Table 2). While governments could potentially regulate social media companies' use of data, only 6.9% of respondents were confident in their government's capacity to do so. When asked about some of the most popular social media companies, few participants were comfortable with how those companies used their data. Participants were least comfortable with how Facebook used their data and although they appeared to have slightly more trust in Twitter and Snapchat, in both cases it was still fewer than 20% of respondents who expressed they were comfortable with how those companies used their data. A handful of respondents included qualitative comments explaining their discomfort regarding social media companies' data use. For example, one participant wrote the following: "There have been a lot of accusations toward many major social media companies lately about them sharing people's private information. I do not trust many of these companies and therefore, take a passive role in participating [Participant 90]." Other comments referred to reasons for such discomfort, including the sharing of their personal data to third-party companies: "I wish social media companies were clearer about what they use the data for [Participant 30]" and "Concerns about the use of the data for advertising purposes. Data sale to other companies. Violation of privacy. Data leaks [Participant 99]."

Table 1: Awareness and beliefs regarding government data privacy policies

	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
I am aware of national data privacy policies related to the personal use of social media (COPPA/FERPA)	29.1	31.8	19.6	14.9	4.7
I consider myself familiar with national data privacy policies related to the use of social media by children and young people	29.1	31.8	27.0	8.8	3.4
I consider myself familiar with national data privacy policies related to the use of social media with educational purposes in the schools	31.1	41.9	18.2	8.1	0.7
I am aware of the data privacy policies of different social media services that younger students and I use	27.0	35.1	23.0	13.5	1.4
Teachers have a responsibility to teach students about data privacy policies and practices	5.4	12.2	31.1	35.1	16.2

Table 2: Participant comfort levels regarding social media companies' use of data

	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
I am comfortable with how social media companies use my data	24.4	38.2	29.0	6.9	1.5
I am comfortable with how social media companies use students' data	23.6	44.7	26.0	4.0	1.6
I am confident that my country's government can effectively regulate social media companies' use of my data	26.9	40.8	25.4	5.4	1.5
I am comfortable with how Facebook uses my data	43.3	33.9	15.8	5.5	1.6
I am comfortable with how Twitter uses my data	25.0	22.6	34.5	16.7	1.2
I am comfortable with how Instagram uses my data	27.8	33.3	27.8	9.3	1.9
I am comfortable with how Snapchat uses my data	24.0	31.0	29.0	14.0	2.0
I am comfortable with how Whatsapp uses my data	33.6	29.0	27.1	7.5	2.8
I am comfortable with how educational social media (Edmodo, Schoology) use my data	15.9	11.6	42.0	20.3	10.1

Despite their apparent discomfort with social media companies' data use, on additional survey items, the participants acknowledged their lack of knowledge regarding matters of data privacy and social media. Asked whether they had read the privacy policies for any of the social media tools they used, 72.3% reported that they had never done so. Users would have clicked that they agreed with these policies in order to join the services. Large percentages of respondents reported being uncertain about policies regarding their social media use. Asked if policies in their countries allowed them to use social media for their own professional purposes, 51.4% indicated yes, 2.0% indicated no and 46.6% reported they were uncertain. Asked if policies in their countries allowed teachers to use social media for educational purposes with students, 42.6% indicated yes, 2.0% indicated no and 55.4% reported they were uncertain.

*RQ2: How do pre-service teachers' awareness of and beliefs about national data privacy policies and about the data privacy policies of the major social media companies relate to their perceptions of the uses of social media as a teaching and learning tool with students?*

There were no associations between the extent to which participants were favorable to the use of social media in schools and the extent to which they reported being aware of governmental policies related to data privacy, data privacy for children, or educational uses of social media. Mantel-Haenszel tests of trend showed no statistically significant linear association between favorability to social media use in school and awareness of governmental policies on data privacy related to social media,  $\chi^2(1) = .010, p = .921, r = .008$ ; favorability to social media use in school and awareness of governmental policies on data privacy related to educational uses of social media,  $\chi^2(1) = .001, p = .974, r = .003$ ; and favorability to social media use in school and awareness of governmental policies related to children's data privacy,  $\chi^2(1) = .505, p = .477, r = .059$ . In other words, those who were more favorable to educational uses of social media did not necessarily indicate being any more aware of relevant government policies.

Similarly, associations were not found between the extent to which participants were favorable to the use of social media in schools and their awareness of and beliefs about the data privacy policies of the major social media companies. Mantel-Haenszel tests of trend showed no

statistically significant linear association between favorability to social media use in school and reported awareness of the data privacy policies of the popular social media services,  $\chi^2(1) = .021$ ,  $p = .886$ ,  $r = .012$ ; between favorability to social media use in school and comfort with how social media companies use teachers' data,  $\chi^2(1) = .741$ ,  $p = .389$ ,  $r = .076$  and between favorability to social media use in school and comfort with how social media companies use students' data,  $\chi^2(1) = 2.365$ ,  $p = .124$ ,  $r = .139$ . In addition, participants' confidence that their governments could effectively regulate social media companies' use of data was not associated with favorability to social media use in school,  $\chi^2(1) = .455$ ,  $p = .505$ ,  $r = .059$ . However, participants who indicated more confidence in their government's capacity to regulate social media companies were more likely to indicate they were comfortable with how social media companies used their data,  $\chi^2(1) = 33.982$ ,  $p < .001$ ,  $r = .519$  and how social media companies used students' data,  $\chi^2(1) = 24.678$ ,  $p < .001$ ,  $r = .453$ .

## Discussion

Our results appear to present a contradictory but not entirely surprising situation in which pre-service teachers tend to see both educational and distracting potential in social media and also admit to lacking knowledge regarding relevant policies and regulations. This reflects trends in the broader population; for example, the rate in our sample of not reading privacy policies is in line with the findings of prior research (Steinfeld, 2016). As in the study of Obar and Oeldorf-Hirsch (2020), a privacy paradox seems to be present: "when asked, individuals appear to value privacy, but when behaviours are examined, individual actions suggest that privacy is not a high priority" (p. 22). This contradiction led the authors to declare that the biggest lie on the Internet is the statement "I agree to these terms and conditions" (Obar & Oeldorf-Hirsch, 2020, p. 2). When users so frequently ignore terms of service, it is easy for educators do so as well, despite the need to consider ethical and professional implications (Walster, 2017) and for companies to develop privacy policies that are easier to read (Kununka, 2018).

It has been said that teacher beliefs are in the center of the relationship between "data and instructional change" (Datnow & Hubbard, 2016). The pre-service teachers in our sample seemed to be at the crossroads between data privacy and educational possibilities of social media. The somewhat contradictory combination of their educational beliefs and attitudes along with their digital habits could reinforce skepticism regarding social media's use in education or alternatively encourage those believing in the potential for social media in education. Although we did not find a correlation between attitudes to educational use of social media in schools and awareness of data privacy policies, higher confidence in the government's capacity to regulate social media companies was associated with higher levels of comfort with how social media companies used data. However, confidence in government regulation of social media companies and those companies themselves was generally very low, which aligns with prior authors' assertions that information policy is not keeping up with social media reality (Jaeger, Bertot, & Shilton, 2012; Muls *et al.*, 2019).

Failure to develop teachers' data literacies could result in their beliefs and attitudes toward technology becoming barriers to innovation. Three main factors could prevent educational innovation: first of all, the impact of scandals of unethical usages of citizens data; second, non-transparent usages of students' and teachers' data data-driven educational practices in adaptive digital environments (Perrotta & Williamson, 2018) that serve the economic interests of global businesses (Kühn Hildebrandt, 2019); and third, the fact that data awareness could be perceived by teachers as a new source of workload that further intensifies their work (Selwyn, Nemorin, & Johnson, 2017).

The lack of teacher training in digital citizenship in the U.S. and safety in Europe (Gordillo, López-Pernas, & Barra, 2019) and the responsibility that teachers have regarding teaching about and serving as role models of technology use justifies attention to data privacy and data literacy matters in teacher education. Our findings are consistent with the work of Gallego-Arrufat *et al.* (2019), who argue that many teachers' practices demonstrate insufficient digital competence. Teachers may have only developed their digital competence independently and outside formal learning programming or spaces, which underscores the need for training for teachers on related topics, among them, personal data protection in the field of education.

Our results related to the lack of awareness of data privacy issues in social media suggest that a more holistic approach is needed, with data literacy addressed from the early stages of teacher education. Students teachers' awareness must be developed so that they understand how their data are being captured and are able to interact with digital environments in ways such that they are in control of the data they generate (Pangrazio & Selwyn, 2019). This awareness has to be translated into data-driven educational designs that further already existing data mining processes to support learning (Manca *et al.*, 2016). Raffaghelli's (2019) work highlighting the related skills in the different levels of performance and areas of the European Commission's DigCompEdu framework seems a promising and useful approach to developing pre-service teachers' data literacy. Because efforts to change beliefs and attitudes require long-term interventions, the earlier we start in teacher education, the greater the possibilities for transformational experiences that advance pre-service teachers' data literacy.

### *Recommendations*

Teachers at any educational level, but particularly at the primary and secondary levels, need to manage the troublesome space created by competing technology imperatives and balance the need for students' data privacy with the need for innovation (Krueger & Moore, 2015; Leatham & Robertson, 2017). Therefore, data privacy beliefs and awareness need to be further developed during pre-service teachers' pre-service teacher training. Additionally, going beyond safety concerns to address data agency would benefit pre-service teachers as future technology role models. A critical perspective toward the educational use of social media in pre-service teacher training should incorporate a data literacy perspective (Raffaghelli, 2019). This could include, for example, pedagogical strategies to build upon the informed pedagogical choice of tools considering student data privacy (Cormier *et al.*, 2020), tactics to deal with privacy policies and strategies for personal data empowerment (Pangrazio & Selwyn, 2019; Selwyn & Pangrazio, 2018). We encourage teacher educators to consider addressing data privacy beliefs and awareness following a personal data literacy approach in which data can be identified, understood, reflected upon, managed, controlled and repurposed for creative applications (Pangrazio & Selwyn, 2019).

Considering that neither the E.U. nor the U.S. laws appear to adequately address education-related data privacy concerns, the results of this study may be a call for educational institutions to start devising regulations within the frame of their academic activities and prepare guidelines concerning data privacy and educational uses of social media.

### **Conclusions**

The digital honeymoon is over and educators need to rethink our relationship with technology (Cobo, 2019; Krutka, Heath, & Willet, 2019); data literacy must be a topic of focus in this rethinking, since big data and analytics in education have come to stay (Daniel, 2015).

The study provides a novel contribution by providing an insight into pre-service teachers' perceptions of the educational use of social media and related data privacy policies and confirms

trends in the broader population related to data literacy. Previous research had either focused on pre-service teachers' digital competence (Gallego-Arrufat *et al.*, 2019) or on in-service teachers' perceptions toward social media policies in schools (Kumar, Chetty, Clegg, & Vitak, 2019; Muls *et al.*, 2019). Furthermore, this contribution addresses the topic from an interpretive approach based on quantitative and qualitative analysis of data.

However, the results of the study should be considered in light of its limitations. The first and more important limitation concerns the data analyzed in the study, which is self-reported by the participants and does not include additional triangulated data. Therefore, our claims are based on results that concern pre-service teachers' attitudes, without considering other complex pedagogical and regulatory factors. A second limitation is the type of sample, which was based on convenience and not necessarily representative of the whole collective of pre-service teachers in each of the participating universities and countries. Furthermore, we did not ask if the participants were preparing to become teachers in a particular discipline (eg, mathematics, science, history, world languages) and we, therefore, may have missed differences among participants associated with academic disciplines.

In future work, more qualitative data from pre-service teachers could be collected to complement the results of this study, eg, in the form of interviews. Further research could explore other dynamics related to data privacy for educational uses of social media, such as related pedagogical strategies and universities and schools' policies, among other topics. In another line of study, a comparative approach to studying pre-service teachers' attitudes and beliefs about social media and data privacy could be taken into account, considering that a like-for-like comparison may be challenging due to differences in the educational landscape in terms of attitudes and policies. Another potentially beneficial area of research is to explore other methods to analyze pre-service teachers' data literacy and to create and validate the educational design of data literacy activities for pre-service teachers. Finally, future research could investigate the extent to which the coronavirus pandemic has created new dynamics that influence attitudes toward data privacy and educators' uses of social media for just-in-time professional learning (Trust, Carpenter, Krutka, & Kimmons, 2020).

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## Statements on open data, ethics and conflict of interest

Researchers may contact the corresponding author for access to de-identified data.

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