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Where there's a will, is there a way? Exploring digital competence in pre-service teachers' intentions to use technology

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ABSTRACT

This study investigated primary-level pre-service teachers' (PSTs) intentions and digital competence for using digital technology in their professional practice in Ireland. Utilising the Theory of Planned Behaviour, the research examined self-reported attitudes, subjective norms, and perceived behavioural control as predictors of PSTs' intentions. It also explored the role of digital competence as a predictor. Data from 300 final-year PSTs, collected using validated scales (I-TEL and DigCompEdu), indicated high intentions but predominantly beginner digital competence levels. Attitude towards use emerged as the strongest predictor of intention, followed by perceived behavioural control. Despite a positive correlation with intention, digital competence did not significantly enhance the prediction model. Given European policy interest in emerging technologies, these findings hold global implications for Initial Teacher Education (ITE). They highlight ITE's need to prioritise improving PSTs' attitudes and beliefs about digital technology, alongside developing their digital competence, to meet educational mandates and enhance classroom practice.

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Pre-service teachers; initial teacher education; digital competence; intention; digital technology

1. Introduction

In an era of ever-increasing digitisation, the use of digital technology has become a priority of education policy internationally (e.g. European Commission 2020; UNESCO 2023). This priority is reflected in national curriculum specifications and educational policy documents in many countries, including Ireland (Department of Education 2022; National Council for Curriculum and Assessment 2023). For example, revisions to the primary school curriculum in Ireland emphasise preparing children to 'become curious, confident, and critical users of digital technology' (NCCA 2023, 10), while national policy emphasises preparing all learners to 'participate fully as global citizens in a digital world' (DE 2022, 11). The responsibility for enabling children to use digital technology in the ways mandated by curricula and education policy ultimately falls to teachers. However, despite pre-

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existing policy mandates to make use of digital technology (e.g. Department of Education and Skills 2015), in-career primary-level teachers in Ireland have been found to make only moderate use of digital technology in their professional practice, with some areas of use more developed than others (Cosgrove et al. 2019; Feerick, Cosgrove, and Moran 2021; Inspectorate 2020). The use of digital technology in the teaching profession may become more embedded over time, but an important step towards supporting pedagogical use is to ensure that pre-service teachers are supported to develop understandings and competences relating to digital technology use.

Measures targeting pre-service teachers preparing to enter the profession have been introduced. Specifically, the accreditation standards for teachers in Ireland have been revised to include requirements to develop the digital competence of pre-service teachers (The Teaching Council 2020); with comparable revisions evident in other countries (Janeš et al. 2023). Recent studies have reported varying levels of PST digital competence, e.g. in Spain (Tarraga-Minguez, Suarez-Guerrero, and Sanz-Cervera 2021), Germany (Quast, Rubach, and Porsch 2023), Vietnam (Hoang 2024), and Turkey (Reisoğlu and Çebi 2020). Studies also indicate that the attitudes and intention of PSTs to use digital technology become less positive as they complete their programme of initial teacher education (Gisbert-Cervera, Usart, and Lázaro-Cantabrana 2022; Herring Watson and Rockinson-Szapkiw 2021). Thus, while PSTs are expected to be competent in using digital technology in their professional practice, the extent to which they (i) intend to use digital technology in the ways mandated by policy and (ii) possess the requisite digital competence to do so, remains unclear.

This study aimed to address this gap by measuring the intentions and digital competence of Irish primary-level PSTs to use digital technology in their professional practice. In addition, it explores the relationship between digital competence and intentions. Specifically, it addresses the following questions:

(1) What are the self-reported intentions and digital competence of Irish primary-level PSTs to use digital technology in their professional practice?
(2) What are the major predictors of PSTs' intentions to use digital technology in their professional practice?
(3) Can digital competence contribute to predicting PSTs' self-reported intentions to use digital technology in their professional practice?

2. Literature review

2.1. Theoretical frameworks of intention

To examine the intention of primary-level PSTs to use digital technology in their professional practice of learning, teaching, and assessment, it is necessary to identify a suitably robust and comprehensive theoretical framework of intention. Three of the most commonly accepted and validated theories of intention (Hou and Shen 2024) include the Theory of Planned Behaviour (TPB), the Technology Acceptance Model (TAM), and the Unified Theory of Acceptance and Use of Technology (UTAUT). The first of these, the TPB, examines behavioural intention (i.e. to use digital technology) through three variables: attitude towards use, subjective norms, and perceived

behavioural control (Ajzen 1991). TAM (Davis 1986) proposes that the actual use of a system (i.e. a specific digital technology) can be predicted by an individual's attitude towards using the technology, as influenced by perceived ease of use and perceived usefulness, and further influenced by the specific technology's features and capabilities. UTAUT (Venkatesh et al. 2003) integrates key elements of eight models, and proposes that behavioural intention to use a specified technology is composed of four determinants and four moderators of relationships. The influence of the aforementioned models can be seen in its determinants of intention; e.g. performance expectancy is linked with perceived usefulness (TAM), social influence with subjective norm (TPB). Table 1 provides an overview of key variables included in these frameworks.

In comparing these models, analysis by Teo found the TPB to better explain technology acceptance for a sample of teachers ($n = 673$), compared to TAM and UTAUT (2013). Examination of these frameworks in the context of this study highlights two crucial differences: the specificity of digital technology, and the time-bound nature typically applied to both the TAM and UTAUT. These models are designed to predict actual use of a specific DT. In the case of the TAM, the perceived ease of use and perceived usefulness are specific to the DT under examination. In UTAUT, both performance and effort expectancies are linked to the specific DT. This presents a barrier to the use of both models as the present study explores DT use by PSTs more broadly and does not list specific technologies. The TPB offers a useful lens to examine the intention of primary-level PSTs to use digital technology in their ongoing professional practice. This is due to its emphasis on the influence of a PST's attitudes and technology self-efficacy, as well as consideration in the subjective norm to the influence of other actors upon their technology use.

Table 1. Operational definition of variables commonly included across frameworks.

Name of variable	Definition	Reference	Model
Attitude toward use	An individual's positive and negative knowledge and attitudes held toward the behaviour; composed of affective and instrumental attitudes	Rhodes and Courneya (2003)	TPB
Behavioural intention	How hard an individual is willing to try, or how much of an effort they are planning to exert, to perform the behaviour; an indication of a person's readiness to perform a behaviour	Ajzen (1991); Fishbein and Ajzen (2011)	TPB; UTAUT
Perceived behavioural control	An individual's perception of how easy or difficult the performance of the behaviour is, including: 1) capacity: conceptually very similar to self-efficacy (Bandura 1997); 2) controllability: an individual's perception of personal control over the behaviour, including perceptions of whether there are resources available to support the behaviour.	Ajzen (2012)	TPB
Perceived ease of use	The degree to which a person believes that using a system would be free of effort	Davis (1986)	TAM
Perceived usefulness	The degree to which a person believes that using a particular system would enhance their job performance	Davis (1986)	TAM
Subjective norm	An individual's evaluative judgements about the perceived social pressure to behave in a certain way, encompassing: 1) Injunctive social norm: whether the behaviour is approved by others; 2) Descriptive social norm: whether the behaviour is performed by others	Rhodes and Courneya (2003)	TPB

2.2. The Theory of planned behaviour

The TPB is recognised as one of the dominant models of the relationship between attitude and behaviour in social psychology (Costarelli and Colloca, 2007). As seen in Figure 1, the TPB proposes that the immediate antecedent of a behaviour is behavioural intention, with stronger behavioural intention positively associated with actual behaviour (Ajzen 1991, 181). In this study, intention represents the motivational readiness of PSTs (or how strongly a PST plans) to use digital technology as part of their professional practice for learning, teaching, and assessment; with stronger intention positively associated with actual use of digital technology by PSTs.

As illustrated in Figure 1, intention is determined by three variables: attitudes, subjective norm, and perceived behavioural control. Attitudes reflect a PST's positive or negative evaluations of the use of digital technology for learning, teaching and assessment. Attitudes are informed by beliefs and experiences, with a PST's beliefs and experiences influencing their attitudes. The subjective norm refers to evaluative judgements by PSTs about perceived social pressures to use digital technology. It encompasses two dimensions: perceptions of whether digital technology use is approved of, and expected, by others; and perceptions of whether others use digital technology in their professional practice. As PSTs interact with, and are influenced by, a range of actors during initial teacher education, there may be variance in the social pressures perceived by individual PSTs. Perceived behavioural control refers to a PST's perception of how easy or difficult it is to use digital technology in their professional practice. This is influenced by perceptions of PSTs as to whether suitable resources are available (e.g. digital devices), and their beliefs about their ability to successfully use digital technology; i.e. self-efficacy (Bandura

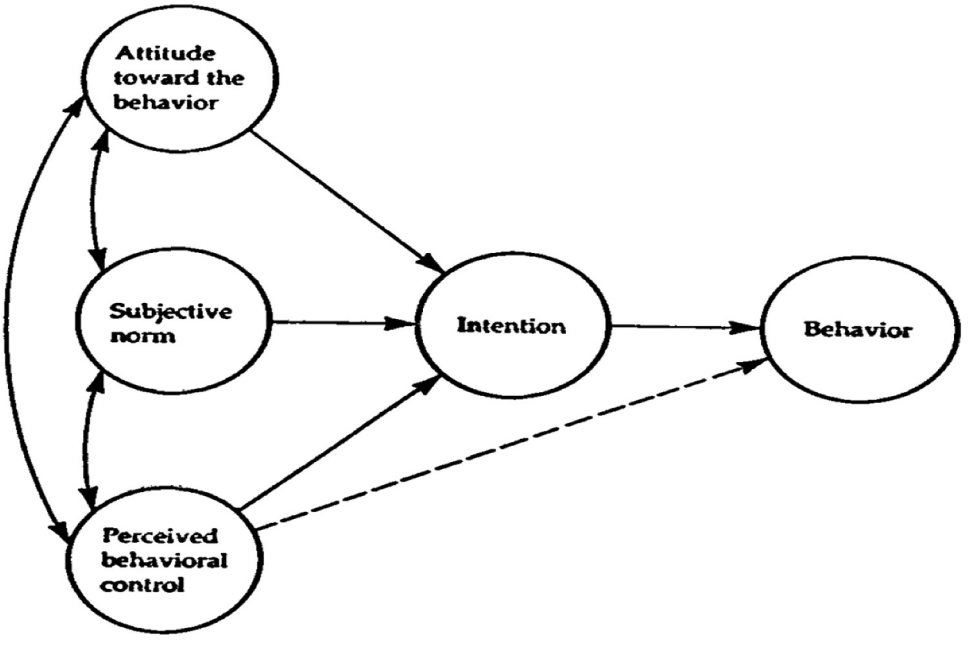

Figure 1. The theory of planned behaviour (Ajzen 1991).

1997). Self-efficacy is a future-oriented perception about one's own ability or competency (Hong et al. 2022), and, as it is a personally held rating, there can be variability between PSTs.

Due to the emphasis it accords to perceived behavioural control upon both the teacher's self-efficacy, and perceptions of control and support in using technology, the TPB has been found to be especially suitable for examining teachers' use of digital technology (Heuckmann, Hammann, and Asshoff 2020; Teo and Tan 2012). Furthermore, this model considers social influences upon behavioural intention (E. W. L. Cheng 2019), and has been shown to enable researchers to better understand and conceptualise the disparity between behavioural intention and the actual behaviours of teachers using digital technology in their professional practice (Shaw et al. 2013). The TPB is not without its detractors, as unaccounted mediator variables (e.g. age, socio-economic status) have been found to predict behaviour (McEachan et al. 2011), leading to suggestions that more recently developed models may offer greater reliability (Sniehotta, Presseau, and Araújo-Soares 2014). For PSTs, gender may also be an unaccounted-for mediator, particularly given reports of gender bias in PSTs' self-efficacy relating to digital technology use (Kruskopf et al. 2024). Despite these known limitations, studies in the field of psychology have found the TPB to be most predictive of behaviour among younger participants (e.g. PSTs) who complete a self-reported measure of behaviour over a short term (McEachan et al. 2011; Sniehotta, Presseau, and Araújo-Soares 2014).

2.3. Digital competence

Digital competence suffers from definitional confusion owing to the variations in meanings attributed to the term, depending on the field and background of the researcher (Moynihan et al. 2023; Rubach and Lazarides 2023). This is compounded by differences across policy contexts, as well as the variety of terms used to refer to broadly the same concept, including digital competence, digital competency, digital skill, and digital literacy (Fernández-Batanero et al. 2022; Smestad et al. 2023). As highlighted by Gouseti et al. (2024), this definitional confusion indicates how complex and multi-faceted the concept of digital competence is, with this exacerbated by ongoing developments in digital technology. In this study, the digital competence of PSTs refers to the skills, attitudes and knowledge required by PSTs to use digital technology pedagogically; it encompasses more than technical efficacy, and conceptualises digital technology as an enabler of learning (Castañeda and Graves Wolf 2020; Suárez-Guerrero, Gutiérrez-Esteban, and Ayuso-Delpuerto 2024; Tarraga-Minguez, Suarez-Guerrero, and Sanz-Cervera 2021). As is commonly accepted (Smestad et al. 2023), this study employed a framework of teacher digital competence in an attempt to capture the complexity of this concept.

Four key digital competence frameworks were identified through a review of the relevant literature, based on their prominence and frequent use in prior research studies: The Technological Pedagogical Content Knowledge Framework (Koehler and Mishra 2009); International Society for Technology in Education Educator Standards (Crompton and International Society for Technology in Education 2017; The UNESCO ICT Competency Framework for Teachers [UNESCO] 2018); The Digital Competence Framework for Educators [DigCompEdu] (Joint Research Centre (European Commission) (Redecker and Punie 2017). While there are similarities across frameworks, none provides exhaustive

coverage of the nuanced concept of a PST's digital competence, or how this might adapt in line with advancements in DT (Gisbert-Cervera, Usart, and Lázaro-Cantabrana 2022). However, upon careful consideration, DigCompEdu was identified as providing the best fit for Irish primary-level PSTs. This was owing to its explicit emphasis on pedagogical use and the development of learner digital competence, and its prominence within education policy impacting PSTs in Ireland.

2.4. The development of PST intentions to use digital technology during Initial teacher education

Initial teacher education (ITE) refers to the preparation of PSTs to join the teaching profession (Cochran-Smith *et al*., 2015). ITE typically involves numerous actors across multiple sites of practice of ITE, which in turn have been shaped by external forces, such as policy and curriculum. Consequently, the development of a PST's self-reported intention to use digital technology in their professional practice is a complex process (Ell *et al*., 2017). In Ireland, programmes of ITE involve two primary sites of practice: the higher education institution (HEI) and school placement (SP). PSTs interact with, and are potentially influenced by a range of actors including HEI tutors, SP tutors, cooperating (i.e. mentor/supervising) teachers, and fellow PSTs (Moynihan et al. 2023). Furthermore, each actor has the potential to positively and/or negatively influence PST attitudes, beliefs and experiences, intentions, and self-efficacy. SP has been found to be particularly influential upon PSTs, with Resch et al., reporting that PSTs repeatedly identify SP experiences as the most effective part of their ITE, regardless of the HEI (2022). This influence is seen in recent studies, which report differences in both the self-reported intention and digital competence of PSTs dependent on their stage of ITE. A large-scale ($n = 1214$) Spanish study utilised a DigCompEdu-aligned instrument to examine primary-level PST digital competence and found that first-year PSTs self-reported higher levels of digital competence compared with second- and third-year PSTs (Gisbert-Cervera, Usart, and Lázaro-Cantabrana 2022). Similarly, final-year PSTs were found to have significantly lower intentions to use digital technology compared to first-year PSTs in an American study of PSTs (Herring Watson and Rockinson-Szapkiw 2021) utilising an instrument informed by the TPB; the I-TEL Scale. Significantly, in both cases, the researchers attribute differences between PST cohorts to the influence of SP experiences. This suggests the intentions and digital competence of PSTs are altered in correspondence with the varying actors, influences and experiences which compose SP.

Three studies that informed this study, specifically the relationship hypothesised in RQ3, include Habibi et al. (2022), Gökçearslan, Yildiz Durak, and Atman Uslu (2022), and Antonietti, Cattaneo, and Amenduni (2022). In each study, a framework of intention has been modified to include variables related to the pedagogical use of technology to enhance it for educational contexts. Habibi et al. (2022) added a variable inspired by the TPACK framework of technology integration to the TPB. Subjective norm was identified as the strongest predictor of technology use among PSTs, followed by perceived behavioural control. Notably, perceived behavioural control was influenced by the novel TPACK variable. In explaining differences in reported use of digital technology, Habibi and colleagues highlight the potential impact of differences in the modelling of technology use by HEI tutors.

Gökçearslan, Yildiz Durak, and Atman Uslu (2022) added a digital competence variable to the Technology Acceptance Model. Their findings highlight the influence of digital competence upon perceived ease of use, which, alongside perceived usefulness, had the greatest influence upon PST intentions. Similarly, Antonietti, Cattaneo, and Amenduni (2022) introduced a DigCompEdu-based digital competence variable to the Technology Acceptance Model. Their novel DigCompEdu-based variable (TDCB) was reported to be positively related to perceived usefulness, which was highly related to in-career teacher intentions. These studies suggest that higher levels of digital competence had a positive influence upon intentions to use DT; namely, digital competence was positively associated with use of digital technology.

3. Methods

3.1. Design, participants, setting, and procedures

A predictive correlational study design was employed to examine the three research questions guiding this study. A non-probability volunteer sampling approach was deployed to recruit participants from the cohort of PSTs in their final year of study in the four-year concurrent undergraduate Bachelor of Education degree programme in a major teacher education institute, Dublin City University Institute of Education: BEd4 ($N = 389$). This setting was chosen as it accounts for approximately 40% of PSTs joining the teaching profession in Ireland from undergraduate programmes each year (Department of Education 2021). The selection of this site was justified by its role as a 'benchmark' institution; the curriculum, entry requirements, and practice standards are strictly aligned with national accreditation standards mandated by the Teaching Council (2020). As these requirements apply to all accredited programmes in Ireland, the institutional context is broadly comparable to other ITE providers. These PSTs were purposefully chosen as they had completed five school SP experiences totalling 22 weeks in classrooms to date. They therefore had direct knowledge and lived experience of classroom contexts, while also avoiding potential naivety noted in previous related studies. PSTs had undertaken a foundation module relating to digital technology use in their first year (1.6 ECTS), and were undertaking another digital technology module (1.5 ECTS) at the time of this study. The study was approved by the university's research ethics committee on 13/10/2022. Participants who provided informed consent were asked to complete the anonymous survey instrument on digital devices during the first semester of the 2023–2024 academic year. After deleting incomplete or erroneous survey responses, the response rate was 77% ($n = 300$) of the sampling frame. This high response rate mitigates the potential for non-response bias, as the sample captures the vast majority of the target population within the sampling frame. According to Mangione (1995), response rates over 70% are categorised as 'very good' to 'excellent' for establishing the rigour of survey-based quantitative results. Consequently, the findings can be considered a reliable reflection of the PST cohort at this benchmark institution. The majority of participating PSTs were female (85.7%), and under the age of 24 (95.7%). Table 2 presents participant demographics.

Table 2. Participant demographics ($n = 300$).

Demographic Categories		Percentage (%)	Frequency
Gender	Female	85.7%	257
	Male	14.3%	43
Age	18 – 23 years	95.7%	287
	24 years or older (i.e. mature students)	4.3%	13

3.2. Instrumentation

The anonymous online survey instrument was composed of three sections. Section One gathered demographic information (i.e. age, gender). Age was gathered to identify any PSTs categorised as mature students (i.e. 24 years or older) and may therefore have had distinctly different school experiences. Gender was gathered to facilitate analysis of potential gender differences, as highlighted in previous related studies (Cheng, Chang, and Romero 2022; Kruskopf et al. 2024). The remaining sections employed pre-existing validated scales: the Intention to Use Technology-enabled Learning (I-TEL) Scale (Herring Watson and Rockinson-Szapkiw 2023), which measured the self-reported intentions of PSTs to use digital technology in their professional practice; and the DigCompEdu self-assessment tool (Caena and Redecker 2019), which measured self-reported digital competence. This order of presentation was purposely chosen to enhance validity, by preventing I-TEL responses from being potentially biased by the DigCompEdu self-assessment scale, as this included statements ordered by level of proficiency. The I-TEL scale can be accessed in Herring Watson and Rockinson-Szapkiw (2023), and the DigCompEdu self-assessment tool can be accessed in Cabero-Almenara and Palacios-Rodríguez (2020). Both established, peer-reviewed instruments have been used with populations with demographic characteristics similar to the current sample, thus supporting both the construct validity and conceptual relevance of survey items.

The I-TEL scale was utilised as it is based upon the constructs of the TPB and was found to provide reliable results for PSTs (Herring Watson and Rockinson-Szapkiw 2023). I-TEL consists of 22 Likert-type scale items, scored using a seven-point scale from 'strongly disagree' to 'strongly agree'. The 22 items are divided into five factors (F1-perceived behavioural control, F2-future subjective norm, F3-attitude towards behaviour, F4-intention, F5-present subjective norm), with each factor scored by calculating the average. It was necessary to localise the language of the scale (e.g. education major was changed to BEd), with two further minor language changes made following a pilot study with PSTs ($n = 24$), who did not participate in the later study. Sample items are presented in Table 3.

The DigCompEdu self-assessment tool (Caena and Redecker, 2019) is a validated scale which mirrors DigCompEdu. It consists of 22 items, one per DigCompEdu competence, and is organised in six sub-dimensions. DigCompEdu includes six proficiency levels; however, Caena and Redecker modified the self-assessment scale to present five possible answers for each item, to reflect the progression stages expected to be prevalent among teachers (2019). Sample items and answers are presented in Table 4.

Table 3. I-TEL sample items (Herring Watson and Rockinson-Szapkiw 2023).

Subscale	# of items	Sample Item
F1-perceived behavioural control	6	I can use digital technology in my future classroom
F2-future subjective norm	4	Colleagues (e.g. other teachers and support staff) at my future school will expect me to use digital technology in my classroom.
F3-attitude toward behaviour	5	Digital technology enhances the quality of learning.
F4-intention	4	I intend to use digital technology in my future classroom.
F5-present subjective norm	3	My lecturers and school placement tutors expect me to use digital technology in my future classroom.

Note. Respondents indicated their level of agreement with each item using seven-point Likert-type scale.

3.3. Statistical analysis

All data from the surveys were imported into SPSS, Version 28 (IBM Corp, 2023) and cleaned. Totals were computed for each of the I-TEL factors. A further variable, subjective norm combined, was computed by averaging F2-future subjective norm and F5-present subjective norm; this was to ensure comparability with TPB-informed instruments, which do not separate subjective norm. Items on the DigCompEdu self-assessment scale were scored using a five-point scale (from 0 to 4). A new variable which calculated the overall digital competence score was computed. This variable was then mapped onto the six proficiency levels of the framework, see Table 5.

4. Results

4.1. Self-reported attitudes, beliefs and intentions of PSTs regarding the use of digital technology in their professional practice

The I-TEL scale had a high level of internal consistency, as determined by Cronbach's alpha: intention = 0.91, attitudes = 0.79, present subjective norm = 0.83, future subjective norm = 0.68, perceived behavioural control = 0.81 (Howitt and Cramer 2014). The lower alpha value reported for future subjective norm is likely due to the high agreement (i.e. low variation) of participant scores. The reported alpha values are quite similar to those reported by Herring Watson and Rockinson-Szapkiw (2023). As shown in Table 6, mean scores for each subscale were very negatively skewed, indicating high agreement with all scale items. These subscale scores ranged from 1 to 7, with higher scores indicating higher levels of agreement with the items on that subscale. I-TEL variables were not normally distributed, as assessed by Kolmogorov-Smirnov's test ($p < .001$) and inspection of the relevant distributions. This is most likely attributed to the very negatively skewed scores for each subscale.

Follow-up analyses were run to determine if there were age- or gender-based differences in Intention to use digital technology. Intention to use digital technology scores for each level of age and gender were not normally distributed, as assessed by Kolmogorov-Smirnov's test ($p < .001$). A Mann-Whitney U test confirmed that there was no statistically significant difference in Intention to use digital technology according to age category: for PSTs 20–23 years ($n = 287$, $Md = 6.75$), and PSTs classified as mature students, i.e. PSTs 24 years or older ($n = 13$, $Md = 6.5$), $U = 538.00$, $z = -.324$, $p = .746$, $r = 0.02$. There was

Table 4. DigCompEdu self-assessment tool sample items (Caena and Redecker, 2019).

Subscale	# of items	Sample Item	Answers
Digital Resources	3	I can use digital technology in my future classroom	I only rarely use the internet to find resources. I use search engines and educational platforms to find relevant resources. I evaluate and select resources on the basis of their suitability for my learner group. I compare resources using a range of relevant criteria, e.g. reliability, quality, fit, design, interactivity, appeal. I advise colleagues (fellow BEd students, teachers) on suitable resources and search strategies.
Teaching and Learning	4	Teaching	I do not or only very rarely use digital devices or digital content in my teaching. I use available classroom technologies, e.g. digital whiteboards, projectors, PCs. I organise and manage the integration of digital devices (e.g. classroom technologies, students' devices) into the teaching and learning process. I use digital technologies in teaching to increase methodological variation. I experiment with and develop new formats and pedagogical methods for instruction.
Assessment	3	Assessment Strategies	I do not or only very rarely use digital assessment formats. I use digital technologies to create assessment tasks which are then administered in paper-format. I use some existing digital technologies for formative or summative assessment, e.g. digital quizzes, e-portfolios, games. I use a range of e-assessment software, tools and approaches, for formative assessment, both in the classroom and for learners to use after school. I develop new digital formats for assessment, which reflect innovative pedagogical approaches and allow for the assessment of transversal skills.
Empowering Learners	3	Differentiation and personalisation	I do not know how digital technologies can help me offer personalised learning opportunities. I am aware that digital technologies can support differentiation and personalisation, e.g. by providing activities at different levels and speeds. I select and use some learning activities, e.g. quizzes or games, that allow learners to proceed at different speeds, select different levels of difficulty and/or repeat activities previously not solved adequately. When designing learning and assessment activities, I use a range of different digital technologies, which I adapt and adjust to account for different needs, levels, speeds and preferences. I reflect on, discuss, re-design and innovate pedagogical strategies for personalising education through the use of digital technologies.

(*Continued*)

Table 4. (Continued).

Subscale	# of items	Sample Item	Answers
Facilitating Learners' Digital Competence	5	Digital content creation	I do not or only very rarely consider how to foster digital content creation by learners. I encourage learners to express themselves using digital technologies, e.g. by producing texts, images, videos. I implement learning activities in which learners use digital technologies to produce digital content, e.g. in the form of text, photos, other images, videos, etc. I use a range of different pedagogic strategies to enablers to express themselves digitally, e.g. by contributing to blogs, by using e-portfolios for their digital creations. I guide learners in designing, publishing and licensing complex digital products, e.g. creating websites, blogs, games or apps.
Professional Engagement	4	Reflective Practice	I know that I need to enhance my digital skills, but I am unsure how and where to start. I am aware of the limits of my own digital competence and my training needs. I seek to improve and update my digital pedagogical competence through experimentation and peer-learning. I evaluate, reflect on and discuss with peers how to use digital technologies to innovate and improve educational practice. I follow current research on innovative teaching and integrate research findings into my practice.

Note. For each item, respondents selected the answer which best described their professional practice.

Table 5. Mapping the DigCompEdu self-assessment scale (Caena and Redecker, 2019) to the DigCompEdu proficiency levels (JRC, Redecker and Punie 2017, 29).

Proficiency Level	A1 Newcomer	A2 Explorer	B1 Integrator	B2 Expert	C1 Leader	C2 Pioneer
Scoring of Scale	0 to 19	20 to 33	34 to 49	50 to 65	66 to 80	81 to 88

Table 6. Descriptive Statistics for I-TEL variables ($n = 300$).

Variable	*M*	*SD*
Intention to use Digital Technology	6.48	.77
Attitude toward Digital Technology	6.26	.53
Subjective Norm (Future)	6.07	.65
Subjective Norm (Present)	5.75	.81
Subjective Norm (Combined)	5.91	.65
Perceived Behavioural Control	5.79	.64

Note. I-TEL variables scored on a scale of 1–7.

however a statically significant difference in intention according to gender, with male PSTs ($n = 43$, $Md = 6.5$) reporting lower intention to use digital technology compared to female PSTs ($n = 257$, $Md = 6.75$), $U = 6583$, $z = 2.079$, $p = .038$ (two-tailed), $r = 0.12$, representing a small effect size (Crotty, 1998).

4.2. Self-reported digital competence of PSTs

The DigCompEdu self-assessment tool had a high level of internal consistency, as determined by a Cronbach's alpha of 0.89 ($M = 30.04$, $SD = 11.30$). Overall, digital competence levels ranged from Newcomer (A1) (18.7%) to Expert (B2) (4.7%), with the majority classified as Explorer (A2) (43%). Figure 2 depicts the self-reported digital competence of PSTs, as categorised into the six digital competence proficiency levels of DigCompEdu. Notably, no participants were classified at 'advanced' competence proficiency levels (C1, C2).

Follow-up analyses were run to determine if there were age- or gender-based differences in digital competence. Digital competence scores for each level of age and gender were not normally distributed, as assessed by Kolmogorov-Smirnov's test ($p < .05$). A Mann-Whitney U test confirmed that there were no significant differences in Overall Digital Competence levels between males ($n = 43$, $Md = 28$) and females ($n = 257$, $Md = 30$), $U = 5469$, $z = -0.107$, $p = .914$, $r = 0.01$. Furthermore, a chi-square test for association did not reveal statistically significant associations between gender and any of the Digital Competence areas ($p > .05$for all instances). A Mann-Whitney U test confirmed there was no statistically significant difference in Overall Digital Competence levels according to age category, for PSTs 20–23 years ($n = 287$, $Md = 30$), and PSTs classified as mature students, i.e. 24 years or older ($n = 13$, $Md = 25$), $U = 385.500$, $z = -1.199$, $p = .231$, $r = 0.07$.

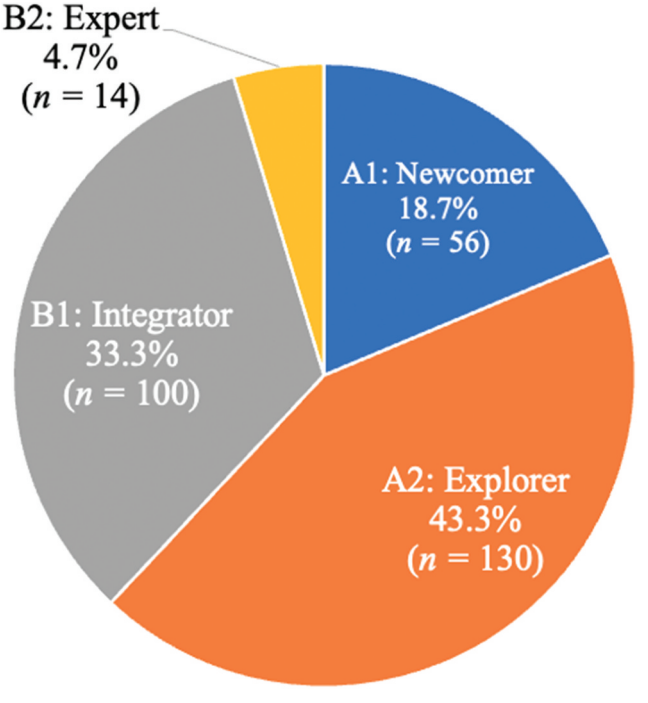

Figure 2. Overall digital competence proficiency levels in this study ($n = 300$).

4.3. Predicting the intentions of PSTs

I-TEL variables were not normally distributed, as assessed by Kolmogorov-Smirnov's test ($p < .001$). Results of Spearman's correlation analyses demonstrate that a significant association existed between the I-TEL variables. Namely, between the dependent variable (intention), and each of the three independent variables (attitude towards use, subjective norm, perceived behavioural control), see Table 7.

A hierarchical multiple regression was run to predict Intention to use digital technology, from attitude towards use, subjective norm, and perceived behavioural control. Before conducting the multiple regression, assumption testing was completed. No assumption violations were found, indicating that the multiple regression was appropriate for analysing the data set. The multiple regression model statistically significantly predicted Intention to use digital technology, $F(3, 296) = 29.026$, $p < .001$, adj. $R^2 = .219$, $F^2 = .28$. All three variables added statistically significantly to the prediction, $p < .05$. Regression coefficients and standard errors are presented in Table 8.

This model accounted for 22% of the variance in the self-reported intention of PSTs to use digital technology. According to Cohen's (1988) guidelines for the magnitude of the variance explained in multiple regression models, the effect size in this model is considered small to medium. In practical terms, for every extra unit in attitude towards use, the Intention of a PST to use digital technology would be expected to increase by 0.33 points (43% of a standard deviation). Results indicate that the I-TEL scale can be used to make valid inferences about the intention of PSTs in Ireland to use DT in their professional practice of teaching, learning and assessment.

Table 7. Correlation matrix for I-TEL variables ($n = 300$).

Variable	Intention	Attitude Toward Use	Subjective Norm (Combined)	Perceived Behavioural Control
Intention	–	.449***	.319***	.382***
Attitude Toward Use	.449***	–	.343***	.411***
Subjective Norm (Combined)	.319***	.343***	–	.353***
Perceived Behavioural Control	.382***	.411***	.353***	–

Note. *$p < .05$. **$p < .01$. ***$p < .001$.

Table 8. Multiple regression results for intention to use digital technologies in my professional practice.

	B	95% CI for *B*		*SE B*	*β*	ΔR^2
Intention		LL	UL			
Model						
Intercept	2.945***	2.18	3.71	.39		.22***
Attitude Toward Use	.354***	.23	.47	.06	.33***	
Subjective Norm (Combined)	.107*	.01	.20	.05	.12*	
Perceived Behavioural Control	.126*	.02	.23	.05	.14*	

Note. Model = "Enter" method in SPSS Statistics; *B* = unstandardised regression coefficient; CI = confidence interval; LL = lower limit; UL = upper limit; *SE B* = standard error of the coefficient; β = standardised coefficient; ΔR^2 = adjusted coefficient of determination.
*$p < .05$. **$p < .01$. ***$p < .001$.

4.4. Examining whether digital competence can contribute to the prediction of self-reported intention

As not all variables were normally distributed, a Spearman's rank-order correlation was run to assess the relationship between a PST's digital competence score and their intention to use digital technology. Spearman's correlation was conducted as the sample size was deemed robust enough to manage two extreme outliers, which represented <0.01% of the sample. There was a statistically significant, weak positive correlation between digital competence score and intention to use digital technology, r_s (298) = .154, $p = .007$, with digital competence score explaining 2.37% of the variation in Intention to use digital technology.

Next, a multiple regression was run to predict self-reported Intention to use digital technology from a model composed of attitude towards use, subjective norm, perceived behavioural control, and Digital Competence score. Before conducting the hierarchical multiple regression, assumption testing was completed. No assumption violations were found, indicating that the multiple regression was appropriate for analysing the data set. The multiple-regression model statistically significantly predicted Intention to use digital technology, $F(4, 295) = 22.716$, $p < .001$, adj. $R^2 = .225$, $F^2 = .29$. attitude toward use, subjective norm, and perceived behavioural control added statistically significantly to the prediction, $p < .05$. However, Digital Competence score did not add statistically significantly to the prediction, $p = .077$. Regression coefficients and standard errors can be found in Table 9.

Follow-up moderator analyses were conducted to test whether the effect of the independent variables (attitude towards use, subjective norm, perceived behavioural control) upon Intention to use digital technology, are moderated by Digital Competence. A dummy variable, 'Digital Competence binary' was created and coded such that participants classified as Newcomer (A1) and Explorer (A2) were labelled 'Lower Digital Competence', while 'Higher Digital Competence' included participants classified as Integrator (B1) and Expert (B2). A series of hierarchical multiple regressions were then run to assess the increase in variation explained by the addition of interaction terms involving each independent variable and Digital Competence binary, on a case-by-case basis.

Digital Competence binary did not moderate the effect of attitude towards use on Intention to use DT, as evidenced by an increase in total variation explained of 0.0%, which was not statistically significant (F(1, 296) = 0.091, $p = .763$). Digital Competence

Table 9. Multiple regression results for intention to use digital technologies in my professional practice.

Intention	*B*	95% CI for *B*		*SE B*	β	ΔR^2
		LL	UL			
Model						
Intercept	2.888***	2.13	3.65	.37		.23***
Attitude Toward Use	.362***	.24	.48	.06	.34***	
Subjective Norm (Combined)	.197*	.01	.20	.05	.12*	
Perceived Behavioural Control	.150**	.05	.26	.05	.17**	
Digital Competence Score	−.005	−.01	.00	.00	−.10	

Note. Model = "Enter" method in SPSS Statistics; *B* = unstandardised regression coefficient; CI = confidence interval; LL = lower limit; UL = upper limit; *SE B* = standard error of the coefficient; β = standardised coefficient; ΔR^2 = adjusted coefficient of determination.
*$p < .05$. **$p < .01$. ***$p < .001$.

binary did not moderate the effect of subjective norm on Intention to use DT, as evidenced by an increase in total variation explained of 0.0%, which was not statistically significant ($F(1, 296) = 0.007$, $p = .934$). Digital Competence binary did not moderate the effect of perceived behavioural control on Intention to use DT, as evidenced by an increase in total variation explained of 0.0%, which was not statistically significant ($F(1, 296) = 1.267$, $p = .261$). A hierarchical multiple regression was run to assess the increase in variation explained by the addition of the three interaction terms (one for each of the independent variables and Digital Competence binary). Digital Competence binary did not moderate the effect of a model including attitude towards use, subjective norm, and perceived behavioural control, on Intention to use DT, as evidenced by an increase in total variation explained of 1%, which was not statistically significant ($F(3, 293) = 1.236$, $p = .297$). In other words, attitudes, subjective norm and perceived behavioural control predicted intention to use DT in practice to essentially the same degree, regardless of digital competence levels. Therefore, results indicate that self-reported digital competence does not contribute to predicting the self-reported intentions of PSTs in Ireland to use digital technology in their professional practice.

5. Discussion

5.1. Intentions and digital competence of Irish primary-level PSTs to use digital technology

PSTs in this study reported very high intention to use digital technology ($M = 6.48$). This indicates that PSTs held high motivational readiness to use digital technology, and suggests that these PSTs have a very high likelihood of using digital technology in their professional practice. Owing to the utilisation of an identical instrument (I-TEL) and a comparable analysis approach, two previous studies by Herring Watson and Rockinson-Szapkiw (2021, 2023) feature prominently in this discussion. It is striking that none of the variables composing the I-TEL scale were normally distributed in the current study – indeed, compared with previous studies, a very negative skew was reported. Furthermore, standard deviation values in this study indicate very little variation between participant responses, particularly compared to previous studies, see Table 10.

Comparatively, previous studies utilising this scale reported low to medium PST intention to use digital technology in their professional practice: $M = 1.81$ (Herring Watson and Rockinson-Szapkiw 2021), and $M = 2.66$ (Herring Watson and Rockinson-Szapkiw 2023). This observed difference in intention may be attributed to differences in the study populations. Specifically, the present study included primary-level PSTs only, whereas approximately half of the participants in the previous studies were primary-level (48.6% in 2021 and 47% in 2023). This variation in the sample composition may also explain why the I-TEL variables were not normally distributed in the current study. Participants were otherwise comparable, i.e. predominately female PSTs (>80%), under the age of 25 (>90%). Furthermore, data collection procedures were similar in each setting: conducted by a HEI tutor within the context of a digital technology-related module. Data collection for each study was undertaken in a relatively similar timeframe (Autumn 2020, Spring 2021, Autumn 2023), which reduces the likelihood that differences are resulting from technological or societal changes. Nevertheless, it is possible that PSTs in the present

Table 10. Comparison of Descriptive Statistics for I-TEL variables.

	This Study		Herring Watson and Rockinson-Szapkiw (2021)		Herring Watson and Rockinson-Szapkiw (2023)	
	(*n* = 300)		(*n* = 111)		(*n* = 313)	
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*
Intention	6.48	.77	1.81	.87	2.66	.99
Attitude Toward Use	6.26	.53	2.33	1.11	2.75	1.78
Subjective Norm (Future)	6.07	.65	2.08	.82	2.87	1.84
Subjective Norm (Present)	5.75	.81	6.25	2.98	2.58	1.89
Perceived Behavioural Control	5.79	.64	1.89	.79	2.92	1.85

Note. I-TEL variables scored on a scale of 1–7.

study may have been more influenced by increased use of digital technology as a consequence of COVID-19 (Blaskó, da Costa and Schnepf, 2022; Scully, Lehane and Scully, 2021; Winter *et al*., 2021). Notably, their first year of ITE predominately involved remote or hybrid approaches to learning. Details of the module content which preceded data collection in Herring Watson and Rockinson-Szapkiw's studies are unavailable, making direct comparisons impossible. The high intentions reported in this study could possibly be attributed to the timing of data collection. Specifically, the recency of discussion of the *Being a Digital Learner* Key Competency of the *Primary Curriculum Framework* (NCCA 2023) by HEI tutors during the foundational *Digital Learning* module may have influenced the findings. Nonetheless, differences in PST intention to use digital technology comparative to Herring Watson and Rockinson-Szapkiw's studies could conceivably be a result of 1) differences in educational level preparations (i.e. primary-level, secondary-level), 2) SP expectation differences (The Teaching Council 2020, 2021; Tatto, 2021), and 3) broader differences between contexts.

With regard to digital competence, PSTs held overall self-reported competence levels ranging from A1 (18.7%) to B2 (4.7%), with the majority classified as A2 (43.3%). Over 60% of participants were classified as having a 'beginner' level of digital competence, which implies that the majority of PSTs are aware of the potential of technology use, but mainly use technology for lesson preparation (JRC, Redecker and Punie 2017). As DigCompEdu was designed for experienced teachers, it should be unsurprising that the majority of PSTs were classified at beginner levels of digital competence. Rather, it is promising that PSTs have started using technology in some areas of digital competence (e.g. *Digital Resources*). However, they need guidance and encouragement to use digital technology in the pedagogical ways mandated by Irish education policy and curriculum (Department of Education 2022; NCCA 2023).

5.2. Predictors of PST intentions to use digital technology

This study found that attitude towards use of technology had the largest effect on PST intention to use digital technology, followed by perceived behavioural control. While consistent with two previous studies (Herring Watson and Rockinson-Szapkiw 2021; Teo and Tan 2012), this conflicts with Habibi *et al*.'s finding that subjective norm had the largest effect upon intention (2022). Despite the strikingly high mean scores, the beta weight values for the predictor variables in this study were very similar to those found by

Table 11. Comparison of individual contributions of predictor variables.

	This Study (n = 300)		Herring Watson and Rockinson-Szapkiw (2021) (n = 111)	
Variable	β	p	β	p
Attitude Toward Use	.33	<.001	.38	<.001
Perceived Behavioural Control	.14	<.05	.17	<.01
Subjective Norm (Combined)	.12	<.05		
Subjective Norm (Present)			.11	.25
Subjective Norm (Future)			.05	.68

Herring Watson and Rockinson-Szapkiw (2021), see Table 11. This suggests that the I-TEL scale is robust, and supports the rigour and consistency of the findings.

As aforementioned, this study combined the two I-TEL subjective norm variables into one variable, subjective norm (combined), to ensure comparability with TPB-informed studies which typically do not separate subjective norm. Notably, the independent variable subjective norm (combined) was found to be statistically significant in the present study ($p < 0.05$). In contrast, neither the subjective norm (present), nor the subjective norm (future) were found to be statistically significant in previous research (cf. Herring Watson and Rockinson-Szapkiw 2021). As the beta weight values were similar, it is likely that the statistical significance found in the present study, is a result of: a) the combining of these highly theoretically similar variables; b) the much larger sample size, and the consequential increase in statistical power; and c) a participant sample composed solely of primary-level PSTs with experience of five SP experiences. Thus, an increase in a PST's attitude towards digital technology use by one SD (0.53) would result in their intention to use digital technology increasing by .33 (43% of a SD), provided the other variables (perceived behavioural control, subjective norm) remained constant.

5.3. The relationship between intention and digital competence

PSTs in this study were found to hold very high intention to use digital technology but predominately beginner levels of digital competence. A positive relationship was reported between digital competence and intention to use digital technology. This is in line with the findings of conceptually similar research (e.g. Antonietti, Cattaneo, and Amenduni 2022; Gökçearslan, Yildiz Durak, and Atman Uslu 2022). However, the strength of the relationship detected in this study was comparably weak. Although significant in a statistical sense, the practical significance of this finding is questionable. When taken as a standalone finding, it suggests that improving the digital competence of PSTs may not have a meaningful impact on their intentions to use digital technology in their practice. That being said, the weak strength of this relationship can likely be attributed to the unexpectedly high self-reported PST intention to use digital technology (M = 6.48), as well as the minimal variation reported between participant responses (see SD values, Table 10).

Past research findings (e.g. Antonietti, Cattaneo, and Amenduni 2022; Gökçearslan, Yildiz Durak, and Atman Uslu 2022; Habibi et al. 2022) suggest that higher levels of digital competence had a positive impact on intentions to use technology. With this in mind, it was expected that attitudes, perceived behavioural control, and subjective norms would have less predictive influence on intentions to use digital technology in the case of PSTs with higher levels of digital

competence. In other words, where a PST perceived themselves to have a higher digital competence (S.-L. Cheng, Chang, and Romero 2022), it was hypothesised that this could overcome lower scores on TPB variables, and result in higher intention to use digital technology. However, our findings suggest that self-reported digital competence did not moderate the relationship between PST attitude, perceived behavioural control, subjective norm and intention. It is likely that two factors compounded these analyses, namely: a) unexpectedly high PST self-reported intention to use digital technology, and b) the phrasing of I-TEL items. Crucially, I-TEL items were phrased quite generally and did not specify the 'how' or 'who' digital technology was being used in classroom contexts. As the digital competence and beliefs of PSTs relating to digital technology likely differed due to varying experiences (e.g. lived-experience, SP), the very positive participant responses likely relate to differing understandings of digital technology use. Had I-TEL been more specific about how digital technology was used, and by whom, this would have enabled a more fruitful examination of the potential effect of digital competence upon the intention of PSTs.

6. Conclusions and implications

Irish primary-level PSTs in this study were found to self-report very high intentions to use digital technology in their professional practice. On the other hand, the majority of PSTs were found to have beginner levels of digital competence: A1 and A2 levels of DigCompEdu. PST attitude towards the use of digital technology was found to be the greatest predictor of their intention to use digital technology, followed by perceived behavioural control. While digital competence did not contribute to the prediction of PST intention in this study, there was a positive relationship between digital competence and intention, implying that an increase in digital competence would likely result in more positive intentions to use technology. These findings are particularly relevant given the current interest in emerging technologies. They suggest that PSTs must develop positive attitudes and beliefs relating to digital technology if these technologies are to be utilised. Although this research was conducted in the Irish context, the findings have potential global implications for ITE. To meet curriculum and policy mandates for the pedagogical use of digital technology, this paper echoes previous recommendations (e.g. McDonagh et al. 2021; Tondeur et al. 2025; Tondeur, Howard, and Yang 2021) that ITE should focus on fostering positive attitudes and beliefs about digital technology among PSTs. In parallel, PSTs should be supported in developing their digital competence, with an emphasis on experiencing and understanding the pedagogical uses of digital technology.

Three limitations must be borne in mind when interpreting the findings from this study. First, this study relied upon self-reported survey data that mirror PST subjective perceptions, reflections and understandings of digital technology use for teaching, learning and assessment. In particular, I-TEL items relating to intention did not distinguish between the pedagogical quality of digital technology use being considered by the PST. Therefore, caution is needed when directly comparing PST intention as it may relate to differing pedagogical quality. For this reason, it is recommended that future examination of the intention of PSTs using the I-TEL scale be accompanied by a qualitative measure which seeks to gain greater understanding of PST intention to use digital technology. Second, participants were all drawn from the same institutional cohort of undergraduate PSTs. Although this cohort represents approximately 40% of the PSTs entering the profession in a given year, it is possible that

institution-specific factors may have influenced the results to some extent. Similarly, although the majority of this cohort participated in the study (response rate of 77%), it is also possible that the 23% of PSTs who elected not to participated may have differed systematically from those who did. Taking these factors into consideration, the authors acknowledge that the findings provide a high-fidelity 'case-in-point' offering transferable insights into the intention and digital competence of PSTs, rather than providing statistical generalisation to the national population. Third, prior interactions between some PSTs and the research team may have introduced a bias. To counter this, PSTs were assured: a) participation was voluntary, b) the survey was entirely anonymous. Nevertheless, it is possible that participants may have presented more favourable accounts of their experiences using digital technology for teaching, learning and assessment.

This study made an original methodological contribution by examining both the intention and competence of PSTs relating to digital technology use in their professional practice. In so doing, it addressed a gap in the research literature for an examination of the digital competence of Irish PSTs (Roulston et al., 2019). Given the emphasis of education policy upon emerging technologies, this research comes at a critical time. Crucially, while this research was designed prior to the exponential interest in Generative AI (GenAI), it highlights the inescapable trajectory for future work as PSTs held high intention to use DT, but lower levels of digital competence. It is proposed that future studies exploring PST use of DT would explicitly examine their intention and competence regarding GenAI tools.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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