

Developing Digital Competence during School Placement: Experiences of Primary-level Pre-Service Teachers

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Contemporary education policies globally emphasise the importance of developing primary-level pre-service teacher (PST) digital competence. While authentic school placement is widely seen as the ideal space to develop these skills, the reported lived experiences of PSTs reveal an uneven reality. Grounded in Starkey's digital competence framework and utilising a Critical Realist Approach to Thematic Analysis, this study investigates the qualitative, self-reported placement experiences of final-year primary PSTs in Ireland. The findings indicate that while successful perceived experiences using digital technology in classrooms are associated with digital competence growth, school placement environments were reported to often fail to provide the stable conditions necessary for pedagogical experimentation. Specifically, participants narrated that digital competence development is frequently hindered by inconsistent school resources, unaligned expectations within the school placement triad (PST, cooperating teacher and placement tutor), and the performative pressures of graded assessment rubrics. By providing causal explanations for these perceived outcomes, this paper moves beyond describing technology use. It offers actionable insights for international teacher educators and policymakers, arguing for the co-construction of a shared digital pedagogy vision across initial teacher education programmes to close the gap between policy rhetoric and classroom reality.

Keywords: digital technology, school placement, digital competence, pre-service teachers, initial teacher education

Introduction

Digital technology (DT) has become ubiquitous across virtually all aspects of society, including education (Gabriel et al. 2022; Aagaard et al. 2025). Alongside technological advancements, there have been a steady stream of education policy documents which place demands upon systems of education to develop the digital competence of learners and teachers (e.g., European Commission 2020; OECD 2023). Consequently, digital competence has been the subject of numerous studies, primarily addressing the digital competence of in-career teachers (e.g., Dias-Trindade, Moreira, and Ferreira 2021; Feerick and Cosgrove 2022; Antonietti et al. 2023), teacher educators (e.g., Wang and Chu 2023; Basantes-Andrade et al. 2022), and early career teachers (e.g., Brenner and Brill 2016; Knussen and Agnew 2022). However, previous studies exploring the digital competence of pre-service teachers (PSTs) have prioritised the perspectives of teacher educators and policymakers (e.g., Instefjord and Munthe 2016; Tomczyk 2024; Aagaard et al. 2025), with the voice of PSTs largely captured through self-reported survey instruments (e.g., McGarr and McDonagh 2021; Gisbert-Cervera, Usart, and Lázaro-Cantabrana 2022).

By contextualising and explaining the experiences of primary-level PSTs in developing digital competence during authentic experiences of working as a teacher, this paper responds to calls within the research community for a qualitative examination of PST digital competence development (Gisbert-Cervera, Usart, and Lázaro-Cantabrana 2022; Juliano and Palma 2025; Carvalho, Rebelo, and Santos 2025; Redmond et al. 2025; Moynihan et al., 2023). Given the emphasis on developing teacher digital competence within national and international education policies, understanding PSTs' experiences in this area is crucial. By voicing the lived experiences of PSTs, this paper offers an insight into the enablers and barriers to developing the

digital competence of PSTs in Ireland, during a time of increasing digitisation. These insights may offer valuable information to guide changes to initial teacher education (ITE) programmes and the practices of teacher educators during school placements. Methodologically, the study contributes to educational research by demonstrating how a critical realist approach to thematic analysis can capture these complex experiences of PSTs.

Background

Policy Context

Previous research has highlighted an over-arching policy emphasis upon systems-level approaches for developing digital competence (Gabriel et al. 2022; Carvalho, Rebelo, and Santos 2025), with Stenbom and Geijer ascribing this to an economic need to prepare the ‘future workforce’ (2024). At the international level this economic imperative is systematically reinforced across key policy documents (World Trade Organisation 2020; European Commission 2021; OECD 2023). In the Republic of Ireland, this global rhetoric is directly translated into national contemporary education policy and curriculum documents. The vision of the *Digital Strategy to 2027* explicitly mirrors the priority areas of the *EU Digital Education Action Plan* (European Commission 2020), aiming to cultivate an effective digital education ecosystem alongside developing the digital competence of learners.

This competency-based focus is explicitly embedded within the primary curriculum via the NCCA’s ‘Being a Digital Learner’ key competency (2023), which positions the development of children’s digital competence as a central, cross-curricular educational outcome. Crucially, within this policy landscape digital competence is simultaneously codified as a core mandatory element within the *Céim* initial teacher

education (ITE) accreditation standards (The Teaching Council 2020). Consequently, ITE programmes are tasked with a dual responsibility: they must develop the pedagogical digital competence of pre-service teachers (PSTs) specifically so that these future educators can design learning activities that foster the digital competence and skills of future learners (The Teaching Council 2020; Department of Education 2022; NCCA 2023).

However, these expectations create a significant rhetorical-implementation gap. While policy conceptualises digital competence as a seamless, cross-curricular competency for teachers and learners, it overlooks structural realities facing PSTs during ITE, including disparate school cultures and uneven digital infrastructure. Without addressing these varying contextual realities facing PSTs in developing digital competence, these policy mandates risk reducing pedagogical digital competence to a compliance checklist of technical skills, a tension that informs the experiences of PSTs explored in this paper.

Digital Competence

Defining the digital competence of pre-service teachers (PSTs) is challenging due to terminological confusion in the research literature (Rubach and Lazarides 2023; Moynihan et al., 2023). Various terms such as digital competence, digital skill, and digital literacy are often used interchangeably to describe similar concepts (Fernández-Batanero et al. 2022; Smestad et al. 2023). Despite the varied definitions, there is general consensus in educational research that digital competence encompasses the skills, attitudes and knowledge required by teachers to use digital technology effectively as part of their teaching practice; this includes both technological and pedagogical knowledge (Falloon 2020; Suárez-Guerrero, Gutiérrez-Esteban, and Ayuso-Delpuerto

2024; Tarraga-Minguez, Suarez-Guerrero, and Sanz-Cervera 2021; Domínguez-González et al. 2025; Moynihan et al., 2026).

A range of frameworks of teacher digital competence frameworks have attempted to capture the complexity of this concept (Smestad and Gillespie 2020), yet these have differed in how the broad range of knowledge, skills and attitudes required of teachers have been presented. Indeed, the three categories of digital competence frameworks proposed by Starkey (2020) serve to highlight the range of interpretations present in the research and policy landscape. Starkey's three categories include: generic digital competence, digital teaching competence, and professional digital competence. Generic digital competence comprises non-profession-specific skills applicable to anyone using DT for learning or work (Starkey, 2020). Digital teaching competence refers to a PST's abilities and skills in integrating DT into existing pedagogical practice. This includes being able to select and critique which DT to use and being able to plan and teach learners who are using DT for learning (Starkey, 2020). A distinction is made between digital teaching competence which emphasises the integration (or adding) of DT into existing practice, and professional digital competence which considers DT to be an integral part of a teacher's professional practice. Professional digital competence typically encompasses five dimensions: technological proficiency, pedagogical compatibility, social and ethical awareness, personal attitudes, and professional engagement (Skantz-Åberg et al., 2022; Starkey, 2020).

In the context of this study, Starkey's categories are helpful in two ways. First, each represents an increasingly complex and pedagogically focused conceptualisation of PST digital competence. Second, they highlight how understandings of what constitutes PST digital competence can vary from very narrow technical skills to much broader social and ethical considerations. DT has become an integral part of the fabric of society

and citizenship (e.g. mobile devices, social media, artificial intelligence), and by consequence, an integral part of education in an increasingly post-digital age (McDonagh et al., 2021; Örtengren, 2022). Thus, in this study PST digital competence moves far beyond teachers narrowly using DT as a tool; it is understood to encompass the skills, attitudes, and knowledge necessary for the pedagogical use of technology to enable learning (Çer 2025; Gutiérrez-Esteban, and Ayuso-Delpuerto 2024; Tarraga-Minguez, Suarez-Guerrero, and Sanz-Cervera 2021). Consequently, PSTs face a double challenge as they develop their digital competence while also developing the competence to use DTs in pedagogical ways which support their learners in developing their digital competence (McGarr and McDonagh 2021; Fernández-Batanero et al. 2022).

School Placement

School Placement (SP) refers to the time spent by PSTs in school settings, however varying terms have been used within the research literature: e.g., practicum, professional experience, clinical practice, teaching practice, field experience. During SP PSTs gain authentic teaching experiences in school settings, enabling them to apply and develop the diverse skills and competencies addressed by their initial teacher education (ITE) programme (Forzani 2014; Morrison 2016; Hall et al. 2018; The Teaching Council 2021; Hamman 2009). A substantial body of research investigates SP (e.g., Walsh and Backe 2013; Diamond, Parr, and Bulfin 2017; Doyle et al. 2024), with many studies examining how PSTs develop their professional practice within classrooms. The importance of SP experiences for developing PST competence and attitudes is further highlighted by Resch et al. (2022) who found PSTs to repeatedly identify SP as the most effective part of their ITE, regardless of the programme of ITE. Two key areas have been identified as most influencing PSTs in developing competencies, including

digital competence: the school-university partnership model (Zeichner 2010), and the SP ‘triad’ of PST, cooperating teacher and SP tutor (Kidd and Murray 2020).

The ‘school-university partnership’ model (Ledoux and McHenry 2008; Zeichner 2010; Diamond, Parr, and Bulfin 2017) is considered mutually beneficial to both the ITE provider and partner schools (Walsh and Backe 2013). The most significant reported benefit is the opportunity for PSTs to bridge a perceived ‘gap’ between theory and practice. These two different ‘practice worlds’ (Zeichner 2010), include ‘practice’, which refers to the (social) reality of teaching, and ‘theory’, which refers to research within the programme of ITE (Resch, Schrittemser, and Knapp 2022). SP facilitates the combining of theory from the higher education institution (Diamond, Parr, and Bulfin 2017), with practising teachers’ ‘craft knowledge’ (Cope and Stephen 2001). In the context of digital competence, this ‘gap’ may also reflect perceived differences between the ways in which digital competence is emphasised and made explicit within programmes of ITE, and ways PSTs encounter DT being used in classroom practice. While pedagogical uses of DT are not limited to the university context, the pedagogical use of DT in schools is shaped by local conditions and priorities, which may influence how such practices are experienced by PSTs.

The ‘school-university partnership’ model is not without its challenges (Ledoux and McHenry 2008). Chiefly, there is often a lack of coherent connection between the practice present within programmes of ITE and schools, frequently referred to as the ‘Achilles heel’ of ITE (Darling-Hammond 2010). The apparent disconnect between how digital competence and use of DT are experienced in ITE and schools could help explain the ‘praxis shock’ reported in studies of newly-graduated teachers, whereby their use of DT was limited after entering the profession (Herring Watson 2025; Tondeur et al. 2017). To address these pitfalls the *Céim Standards for Initial Teacher*

Education (The Teaching Council 2020) clarifies the roles and responsibilities within school-university partnerships. Yet, researchers have cautioned that the ambiguity of supports and structures to develop partnerships has resulted in a “loose informal partnership... potentially impacted by wider competing policy agendas, driven by performativity” (Moynihan et al., 2023). This results in what Farrell refers to as an overburdened *ad hoc* system of cooperation (Farrell 2021; 2020).

Accreditation standards in Ireland require that 25% of the four-year concurrent undergraduate programme be allocated to SP (The Teaching Council 2021), however, ITE providers determine the duration, structure and timing of SP for individual programmes. While in school settings PSTs engage in a range of elements including direct teaching experience, team teaching, professional conversations with experienced teachers, and wider participation in school activities. PSTs primarily interact with two actors during an SP experience: cooperating teachers and SP tutors (Moynihan et al., 2023). Within the research literature this trio are referred to as the SP ‘triad’; see Figure 1.

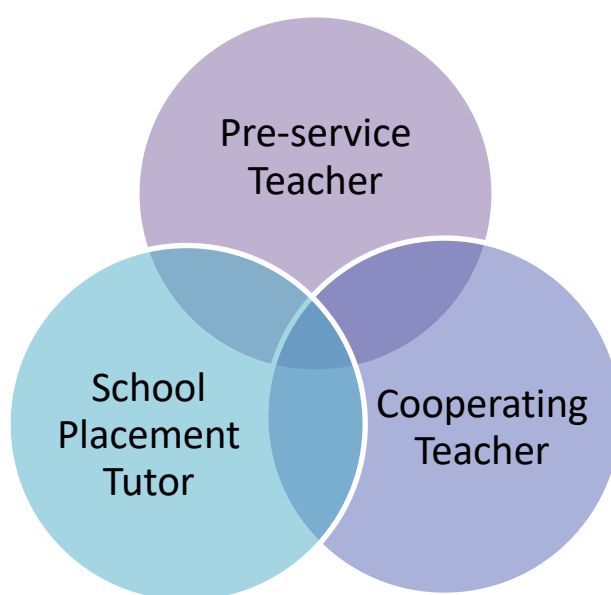


Figure 1: The SP Triad

For each SP experience PSTs are assigned a cooperating (i.e., mentor/supervising) teacher who supports them, but is not directly involved in the grading process. Nevertheless, this actor can exert substantial influence upon a PST (Moore 2003; Ursavaş, Yalçın, and Bakır 2019). Cooperating teachers often lack formal mentoring training (Davis and Fantozzi 2016; Zeichner 2021), leading to an unawareness of the scope of their mentoring (Matsko et al. 2020; Rodrigues and Mogarro 2019), typically resulting in informal support rather than structured mentoring (Young and MacPhail 2015). Consequently, without proper induction and training, they rely on personal beliefs and classroom experiences (O’Grady 2017; Robey and Krause 2024), which may differ from the practices promoted in ITE programmes, such as the pedagogical use of DT. As the mentoring, direction and modelling provided by cooperating teachers is reportedly the “most critical factor” (Tondeur et al. 2017, 157) influencing PST practice, this is potentially problematic for the development of PST digital competence. Nevertheless, research involving multiple programmes of ITE in Ireland suggests it may be more accurate to conclude that the effectiveness of a cooperating teacher in supporting PSTs to develop digital competence may be person-dependent (Cowan et al. 2020); indicating variance across SP experiences.

The SP tutor mentors and assesses the PST during SP experiences; in other jurisdictions this role is alternatively titled university supervisor/tutor or fieldwork supervisor. In Ireland SP tutors are typically either full-time staff teaching on the ITE programme or part-time staff hired specifically for SP (Hall et al. 2018). These part-time SP tutors, often retired teachers or principals, may have limited experience with technology in teaching (McGarr and Ó Gallchóir 2020). Unfortunately, there is a lack of research on part-time SP tutors in Ireland, but international studies suggest many SP tutors receive minimal formal preparation (Korthagen, Loughran, and Lunenberg 2005;

Conklin 2015; Ellis, Alonzo, and Nguyen 2020). Consequently, their attitudes and experiences with pedagogical DT use can vary. As SP tutors assess PSTs, there is a likelihood that PSTs might feel compelled to showcase the theories and practices taught in the ITE program to meet the perceived expectations of the SP tutor (Yung 2020). This may be evidenced by research conducted in Ireland which reported SP tutors directly influencing use of DT by PSTs during SP (Farrell 2020; McGarr and Ó Gallchóir 2020).

The PST completes the SP triad. While the SP tutor and cooperating teacher significantly influence the PST, this influence can be reciprocal. PSTs often introduce innovative pedagogies and curricula to schools (Cochran-Smith *et al.* 2015; Hall *et al.* 2018; Irish *et al.* 2023). Given the varying levels of digital competence and DT use among teachers (Gisbert-Cervera, Usart, and Lázaro-Cantabrana 2022), PSTs have the opportunity to model digital competence and pedagogical use of DT, potentially serving as professional development for cooperating teachers and schools. Thus, while developing their digital competence in authentic school contexts during SP, PSTs are influenced by SP tutors and cooperating teachers (Moynihan *et al.*, 2023). As each actor has the potential to influence PST digital competence, there is the scope for variation in PST experiences of developing digital competence.

Purpose Statement and Research Question

Given the paucity of literature examining PST digital competence development from the perspective of PSTs, this study aimed to voice the experiences of Irish primary-level PSTs during school placement. The purpose of this paper is to present causal explanations which contextualise and explain how the range of experiences, actors and influences which compose the SP experience in Ireland, influence the development of PST self-reported digital competence. Specifically, it investigates the

following question:

- (1) What are the experiences of PSTs in developing digital competence during school placement ~~experiences~~?

Methodology

A Critical Realist paradigm underpinned the mono-method explanatory qualitative research design (Saunders, Lewis, and Thornhill 2019) selected to address the research question. Critical Realism combines “a realist ontology (there is something real to find out about), with a relativist epistemology (different people will come to know different things in different ways)” (Stutchbury 2022, 113). Significantly, Critical Realism treats the world as theory-laden, but not theory-determined (Fletcher 2017), and further notes that reality is not directly observable, and data are only partial. Thus, it also acknowledges that all realities are subjective to the individual (Maxwell *et al.* 2013) and “mediated by means of our perception” (Shipway 2011, 7). Ontologically, Critical Realism conceptualises reality as stratified into three layers (Bhaskar 2013; Barron 2016; Fletcher 2017), with Bhaskar arguing that this enables researchers to offer causal explanations for experiences and/or phenomena (1998). Figure 2 adapts Fletcher’s (2017) iceberg metaphor of the ‘Bhaskarian’ stratified reality to this study. ‘The Empirical’ represents PST experiences. These are mediated through human experience and interpretation, and can be measured empirically. The context of action, ‘The Real’, refers to causal structures which produce events (e.g., SP structures), and set the scene for the actions in ‘The Actual’ (e.g., participation in SP by PSTs). To identify causal mechanisms, it is necessary to examine ‘The Actual’ through qualitative research methods, and ‘The Real’ through a process of inference, involving abduction and retroduction (Stutchbury 2022, 115).

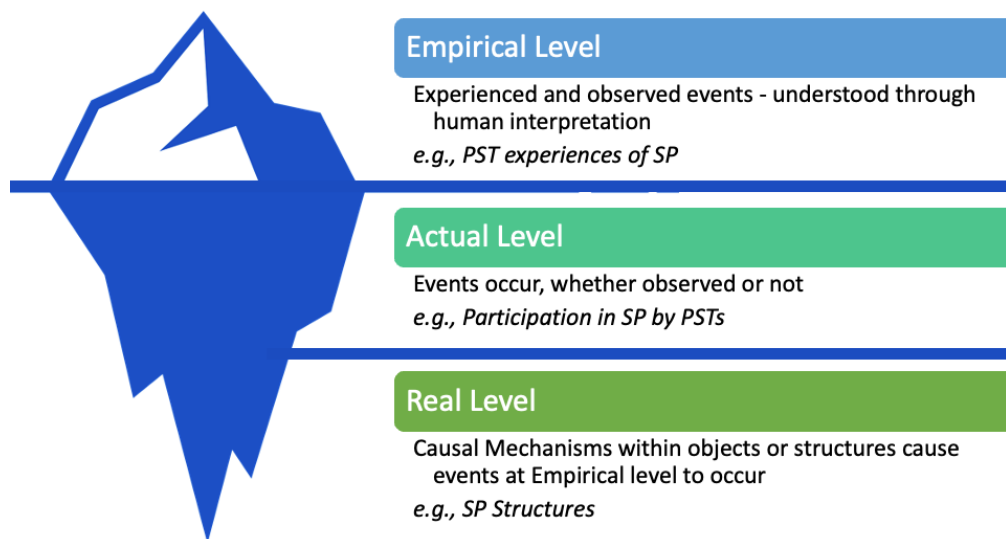


Figure 2: Iceberg metaphor for Critical Realism applied to the present study

Context and sampling

Participants in this study were primary-level PSTs in the final year of a four-year concurrent undergraduate programme of ITE within a university in the Republic of Ireland. These PSTs were purposively chosen because of their lived experience of SP. PSTs had completed five SP experiences totalling 22 weeks in primary school classrooms to date. PSTs were supported and assessed by two tutors on each SP experience (The Teaching Council 2021), and had interacted with up to ten SP tutors prior to data generation. Furthermore, PSTs undertook a foundation module relating to digital technology use in their first year, and were undertaking another digital technology-focused module at the time of this study.

A non-probability volunteer sampling approach was deployed to recruit participants from the cohort of PSTs ($N = 389$). The study was introduced to this cohort during module instruction time. A total of 42 PSTs consented to participate in the study; eight male and 34 female. Nine participants ($n = 9$) were selected using a maximum variation sampling approach. As the cohort included mature students (i.e. 24 years or

older) who may have had distinctly different school experiences to younger students, the criterion of age was utilised to select the youngest and oldest participants. Simple random sampling was applied when multiple individuals met these age criteria. To reflect the overall cohort's 86% female composition, one male participant was then selected via simple random sampling. Six further participants were subsequently chosen using simple random sampling. This sample size was justified as it provided insight into the experiences of PSTs while maintaining the feasibility of the study. Table 1 provides an overview of participants; the authors do not claim this sample is fully representative of all Irish primary-level PSTs.

Table 1: Overview of Participants ($n = 9$)

Number	Pseudonym	Gender	Age	Selection Criteria	Self-rated Digital Competence*
1	Siobhan	Female	24	Gender	Explorer (A2)
2	John	Male	21		Newcomer (A1)
3	Majella	Female	27		Integrator (B1)
4	Cass	Female	28	Age	Explorer (A2)
5	Imelda	Female	22		Integrator (B1)
6	Joanne	Female	21		Integrator (B1)
7	Deirdre	Female	20	Age	Explorer (A2)
8	Barbara	Female	22		Explorer (A2)
9	Brenda	Female	22		Newcomer (A1)

Note. These proficiency levels represent subjective, self-reported rankings. At the outset of the semi-structured interviews, participants were provided with descriptions adapted from the DigCompEdu framework (Joint Research Centre et al. 2017) to self-select a level that they felt reflected their digital competence. This taxonomy was utilised as a heuristic to stimulate reflection and to allow the research team to analyse the interface between participant perception and reported placement practices.

Data Generation

Semi-structured interviews were utilised as they facilitated space for spontaneity of answers from participants, allowing new ideas to emerge (Fletcher 2017), while also enabling the researcher to press for complete answers about complex and deep issues (Cohen, Manion and Morrison 2017). Following Kvale and Brinkmann's guidance (2009), design of the semi-structured interview schedule began with thematising the purpose of the interview: to collect data at the level of the actual (events that occur) and the empirical (what people experience) in order to hypothesise about the real (or causal) (Bhaskar, 1998; Leibowitz *et al.* 2015). To reflect this purpose, the design of the interview schedule was informed by relevant research literature.

Importantly, at the outset of the session, participants were presented with descriptions adapted from the DigCompEdu competence proficiency levels (Joint Research Centre et al. 2017) and asked to self-select a statement that best described their digital competence; see Table 2. While acknowledging that such standardised frameworks have faced criticism for reducing complex pedagogical practices to rigid, linear checklists, these statements were not deployed to objectively rank participants. Instead, this self-reported metric served as a heuristic device to stimulate reflection and expose potential tensions between the student teachers' perceived competence and their actual reported practices.

Table 2: DigCompEdu competence proficiency levels

Competence label	Competence proficiency levels	Competence description
Beginner	A1: Newcomer	You are aware of the potential of digital technologies but have mainly used them for lesson preparation and administration.
	A2: Explorer	You are aware of the potential of digital technologies and have started using them in some areas of your work as a teacher
Intermediate	B1: Integrator	You experiment with digital technologies in a variety of contexts and for a range of purposes. You are still working on understanding which tools work best in which situations.
	B2: Expert	You use a range of digital technologies confidently, creatively and critically. You are curious and open to new ideas.
Advanced	C1: Leader	You have a consistent and comprehensive approach to using digital technologies to enhance pedagogical and professional practices. You continuously reflect on and develop your practices.

Participants with informed consent obtained were asked to complete face-to-face interviews lasting approximately thirty minutes, all of which were conducted by a single member of the research team to ensure continuity. To make interviews as productive as possible the researcher employed prompts (e.g., examples, repeated/rephrased question), probes (e.g., seeking examples or clarifications), and member checking (e.g., summarising/revoicing the participant) (Denscombe 2021). A pilot interview was

conducted with the ninth participant, 'Brenda', with the objective of testing the interview questions and procedures.

Analytical Approach

Fryer's (2022) five-step Critical Realist Approach to Thematic Analysis was adapted to analyse data generated in this study. This approach was chosen for its alignment with Bhaskar's stratified reality (Shipway 2011), where data, codes, and themes correspond to the empirical, actual, and real, respectively (Fryer 2022, 375). This framework enabled the identification of causal explanations to address the study's research question.

Step 1: Develop Research Question

The initial step involved formulating a research question seeking a causal explanation.

Step 2: Data Familiarisation and Preparation

This step, broadly similar to Braun and Clarke's (2021) first phase of reflexive thematic analysis, involved preparing and familiarising with the data. Interviews were transcribed verbatim (Wengraf 2001). NVivo (Lumivero 2023) facilitated a structured approach to data analysis. Subsequently, the researcher skim-read all interview data, documenting initial insights, thoughts, questions, associations, and surprises in a linked analytical memo within NVivo, consistent with Fryer's "Thoughts and Questions" document (2022, 369). This memo facility was used throughout the analysis to enhance validity.

Step 3: Apply, develop and review codes

Coding involved a cyclical process of applying, developing, and reviewing. Initially, a descriptive coding approach captured the nuance of the data. This stage was primarily data-led, aiming for emergent insights rather than being constrained by existing theory or researcher preconceptions. In applying codes, the researcher sought 'demi-regularities' (Danermark et al. 2002, 70), manifest as tendencies, rough trends, or broken patterns in the data (Fletcher 2017, 185).

Code development followed two processes: standardisation, grouping codes referring to the same concept but phrased differently; and consolidation, where theoretical terms were used to unite codes which referred to the same event (Fryer 2022, 372). This iterative process progressed from focusing on individual PST experiences to considering more general events across PSTs. Christodoulou's (2023) 'clustering' method, which groups similar codes (e.g., practices, events, beliefs), was valuable in supporting the researcher to see the bigger picture.

Finally, codes were reviewed for descriptive and interpretive validity, with insights captured in NVivo memos. A notable strength of the Critical Realist approach is its emphasis on highlighting the 'negative', or things omitted from the data, which can be essential to understanding the causal processes (Bhaskar 2008). This included documented silences by PSTs following specific questions, and contradictions within transcripts.

Step 4: Develop and review themes

Within the Critical Realist approach, a theme is defined as a causal explanation. These causal explanations outline how causal mechanisms (or structures) produce the experiences and events observed in the data. This step involved an iterative process of

developing and reviewing themes. Developing involved creating causal explanations through retroductive reasoning, supported by the data, analytical memos, and relevant research literature. Reviewing involved the full research team cross-checking and critically reflecting on the generated explanations to verify their descriptive, interpretive, and theoretical validity. The team assessed broader indicators like empirical adequacy, ontological plausibility, and explanatory power (Wiltshire and Ronkainen 2021), specifically scrutinising the logical basis of retroductive claims against the interview findings. Consistent with Tikly (2015), the team worked collectively to specify the contingent conditions under which causal powers likely generate particular events.

Step 5: Generate conclusions and reports

The final step involved generating conclusions and identifying suitable extract samples to support them.

Findings

Three causal explanations were identified and are presented in Table 3 as a causal explanation framework. These explanations relate to: (1) the conditions for digital technology (DT) use provided by the school context, (2) expectations surrounding DT use, and (3) experience using DT for learning, teaching, and assessment as teachers. Table 3, inspired by Wiltshire and Ronkainen (2021) and Fryer (2022), is designed to communicate these causal explanations clearly and transparently. It integrates causal mechanisms with the events they tend to produce, alongside the self-reported experiences of PSTs. To enhance clarity, the table is colour-coded to align with Figure 2: causal mechanisms correspond to ‘the Real,’ events to ‘the Actual,’ and experiences to ‘the Empirical.’ The extracts included in these tables were chosen as representative examples of the lived experiences of PSTs. Each causal explanation is discussed in turn.

Table 3: Causal Explanation Table

Causal Mechanism	Events	Experiences
<i>‘The Real’</i>	<i>‘The Actual’</i>	<i>‘The Empirical’</i>

1. The conditions for DT use provided by the school context	The availability of what PSTs perceived as the necessary conditions for DT use	“it can depend on the school and the resources because I have had some schools where they have like a million and one iPads, but then there's other schools that maybe have like 10 iPads, and so that's a bit more difficult in terms of scheduling ... sometimes it can be a bit more hassle to use it then it's worth” (Siobhan)
	The cooperating teacher supporting and enabling PSTs to develop digital competence and intention to use DT	“the teacher suggested the idea... using the iPad... I can incorporate it there” (John)
		“... my placement teachers have discouraged me from using laptops... Keep it safe, play it safe. So I suppose even my teachers have kind of put that in my head that it's not really a safe move to use it [DT].” (Barbara)
2. Expectation of DT use	Expectations of DT use during SP	“on the placement grading rubric like there is so much you have to cover on school placement, but sometimes there's not as many opportunities to integrate digital learning as there would be in like a day that you weren't being assessed, if that makes sense.” (Joanne)
	Perceptions that actors involved in SP are aligned in their expectations of DT use	“I feel like sometimes they're [SP Tutors] looking for different things... when it comes to DT, everyone has different opinions... a few weeks ago I was told not to use it. Now I'm being told to use it more. I just don't know what to do.” (Brenda)
3. Experience using DT for learning, teaching and assessment as teachers	PST having opportunities to experiment with, and experience DT use.	“I've used it a couple of times with some good experiences... like most recently on our last placement in third year I used BeeBots [robotic toys], like outside of university which is really good. And actually that went very well.” (Cass)
		“...the Chromebooks have kind of given me a bit of PTSD from that experience (laughs).” (Cass)
	The association of perceived digital competence with frequency of DT use.	“We did it over the course of about two weeks... even the teacher herself ... was like, "oh my god, that was so amazing, like I'd definitely use that". But I found that was really easy. (Deirdre)

1. The conditions for DT use provided by the school context

The conditions within the school context were found to influence the intention of PSTs to use DT, and consequently, their ability to develop digital competence. PSTs perceived this as relating primarily to two events which are discussed in turn.

The availability of what PSTs perceived as the necessary conditions for DT use

PSTs perceived three necessary conditions for DT use: digital infrastructure, school policies and procedures, and the availability of support to use DT. First, the availability of digital infrastructure in a school had a direct impact on the intention of (all nine) PSTs to use DT while on SP. As explained by participants, digital infrastructure is “the starting point” (Joanne) in planning for DT use on SP, as “if the resources aren’t there, then you’re not going to be able to use them” (Deirdre). PST experiences suggest wide variations in the availability of digital infrastructure, from schools with “a million and one iPads” (Siobhan), to others with limited digital resource beyond the interactive whiteboard. This unpredictability of digital infrastructure across schools directly impacts PSTs digital competence development, as they cannot be sure what to expect while on SP. Moreover, the irregularity and diversity of digital resources makes it difficult for PSTs to plan for this element of their professional practice; as Cass explains:

The difference in schools is just huge...I think a lot of people wish that there was more consistency across the schools and what people have access to... I think if it was consistent that we would have a lot more certainty in our planning... It would take this uncertainty and pessimism away.

The existence of established school procedures relating to using DTs was perceived as a second necessary condition for DT use. Well-practiced and embedded rules and routines for children to follow when using DT during learning, teaching and assessment, appear to enable and support use of DT by PSTs (e.g., Joanne, Brenda). As using DT for learning, teaching and assessment was a ‘normal’ activity in these classrooms, PSTs do not need to establish routines; “it's just routine rather than it being this big deal that they've never done anything like this before” (Joanne). This had a

positive influence upon their digital competence development, as they were enabled to focus on using DT as a pedagogical tool for learning, teaching and assessment.

Conversely, where there are no established classroom routines for use of DT, PSTs are “wary” (Barbara) about using DT, as they need to create rules and expectations (John, Majella, Imelda, Barbara).

School policies relating to accessing and charging digital devices emerged as being particularly relevant to PSTs. In some cases (e.g., Joanne) this was seen as, a “straightforward and simple” process, whereas other PSTs found the experience of accessing digital devices to be “daunting” (John). One participant recounted a “nightmare” experience where non-adherence to school policy, led to significant stress and nervousness as devices were not charged. This deterred the PST from future DT use, as this event “made me very nervous to do the second one [lesson]”. This illustrates how negative experiences with DT use on SP can have a profound impact upon PST digital competence development.

The availability of support to use DT was perceived as a third necessary condition for DT use. Where PSTs perceived they could seek technical support (Barbara, Joanne), they were more likely to use DT. Yet, PSTs do not always perceive support as being available to them in schools, and this may reduce their use of DT, in case “something goes wrong” (Joanne). This was most evident where PSTs perceived themselves to be less digitally competent, as they were more concerned about technical problems. As Brenda, who self-reported a lower digital competence proficiency, explained, “...the only support I had was my cooperating teacher, and eight or nine times out of ten if they didn’t know how to use it [DT] well then you’re on your own”.

The cooperating teacher supporting and enabling PSTs to develop digital competence and intention to use DT

Where PSTs observed use of DT by the cooperating teacher, this positively influenced their intention. Conversely, intention was negatively influenced where the cooperating teacher was not observed using DT. Initial observations undertaken prior to teaching the class enabled PSTs to become familiar with the cooperating teacher's classroom practice, including use of DT, and were emphasised as setting the status quo for their use of DT during that placement. Three PSTs explicitly described their desire to maintain the normal observed practice of the classroom they joined. John explained that where he saw a cooperating teacher using DT, it positively influenced his intention to use DT. However, where he did not see DT used, or where the cooperating teacher did not suggest using DT, he would plan to utilise pedagogical approaches which did not (necessarily) involve the use of DT:

...from looking at [the cooperating teacher] there, if I seen [*sic*] that they were making good use of digital technology, I try and incorporate it... but if the teacher didn't really suggest it, I'd just kind of go with maybe a worksheet...

Observations by some PSTs (e.g., Brenda, Cass, Joanne, Imelda) concentrated upon the quality of DT use by their cooperating teacher; specifically, whether they perceived the learning activities to benefit learners. Where DT use was perceived to benefit learners, this motivated PSTs develop their digital competence and employ similar uses of DT. Where it was not, these PSTs were motivated to improve upon the DT use modelled by the cooperating teacher. Brenda's observations of what she perceived to be beneficial use of DT by learners (LEGO robotics), resulted in her developing her digital competence to replicate this use of DT. Yet, others described observed DT uses as performative, missing greater opportunities for learning, or PSTs

questioned whether learners benefitted from the observed use of DT: "...sometimes they just get the Chromebook and then you're looking at it after and you're like, was this valuable? Just to say that you used the Chromebook like, I don't know if it was being used to the best of its ability" (Cass). This motivated Cass to move beyond the low-level use of DT observed, and facilitate DT use which she perceived to benefit learners. These experiences reveal that the observed use (or non-use) of DT by the cooperating teacher may positively (or negatively) influence a PST's use of DT during that SP, as they strive to maintain the status quo of DT use within that classroom. Nevertheless, PSTs reported perceiving that cooperating teachers expected them to use DT. This may be seen in Barbara's belief that teachers expect PSTs to be digitally competent and in favour of DT use, "...you kind of have the most up to date as far as education and you're younger, so I feel a lot of teachers would expect you to be all for the technology and be really ready to implement it".

PSTs repeatedly referred to perceptions that the cooperating teacher supported their use of DT. This comprised PST perceptions of their cooperating teacher's attitudes toward the PST's use of DT, and the cooperating teacher's ability to support PST use of DT. Where PSTs perceived their cooperating teacher to be supportive of their use of DT, this increased their intention to use DT and develop digital competence. PSTs perceived that cooperating teachers supported them through: a) surface interactions, whereby the cooperating teacher modelled use of DT; and b) implicit interactions, which took the form of conversations about DT use, and the sharing of experiences using DT. Most PSTs discussed how modelling of DT use by the cooperating teacher made them feel the cooperating teacher would be supportive of their use of DT. Imelda recounted how seeing her cooperating teacher use DT motivated her to experiment with her own use of DT. She felt supported to facilitate a learning activity which went

beyond the cooperating teacher's use of DT and made pedagogical use of a DT (Book Creator). By contrast, she described another SP experience where implicit interactions led her to perceive the cooperating teacher was not supportive of her use of DT, which negatively influenced her intention.

2. Expectations of DT use

Perceptions of expectations of DT use were found to influence the digital competence development of all interviewees. PSTs perceive these expectations as communicated through three main events which are discussed in turn.

Expectations of DT use during SP

Findings indicate PSTs perceive DT use to be expected during SP. Recurrent in the interviews was a strong sense that SP was a pressurised experience; six PSTs explicitly stated feeling under pressure. This pressure was further evidenced by repeated references to the timebound nature of SP (nine PSTs), to meeting perceived requirements of SP (eight PSTs), and to anxiety relating to the SP tutor's visit (six PSTs); the "looming inspection" (Barbara). While Joanne recounted making some use of DT on SP, she felt the SP grading rubric communicated requirements she needed to address as a higher priority when an SP tutor was present.

Sometimes you can't [use DT] for the inspector, if that makes sense. So maybe, like on the placement grading rubric, like there is so much you have to cover on school placement, but sometimes there's not as many opportunities to integrate digital technology as there would be in, like a day that you weren't being assessed [by SP Tutor].

The perception that DT use was of lesser relative importance negatively influenced PST intention to use DT, reducing opportunities to develop digital competence. This perception was echoed by five other participants, four of whom expressed the belief that DT use was not expected during SP. As Imelda put it, "I

suppose there's no expectation [to use DT] on placement". Nonetheless, Imelda planned to use DT outside of SP. Within the reportedly pressurised SP experience, PSTs reported avoiding DT use where they believed it to be time-consuming. While this was found to lessen use DT on SP, PSTs repeatedly referred to using DT outside of SP. This was explained by Siobhán who explained she would be more likely to experiment with DT use after entering the teaching profession.

...sometimes it [DT] can be a bit more hassle to use it than it's worth...you have 20 kids in the class and you're trying to set up 20 laptops... that's just eaten 15 minutes of my lesson... is that worth it. I think maybe if I wasn't on [SP], under such pressure. I probably would put the time into it, like, next year when I'm teaching my own class.

Concerns relating to the SP tutor visit were found to negatively influence intention to use DT where a PST held a lower self-rated digital competence. Six PSTs referenced feeling more comfortable using DT when an SP tutor was unlikely to visit. As SP is a graded examination, PSTs expressed the concern that experimenting with DT use during SP would be akin to wasting a potential examination grade, "...[experimenting with DT use] would be like doing an assignment and trying something, or writing about something you've never done before, or you've never read about nearly. It kind of seems a bit silly to throw away a grade" (Joanne).

Perceptions that actors involved in SP are aligned in their expectations of DT use

Development of PST digital competence through use of DT was found to be negatively influenced by reportedly differing expectations between: a) programme of ITE and school; b) programme of ITE and SP tutors; and c) paired SP tutors. A misalignment of expectations between HEI and school negatively influenced PST intention to use DT. Two PSTs recounted perceiving that expectations of DT use

differed between their programme of ITE and the school context, with lower expectations within school contexts. For example, Siobhan described how, “there's also a lot of things that we learn about in college that hasn't necessarily gotten to schools yet. So, like say the coding hasn't really filtered down so we can't use that in our lessons yet”. Findings indicate that PSTs described adopting the practice observed in the school context. Eight PSTs discussed the (mis)alignment of expectations between the programme of ITE and SP tutors. At the time of interview, PSTs had engaged in supervision meetings with at least ten SP tutors, and recounted a range of experiences across these meetings. Where SP tutors were perceived to reinforce the ITE programme's expectation of DT use during SP, this positively influenced PST intention to use DT. For example, Majella perceived SP tutors to generally expect PSTs to use DT, “they'd much prefer to come in and see the kids in groups of twos or threes maybe sharing an iPad”. Resultantly, her intention was positively influenced as she believed that an SP tutor would prefer to see learner-use of DT. Conversely, Deirdre perceived SP tutors to want less use of DT, which negatively influenced her intention to use DT. Where SP tutors did not address DT use it was found to negatively influence intention to use DT, as PSTs perceived DT use not to be expected. Two PSTs indicated that DT use was never mentioned by their SP tutors during supervision visits. Cass felt that DT use not being mentioned by SP tutors, coupled with the high praise she received for lessons not involving DT use, indicated that she did not need to use DT.

I've had feedback of doing good lessons without technology... I don't even know if I used the interactive whiteboard. And that was highly praised... a bit contradictory to what we're told here [HEI]... they've [SP Tutor] never mentioned anything about you need to use technology more, and definitely not you need to use less... and you know, it's [DT use] never been a point brought up. So, I think I would continue with that going forward.

Cass's experience suggests that where a PST perceives the expectations of an SP tutor to contradict those of the programme of ITE (i.e. expectation of DT use), the PST may prioritise SP tutor expectations, which may lessen opportunities to develop digital competence.

Finally, four PSTs had experience of expectations varying, or conflicting, between SP tutors. This negatively impacted PST digital competence development. Brenda recounted a lesson where DT was used to support learning, teaching and assessment. Despite being able to explain how this use of DT facilitated greater understanding and engagement by the learners in her class, the first SP tutor advised her not to use DT. Resultantly, she minimised her use of DT in future lessons. In the following SP experience, a second SP tutor advised her to use DT, but in a way that mirrored the use she had previously been cautioned against. Brenda questioned the conflicting advice provided, but reported increasing her DT use in advance of the next SP tutor's visit.

Sometimes it's difficult with contradicting advice. So, [Tutor_B] was telling me to use it more, that he enjoyed seeing that... I was getting contradicting advice. And I said to [Tutor_B], I said, Look, I was told not to use it. I think he was a little bit baffled. [Tutor_B] was younger, but [Tutor_A] was, (pause), more senior in years. Um...maybe it was fact that he couldn't understand it, or he couldn't see the whiteboard or something like that. But I was confused there because I was trying to use digital technology to my advantage to improve teaching and learning because it was clear that students really enjoyed this... [Tutor_B] said to use technology more. I was like, Okay, I used it more on that placement for [Tutor_B] just in case. And then yeah, I was just a bit confused. That was just my experience, though. And I know it depends what inspectors you get, and it can be completely different.

Perceptions of SP tutor expectations resulted in changes to this PST's pedagogical use of DT. Similar experiences were described by Brenda, John, and Joanne. Brenda believed that expectations of DT use varied by whether SP tutors were

full-time or part-time; with full-time tutors holding greater expectations of DT use than part-time tutors as a result of differing digital competence levels.

...the [SP Tutors] can be a bit more, maybe not inclusive of technology... I had a lot of external [part-time SP Tutors]. So, they wouldn't be any of my [full-time Tutors] themselves. I think if I had like someone from the Digital Learning Team [full-time tutors], and they see me use iPads or Beebots [robotic toys] or anything like that, I think they would have been really happy. I think it also stems from your own background of technology. So, if you're not used to seeing it, then you kind of don't really see the point.

Findings suggest the majority of interviewees experienced interactions with SP tutors, where expectations of DT use were not aligned with the programme of ITE. While the experiences of interviewed PSTs may not be representative of all PSTs, they are consequential, as these experiences could lead to PSTs reducing their use of DT. This was highlighted by Imelda, who recounted the imbalance between positive and negative interactions with SP tutors. Negative interactions had greater impact upon her digital competence; she explained that “even though I had that good experience, the bad can outweigh the good sometimes”. This imbalance of negative feedback over positive interactions may relate back to the pressurised nature of SP described by interviewees.

3. Experience using DT for learning, teaching and assessment as teachers

Common across the interviews was a sense that opportunities to experience, and experiment with, use of DT for learning, teaching and assessment, facilitated PSTs to develop their digital competence.

PST having opportunities to experiment with, and experience DT use.

The majority of PSTs (seven) spoke about how their experiences of experimenting with, or using DT, positively influenced their self-reported digital

competence. However, PST experiences varied, with SP reportedly not providing the necessary conditions for all PSTs to experiment with, and experience DT use. Cass illustrates this in her description of how her positive experience during SP supported her in overcoming her anxiety relating to DT use.

...on our last placement in third year I used BeeBots [robotic toys], like outside of university which is really good. And actually, that went very well. They were a young class... I didn't have any problems with that. And that's something I definitely would use again, even though I was worried about it.

Positive experience of using DT during SP appears to have positively influenced her digital competence; an experience echoed by Barbara, Brenda, John, and Deirdre. Nonetheless, just under half of PSTs (four) did not believe SP provided the necessary conditions to develop digital competence through experimenting with DT use. As SP is assessed, Joanne and Deirdre described feeling unable to experiment with DT, yet it was their experience that the non-assessed nature of substitute teaching (i.e. where a PST is paid to teach a class in a school) provides a more suitable environment to experiment, and develop their digital competence. As Joanne explained, “you don't really get to do it [experiment with DT] as much on placement... when I try more things tends to be when I'm out in schools subbing... placement is an examination, so you want to do well”. Substitute teaching may provide the conditions Deirdre deems necessary to develop digital competence, “I think if we were given more room, and more access to experiment with technology, then we would be better users of it”. Majella attributed her developing digital competence, and positive intention to use DT in forthcoming SP experiences, to her time substitute teaching.

...the time out in schools subbing... just being more confident, more aware of what there is... I don't think I used digital technology as much to my advantage as I

should have. But that is my plan going forwards...I only had the confidence to even think of using it [DT] on a placement, never-mind getting inspected, last year.

For some PSTs, substitute teaching may provide the necessary conditions to experiment with, and experience DT use, where SP reportedly does not. Thus, findings suggest that experiences of using DT for learning, teaching and assessment while engaged with both SP and substitute teaching, can enable PSTs to develop greater digital competence, and positively influence intention to use DT.

The association of perceived digital competence with frequency of DT use.

Perceived digital competence may shape how frequently PSTs use DT. The seven PSTs who self-reported digital competence above the Newcomer level (i.e. A2, B1; See Table 1), tended to describe DT use which increased as they gained greater digital competence through experience. Deirdre, Joanne, Imelda and Barbara recounted how positive experiences of DT use increased their digital competence, leading to more frequent, and more pedagogical, use of DT. For example, Barbara explained how successful use of DT by learners for a research-based learning activity during a placement, encouraged her to make further use of DT during that placement. Likewise, Deirdre recounted facilitating a series of lessons where learners made active use of DT (i.e., Google Maps), “we did it over the course of about... three weeks, and then we presented them on the last week”. Owing to her perceived digital competence, and the success of these experiences, Deirdre made frequent use of DT during that SP experience. While this necessitated her having to prepare digital resources in advance, she found this “easy” as she had done a similar activity in an ITE module. Furthermore, Deirdre felt she may have positively influenced the cooperating teacher to make greater use of DT in the future. Reflecting upon the experience, she explained how PSTs could serve as “kind of like a teacher for them [cooperating teacher]...maybe show them that

it's not as scary as it's made out to be". Conversely, two PSTs (Brenda, John) who self-reported a lower digital competence proficiency, described limiting their use of DT until they were more confident they had the digital competence to solve technical problems which might arise. Both PSTs recounted growing in confidence in using DT for presentation purposes, but did not yet feel confident in using DT beyond this due to concerns relating to technical problems.

I'd be a lot more comfortable now doing that maybe the introduction of a lesson on the [interactive] whiteboard, or the conclusion... I wouldn't have my whole lesson based, or relying on it [DT]. So, I wouldn't be confident that it would work, or I'd be able to run it properly. (John)

These findings indicate that PST digital competence is positively associated with use of DT. Positive experiences using DT may then be associated with greater digital competence, which is in turn associated with more frequent use of DT. However, where PSTs had lower self-reported digital competence, they appear to use DT less frequently owing to concerns over technical challenges.

Discussion

Consistent with previous studies of PSTs and early-career teachers (Herring Watson 2025; Tondeur et al. 2017; Brenner and Brill 2016), PSTs primarily described using DT in teacher-centred ways during SP experiences (e.g., presentation tools). Crucially, as their perceived digital competence and confidence increased, some PSTs described facilitating pedagogical uses of DT by learners (e.g., Imelda's use of Book Creator). This suggests that PSTs require opportunities to develop their digital teaching competence by using DT during SP; echoing a similar finding by Janeš et al. (2023). This section discusses two factors found to underly the development of PST digital competence during SP: the conditions for DT use provided by SP experiences, and the

SP Triad.

Conditions for DT Use provided by SP experiences

PST experiences indicate that their DT use in school contexts was limited by what Ertmer *et al.* refers to as first-order barriers (2012): digital infrastructure and supports. This supports the findings of previous studies in Ireland (Mac Mahon, Grádaigh and Ghuidhir 2018; Cowan *et al.* 2020; McCoy and Lynam 2022) and internationally (Teo 2019; Knussen and Agnew 2022). Echoing previously reported variances in the digital infrastructure of schools in Ireland (Cosgrove *et al.* 2014 2019; Feerick, Cosgrove and Moran 2021), the PSTs in this study had varying experiences. PSTs described that school-based supports which reduced the perceived complexity of DT use enabled or encouraged more frequent use of DT; specifically technical support, school procedures and routines. Routines which established DT use as a ‘normal’ classroom activity reportedly facilitated PSTs to develop their digital competence by focusing upon pedagogically use by learners (e.g., Joanne, Barbara). PSTs highlighted that the absence of routines increased the perceived complexity of DT use and reduced their willingness to engage with it, particularly when introducing these tools to learners. If SP experiences are to enable PSTs to develop digital competence, consideration must be given to the first-order barriers to DT use faced by PSTs within SP school contexts.

The role of SP as an examination was described by PSTs as limiting the conditions for developing digital competence.

Within PST accounts, SP was experienced as an assessment context that did not provide adequate conditions for them to develop digital competence (e.g., Joanne, Deirdre). Given the perceived high-stakes nature of SP, PSTs reported making less use of DT where they felt they may under-perform if they were evaluated by an SP. This

finding mirrors what Cowan *et al.* reported as PSTs ‘playing it safe’ and avoiding DT use when being observed (2020). Furthermore, as PSTs perceived DT use to be of less relative importance in SP assessment rubrics, some reported *adding* DT use only after they were confident they had reached what they perceived as the *core* expectations of SP (e.g., Barbara). Consequently, PSTs reported minimising DT use during SP, yet most intended to use DT outside of SP. In contrast, the substitute teaching experience, which is not evaluated by the HEI, was described as providing suitable conditions for PSTs to experiment with DT use, with these experiences positively associated with PST digital competence (e.g., Deirdre). Still, such experimentation lacks any coaching from the cooperating teacher or HEI tutor. Although SP is the principal opportunity for PSTs to develop their practice as teachers in authentic settings, many PSTs did not feel SP provided opportunities to experiment with their use of DT and develop their digital competence. PSTs attributed this to their perceptions that SP is too high-stakes, and suggested that the relative importance of DT use needs to be increased in the assessment rubrics if they are to use it. Echoing concerns raised by Cochran-Smith *et al.*, following a systematic literature review of teacher preparation (2015), this study questions the suitability of SP as a safe space for all PSTs to develop their digital competence.

Interactions with the SP Triad

Interactions with members of the SP triad were identified in PST accounts as the second factor shaping their experiences relating to digital competence. As these interactions were reportedly inconsistent, they were perceived as both supportive and constraining in relation to digital competence. PSTs reported inconsistencies between the HEI and school contexts, with PSTs perceiving DTs to be used less frequently in school contexts. This challenged PST attitudes and beliefs relating to DT use, and in

some cases, PST recounted how it lowered intention to use DT (e.g., Siobhan, Joanne). This corroborates previous research (e.g., Tondeur *et al.* 2012), and may evidence what Darling-Hammond referred to as the ‘Achilles heel’ of ITE (2010).

PSTs described cooperating teacher practice as shaping their experiences in this study. Their self-reported experiences suggest their input was more akin to informal support and guidance, rather than formal mentoring (Young and MacPhail 2015; O’Grady 2017; Matsko *et al.* 2020). Owing to their level of teaching experience, PSTs were more likely to require mentoring by cooperating teachers to use DT in authentic classroom contexts. Where PSTs described an absence of mentoring they tended to align DT use with their perception of ‘normal’ classroom practice. This finding echoes McGarr and Ó Gallchóir, who concluded that PSTs would be unlikely to experiment with use of DT or attempt pedagogies that conflict with local practices (2020). Consequently, there is a risk that these types of SP experiences could ‘wash out’ (Zeichner and Tabachnick, 1981), or negatively impact, the attitudes and beliefs of PSTs relating to DT use established through HEI experiences, as PSTs may perceive pedagogical use of DT to be incompatible with their perceptions of ‘normal’ classroom practice in that school context. Nevertheless, as they developed their digital teaching competence, some PSTs recounted how they perceived their facilitation of pedagogical use of DT supported cooperating teachers who were open to developing their digital competence (e.g., Deirdre). This may evidence the two-directional mentoring which could take place during SP (Cochran-Smith *et al.* 2015; Hall *et al.* 2018; Irish *et al.* 2023).

Participants described SP tutors as playing a significant role in shaping their intentions to use DT, consistent with findings reported in research conducted in Ireland. (Farrell 2020; McGarr and Ó Gallchóir 2020). However, SP tutors didn’t always

positively influence the development of PST digital competence. According to PSTs, these experiences were found to vary considerably, with inconsistencies between SP tutors, and between SP tutors and expectations of the programme of ITE reported. While some SP tutors were perceived to expect DT use by PSTs (e.g., Majella), others never addressed the use (or non-use) of DT (e.g., Cass), and others questioned the PST's use of DT (e.g., Deirdre). Accounts suggest these inconsistent interactions directly impacted the perceptions of PSTs that DT was, or was not, expected; and had a knock-on consequence to the development of PST digital competence. Four PSTs experienced conflicting expectations among SP tutors (e.g., Brenda), a finding supported by Hudson who highlighted the variable and contrasting nature of feedback provided by tutors (2014). Interestingly, PSTs described a tendency to implement the guidance of the most recent SP tutor, even where this conflicted with the PST's beliefs and attitudes relating to DT use, and with the DT use expected by their programme of ITE (e.g., Brenda). Furthermore, PSTs highlighted their perception of differing expectations of DT use dependent on whether the SP tutor was full-time or part-time. In the absence of formal induction and ongoing professional learning, Sugrue and Solbrekke suggest these differences in expectations may be attributed to the varying attitudes, beliefs and experiences of DT use held by part-time SP tutors (2017).

Conclusions and Recommendations

By analysing the causal mechanisms which underlie a PST's self-reported digital competence, this study contributes to understanding the complex, interconnected influences acting upon PSTs during SP. Positive experiences using DT during SP were described alongside accounts suggesting increased digital teaching competence. However, SP was often found not to offer suitable conditions for all PSTs to experiment with DT use, and develop the digital competence required to use technology

pedagogically. Factors including opportunities to experiment with technology use, and variances in interactions with the SP triad, were found to underlie PST digital competence. This variation means that some PSTs may develop their digital competence to a lesser extent than required by policy and curriculum documents. This study has provided PSTs with a voice in the research literature during a period of ‘digital skill’ reform in the RoI, while also addressing calls in the research literature for a qualitative examination of the development of PST digital competence. Given that these PSTs will contribute toward facilitating the digital competence development of almost one thousand learners (based on an average class-size of twenty-four learners (DoE 2023) per year for forty years) these are important contributions.

This study offers a methodological contribution by demonstrating the value of a critical realist approach to thematic analysis in examining PST experiences of developing digital competence during school placement. Whilst qualitative thematic analysis typically interprets patterns of shared meaning, a critical realist framework goes further by explicitly theorising the relationship between structure and agency. This approach supports a systematic exploration of the interplay between PSTs' self-reported experiences, their individual agency, and the stratified contextual conditions shaping school placement. This enables a more robust, explanatory interpretation of the data, making visible the underlying institutional and cultural mechanisms that either constrain or enable competence development. This study illustrates how critical realist thematic analysis can be used to capture the causal complexity of professional learning in practice-based settings, contributing a theoretically grounded approach for future research in ITE. Nevertheless, a limitation of this study is the small sample size of preservice teachers which may restrict the generalisability of findings. Future research might address this limitation by including a larger sample size, and by following

preservice teachers across multiple SP experiences.

While acknowledging the identified limitations, this study provides high-quality data which highlights the supports PSTs may require to develop digital competence during SP. These findings can support policymakers and providers of ITE. Accordingly, three key points are advanced. First, to address the range of avoidable challenges relating to the variability of DT infrastructure across schools, it is clear that the recommendations from this study require the assurances of a baseline digital infrastructure. Second, to address local PST perceptions that SP did not provide adequate conditions for them to develop digital competence, this specific ITE provider should provide more opportunities for PSTs to experiment with DT use. This could involve, for example: a) more explicit requirements on the SP grading rubric for PSTs to use DT during SP, b) opportunities to facilitate learning activities involving use of DT by learners (e.g., children, other PSTs), c) non-evaluated SP experiences. Whilst these measures are tailored to this institution, they target a well-documented global challenge in teacher preparation. Consequently, by grounding these initiatives in what the wider literature says about practice-based learning, national and international ITE providers could draw upon this local recommendation to enrich their own programmes. Third, to address PST perceptions that SP tutors and cooperating teachers were inconsistent in their expectations of DT use, this ITE provider should establish a shared consensus around how PSTs can be appropriately supported to develop digital competence during SP. Given that alignment between higher education institutions and school-based cooperating teachers remains a persistent structural hurdle across many jurisdictions, addressing this discrepancy could provide a valuable reference point for international policymakers and ITE providers seeking to standardise stakeholder expectations in teacher education.

As Ireland's education policy continues to champion digital competence, ensuring that SP enables, not hinders, this development is essential. In uncovering the conditions that enable or inhibit this process, this paper offers timely insights to inform more coherent and supportive approaches to PST digital competence development in policy, practice, and ITE programme design.

References

- Aagaard, Toril, Amdam ,Synnøve H., Nagel ,Ilka, Vika ,Karl S., Andreassen ,Johan Kristian, Pedersen ,Cathrine, and Fredrik M. and Røkenes. 2025. ‘Teacher Preparation for the Digital Age: Is It Still an Instrumental Endeavor?’ *Scandinavian Journal of Educational Research* 69 (3): 651–65.
- Antonietti, Chiara, Maria-Luisa Schmitz, Tessa Consoli, Alberto Cattaneo, Philipp Gonon, and Dominik Petko. 2023. “‘Development and Validation of the ICAP Technology Scale to Measure How Teachers Integrate Technology into Learning Activities’”. *Computers & Education* 192 (January):104648.
- Basantes-Andrade, Andrea, Sonia Casillas-Martín, Marcos Cabezas-González, Miguel Naranjo-Toro, and Frank Guerra-Reyes. 2022. ‘Standards of Teacher Digital Competence in Higher Education: A Systematic Literature Review’. *Sustainability* 14 (21): 13983.
- Barron, I. (2016). Flight turbulence: The stormy professional trajectory of trainee early years’ teachers in England. *International Journal of Early Years Education*, 24(3), 325–341. <https://doi.org/10.1080/09669760.2016.1204906>
- Bhaskar, R. (2013). *A Realist Theory of Science*. Routledge.
- Bhaskar, R. (2008). *Dialectic: The Pulse of Freedom*. Routledge.
<https://doi.org/10.4324/9780203892633>
- Bhaskar, R. (1998). *The Logic of Scientific Discovery*. In *Critical Realism*. Routledge.
- Braun, V., & Clarke, V. (2021). One size fits all? What counts as quality practice in (reflexive) thematic analysis? *Qualitative Research in Psychology*, 18(3), 328–352. <https://doi.org/10.1080/14780887.2020.1769238>
- Brenner, Aimee M., and Jennifer M. Brill. 2016. ‘Investigating Practices in Teacher Education That Promote and Inhibit Technology Integration Transfer in Early Career Teachers’. *TechTrends* 60 (2): 136–44.
- Carvalho, Ana Amélia, Piedade V. Rebelo, and Idalina L. Santos. 2025. ‘Perspectives of Pre-Service Portuguese Teachers on Technology Integration in Their Education Programs’. In , 1332–41. Association for the Advancement of Computing in Education (AACE).
- Çer, Erkan. 2025. ‘Enhancing Lecturer Awareness of Technology Integration within the TPACK Framework: A Mixed Methods Study’. *STEM Education* 5 (3): 356–82.

- Christodoulou, M. (2023). The four C's model of thematic analysis. A critical realist perspective. *Journal of Critical Realism*, 0(0), 1–20.
<https://doi.org/10.1080/14767430.2023.2256109>
- Cochran-Smith, Marilyn, Ana Maria Villegas, Linda Abrams, Laura Chavez-Moreno, Tammy Mills, and Rebecca Stern. 2015. 'Critiquing Teacher Preparation Research: An Overview of the Field, Part II'. *Journal of Teacher Education* 66 (2): 109–21.
- Cohen, L., Manion, L., & Morrison, K. (2017). *Research Methods in Education*. Routledge.
- Conklin, Hilary G. 2015. 'Preparing Novice Teacher Educators in the Pedagogy of Teacher Education'. *Action in Teacher Education* 37 (4): 317–33.
- Cope, Peter, and Christine Stephen. 2001. 'A Role for Practising Teachers in Initial Teacher Education'. *Teaching and Teacher Education* 17 (8): 913–24.
- Cosgrove, J., Moran, E., Feerick, E., & Duggan, A. (2019). Digital Learning Framework (DLF) national evaluation: Starting off Baseline report. Educational Research Centre. <https://www.erc.ie/2020/01/14/erc-publishes-baseline-report-on-digital-learning-framework-national-evaluation/>
- Cowan, Pamela, Martin Brown, Stephen Roulston, and Rachel Farrell. 2020. *Readiness and Practice to Teach and Learn in a Digital World (RAP) - A North, South Perspective*. Final Report. Armagh.
- Darling-Hammond, Linda. 2010. 'Teacher Education and the American Future'. *Journal of Teacher Education* 61 (1–2): 35–47.
- Davis, Janine S., and Victoria B. Fantozzi. 2016. 'What Do Student Teachers Want in Mentor Teachers?: Desired, Expected, Possible, and Emerging Roles'. *Mentoring & Tutoring: Partnership in Learning* 24 (3): 250–66.
- Department of Education. 2022. *Digital Strategy for Schools to 2027*. Dublin: Department of Education.
- Department of Education. (2023). Statistical Bulletin – July 2023 Overview of Education 2002 – 2022. Department of Education.
<https://assets.gov.ie/263000/f2932136-6191-4e56-9af0-5b315e85702f.pdf>
- Denscombe, M. (2021). *The Good Research Guide: Research Methods for Small-Scale Social Research Projects*. McGraw-Hill Education (UK).

- Diamond, Fleur, Graham Parr, and Scott Bulfin. 2017. 'University–School Partnerships in English Pre-Service Teacher Education: A Dialogic Inquiry into a Co-Teaching Initiative'. *Changing English* 24 (3): 266–84.
- Dias-Trindade, Sara, José Ant'ónio Moreira, and António Gomes Ferreira. 2021. 'Evaluation of the Teachers' Digital Competences in Primary and Secondary Education in Portugal with DigCompEdu CheckIn in Pandemic Times'. *Acta Scientiarum. Technology* 43 (September):e56383–e56383.
- Domínguez-González, María de los Ángeles, Antonio Luque de la Rosa, Carlos Hervás-Gómez, and Pedro Román-Graván. 2025. 'Teacher Digital Competence: Keys for an Educational Future through a Systematic Review'. *Contemporary Educational Technology* 17 (2): ep577.
- Doyle, A., Conroy Johnson, M., Scanlon, D., Logan, A., Silke, A., Gorman, A., Brennan, A., Furlong, C., & O'Grady, S. (2024). Reconceptualising school placement assessment in initial teacher education: A figurational perspective. *European Journal of Teacher Education*, 47(2), 305–329.
<https://doi.org/10.1080/02619768.2024.2345904>
- Ellis, Neville John, Dennis Alonzo, and Hoa Thi Mai Nguyen. 2020. 'Elements of a Quality Pre-Service Teacher Mentor: A Literature Review'. *Teaching and Teacher Education* 92 (June):103072.
- Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers & Education*, 59(2), 423–435.
<https://doi.org/10.1016/j.compedu.2012.02.001>
- European Commission. 2020. Digital Education Action Plan 2021 - 2027: Resetting Education and Training for the Digital Age. Luxembourg: Publications Office of the European Union.
- European Commission. 2021. 'Learning and Skills for the Digital Era'. Text. EU Science Hub - European Commission. 2021.
- Falloon, Garry. 2020. 'From Digital Literacy to Digital Competence: The Teacher Digital Competency (TDC) Framework'. *Educational Technology Research and Development* 68 (5): 2449–72. <https://doi.org/10.1007/s11423-020-09767-4>.
- Farrell, Rachel. 2020. 'Co-Operating Teachers: The Untapped Nucleus of Democratic Pedagogical Partnerships in Initial Teacher Education in Ireland'. *Education Research and Perspectives* 47 (January):131–56.

- Farrell, Rachel. 2021. 'The School–University Nexus and Degrees of Partnership in Initial Teacher Education'. *Irish Educational Studies* 0 (0): 1–18.
- Farrell, R. (2023). The School–University Nexus and Degrees of Partnership in Initial Teacher Education. *Irish Educational Studies*, 42(1), 21–38.
<https://doi.org/10.1080/03323315.2021.1899031>
- Feerick, Emmet, Clerkin ,Aidan, and Jude and Cosgrove. 2022. 'Teachers' Understanding of the Concept of "Embedding" Digital Technology in Education'. *Irish Educational Studies* 41 (1): 27–39.
- Fernández-Batanero, José María, Marta Montenegro-Rueda, José Fernández-Cerero, and Inmaculada García-Martínez. 2022. 'Digital Competences for Teacher Professional Development. Systematic Review'. *European Journal of Teacher Education* 45 (4): 513–31.
- Fletcher, A. J. (2017). Applying critical realism in qualitative research: Methodology meets method. *International Journal of Social Research Methodology*, 20(2), 181–194. <https://doi.org/10.1080/13645579.2016.1144401>
- Forzani, Francesca M. 2014. 'Understanding "Core Practices" and "Practice-Based" Teacher Education: Learning From the Past'. *Journal of Teacher Education* 65 (4): 357–68.
- Fryer, T. (2022). A critical realist approach to thematic analysis: Producing causal explanations. *Journal of Critical Realism*, 21(4), 365–384.
<https://doi.org/10.1080/14767430.2022.2076776>
- Gabriel, Florence, Marrone ,Rebecca, Van Sebille ,Ysabella, Kovanovic ,Vitomir, and Maarten and de Laat. 2022. 'Digital Education Strategies around the World: Practices and Policies'. *Irish Educational Studies* 41 (1): 85–106.
- Gisbert-Cervera, Mercè, Mireia Usart, and José Luis Lázaro-Cantabrana. 2022. 'Training Pre-Service Teachers to Enhanced Digital Education'. *European Journal of Teacher Education* 45 (4): 532–47.
- Hall, Kathy, Regina Murphy, Vanessa Rutherford, and Bernadette Ní Áingléis. 2018. *School Placement in Initial Teacher Education Final Report*. Cork: School of Education, University College Cork (UCC).
- Hamman, Doug. 2009. 'Hamman, D., & Romano, J. (2009). The Desired Cooperator: Preservice Preference for Qualities and Interaction during the Teaching Practicum. *Current Issues in Education*, 11 (4). Available Online

- [[Http://Cie.Ed.Asu.Edu/Volume11/Number4/](http://Cie.Ed.Asu.Edu/Volume11/Number4/) .’ *Current Issues in Education* 11 (October).
- Herring Watson, Jessica. 2025. ‘Overcoming Praxis Shock and Navigating Resistance: How First-Year Teachers Use Technology-Enabled Learning’. *Technology, Pedagogy and Education*, 1–17.
- Hudson, P. (2014). Feedback consistencies and inconsistencies: Eight mentors’ observations on one preservice teacher’s lesson. *European Journal of Teacher Education*, 37(1), 63–73. <https://doi.org/10.1080/02619768.2013.801075>
- Instefjord, Elen, and Elaine Munthe. 2016. ‘Preparing Pre-Service Teachers to Integrate Technology: An Analysis of the Emphasis on Digital Competence in Teacher Education Curricula’. *European Journal of Teacher Education* 39 (1): 77–93.
- Irish, C. K., Wells, M. S., Davis, J. S., Peck, K., & Clayton, C. (2023). Pandemic Innovations in Teacher Education: Communities of Practice, Mentoring, and Technology. *Education Sciences*, 13(7), Article 7. <https://doi.org/10.3390/educsci13070653>
- Joint Research Centre (European Commission), Christine Redecker, and Yves Punie. 2017. *European Framework for the Digital Competence of Educators: DigCompEdu*. LU: Publications Office of the European Union.
- Juliano, Lorena S., and Reita C. Palma. 2025. ‘Culturally Responsive Teaching Competence, Digital Competence and Language Learning Motivation: A Structural Equation Model of Pre-Service Teachers’ Teaching Competence’. *Asian Journal of Language, Literature and Culture Studies* 8 (1): 110–31.
- Kidd, Warren, and Jean Murray. 2020. ‘The Covid-19 Pandemic and Its Effects on Teacher Education in England: How Teacher Educators Moved Practicum Learning Online’. *European Journal of Teacher Education* 43 (4): 542–58.
- Knussen, Lauren, and Annie and Agnew. 2022. ‘Supporting Early Career Teachers’ Digital Agency: A Role for Mentorship?’ *Irish Educational Studies* 41 (1): 201–11.
- Korthagen, Fred, John Loughran, and Mieke Lunenberg. 2005. ‘Teaching Teachers—Studies into the Expertise of Teacher Educators: An Introduction to This Theme Issue’. *Teaching and Teacher Education*, Teaching Teachers 21 (2): 107–15.
- Janeš, A., Madsen, S. S., Saure, H. I., Lie, M. H., Gjesdal, B., Thorvaldsen, S., Brito, R., Krasin, S., Jwaifell, M., Konca, A. S., & Klančar, A. (2023). Preliminary Results from Norway, Slovenia, Portugal, Turkey, Ukraine, and Jordan:

- Investigating Pre-Service Teachers' Expected Use of Digital Technology When Becoming Teachers. *Education Sciences*, 13(8), Article 8.
<https://doi.org/10.3390/educsci13080783>
- Ledoux, Michael W, and Nadine McHenry. 2008. 'Pitfalls of School-University Partnerships'. *The Clearing House* 81 (4): 155–60.
- Leibowitz, B., Bozalek, V., van Schalkwyk, S., & Winberg, C. (2015). Institutional context matters: The professional development of academics as teachers in South African higher education. *Higher Education*, 69(2), 315–330.
- Mac Mahon, B., Ó Grádaigh, S., & Ní Ghuidhir, S. (2018). From iTE to NQT: Evaluating Newly Qualified Teachers' Use of Mobile Technology in Their First Two Years of Teaching. *International Journal of Mobile and Blended Learning (IJMBL)*, 10(2), 8–19. <https://doi.org/10.4018/IJMBL.2018040102>
- Matsko, Kavita Kapadia, Matthew Ronfeldt, Hillary Greene Nolan, Joshua Klugman, Michelle Reininger, and Stacey L. Brockman. 2020. 'Cooperating Teacher as Model and Coach: What Leads to Student Teachers' Perceptions of Preparedness?' *Journal of Teacher Education* 71 (1): 41–62.
- Maxwell, E., Baillie, L., Rickard, W., & McLaren, S. M. (2013). Exploring the relationship between social identity and workplace jurisdiction for new nursing roles: A case study approach. *International Journal of Nursing Studies*, 50(5), 622–631. <https://doi.org/10.1016/j.ijnurstu.2012.10.015>
- McCoy, S., & Lynam, A. M. (2022). How field experience shapes pre-service primary teachers' technology integration knowledge and practice. *Teacher Development*, 26(4), 567–586. <https://doi.org/10.1080/13664530.2022.2074086>
- McDonagh, Adrian, Patrick Camilleri, Bård Ketil Engen, and Oliver McGarr. 2021. 'Introducing the PEAT Model to Frame Professional Digital Competence in Teacher Education'. *Nordic Journal of Comparative and International Education (NJCIE)* 5 (4): 4. <https://doi.org/10.7577/njcie.4226>.
- McGarr, Oliver, and Adrian McDonagh. 2021. 'Exploring the Digital Competence of Pre-Service Teachers on Entry onto an Initial Teacher Education Programme in Ireland'. *Irish Educational Studies* 40 (1): 115–28.
- McGarr, Oliver, and Ciarán Ó Gallchóir. 2020. 'Examining Supervising Field Instructors' Reporting and Assessment of Technology Use by Pre-Service Teachers on School Placement'. *Computers & Education* 146 (March):103753.

- Moore, Rita. 2003. 'Reexamining The Field Experiences Of Preservice Teachers'. *Journal of Teacher Education* 54 (1): 31–42.
- Morrison, Chad. 2016. 'Purpose, Practice and Theory: Teacher Educators' Beliefs about Professional Experience'. *Australian Journal of Teacher Education* 41 (3).
- Moynihán, D., Gorman, A., Leahy, M., & Scully, D. (2023). All the World's a Stage: Examining the Actors That Influence the Development of Primary Pre-Service Teacher Digital Competence in the Republic of Ireland. *Education Sciences*, 13(10), Article 10. <https://doi.org/10.3390/educsci13101045>
- Moynihán, D., Scully, D., Gorman, A., & Leahy, M. (2026). Where there's a will, is there a way? Exploring digital competence in pre-service teachers' intentions to use technology. *European Journal of Teacher Education*, 0(0), 1–23. <https://doi.org/10.1080/02619768.2026.2680942>
- National Council for Curriculum and Assessment. 2023. *Primary Curriculum Framework: For Primary and Special Schools*. Dublin: Department of Education.
- OECD. 2021. OECD Skills Outlook 2021: Learning for Life. OECD Skills Outlook. OECD.
- OECD. 2023. OECD Digital Education Outlook 2023: Towards an Effective Digital Education Ecosystem,. Paris, France: OECD Publishing.
- O'Grady, Sarah. 2017. 'Policy, Practice and Partnership: An Exploration of the Perspectives of Post-Primary School-Based Teacher Educators in Relation to School Placement.' Doctoral, Dublin City University.
- Örtengren, Alex. 2022. 'Digital Citizenship and Professional Digital Competence — Swedish Subject Teacher Education in a Postdigital Era'. *Postdigital Science and Education* 4 (2): 467–93. <https://doi.org/10.1007/s42438-022-00291-7>.
- Redmond, Petrea, Rhonda Christensen, Ana Amélia Carvalho, David A. Martin, Matt Byrne, Ottavia Trevisan, Shaun Nykvist, et al. 2025. 'A Global Perspective on Integrating Technology into Teacher Education Programs Using Measures of Self-Efficacy, Attitudes and Program Experiences'. In , 1396–1405. Association for the Advancement of Computing in Education (AACE).
- Resch, Katharina, Ilse Schrittemser, and Mariella Knapp. 2022. 'Overcoming the Theory-Practice Divide in Teacher Education with the "Partner School Programme". A Conceptual Mapping'. *European Journal of Teacher Education* 0 (0): 1–17.

- Robey, Hillary M., and Jennifer M. Krause. 2024. 'Cooperating Teachers' Participation and Beliefs Regarding Teacher-Educator Functions'. *Physical Educator* 81 (5): 495–519.
- Rodrigues, Filomena, and Maria João Mogarro. 2019. 'Student Teachers' Professional Identity: A Review of Research Contributions'. *Educational Research Review* 28 (November):100286.
- Rubach, Charlott, and Rebecca Lazarides. 2023. 'A Systematic Review of Research Examining Teachers' Competence-Related Beliefs About ICT Use: Frameworks and Related Measures'. In *Bildung Für Eine Digitale Zukunft*, edited by Katharina Scheiter and Ingrid Gogolin, 189–230. Edition ZfE. Wiesbaden: Springer Fachmedien.
- Saunders, Mark, Philip Lewis, and Adrian Thornhill. 2019. *Research Methods for Business Students*. Harlow, UNITED KINGDOM: Pearson Education, Limited.
- Shipway, B. (2011). *A Critical Realist Perspective of Education*. Taylor & Francis Group. <http://ebookcentral.proquest.com/lib/dcu/detail.action?docID=557319>
- Smestad, Bjørn, Ove Edvard Hatlevik, Monica Johannesen, and Leikny Øgrim. 2023. 'Examining Dimensions of Teachers' Digital Competence: A Systematic Review Pre- and during COVID-19'. *Heliyon* 9 (6).
- Smestad, Bjørn, and Astrid Gillespie. 2020. 'Dimensions of Teachers' Transdisciplinary Competence Based on a Systematic Review of Three Transdisciplinary Areas'. *Nordic Journal of Comparative and International Education (NJCIE)* 4 (3–4): 3–4. <https://doi.org/10.7577/njcie.3757>.
- Starkey, L. (2020). A review of research exploring teacher preparation for the digital age. *Cambridge Journal of Education*, 50(1), 37–56. <https://doi.org/10.1080/0305764X.2019.1625867>
- Stenbom, Stefan, and Lena and Geijer. 2024. 'Primary School Teachers' Perception of Digital Transformation and Their Teaching Role'. *Scandinavian Journal of Educational Research*, 1–14.
- Stutchbury, K. (2022). Critical realism: An explanatory framework for small-scale qualitative studies or an 'unhelpful edifice'? *International Journal of Research & Method in Education*, 45(2), 113–128. <https://doi.org/10.1080/1743727X.2021.1966623>

- Suárez-Guerrero, Cristóbal, Prudencia Gutiérrez-Esteban, and Desirée Ayuso-Delpuerto. 2024. 'Pedagogía Digital. Revisión sistemática del concepto'. *Teoría de la Educación. Revista Interuniversitaria*, March, e31721–e31721.
- Sugrue, C., & Solbrekke, T. D. (2017). Policy rhetorics and resource neutral reforms in higher education: Their impact and implications? *Studies in Higher Education*, 42(1), 130–148. <https://doi.org/10.1080/03075079.2015.1036848>
- Tarraga-Minguez, Raul, Cristobal Suarez-Guerrero, and Pilar Sanz-Cervera. 2021. 'Digital Teaching Competence Evaluation of Pre-Service Teachers in Spain: A Review Study'. *IEEE Revista Iberoamericana de Tecnologías Del Aprendizaje* 16 (1): 70–76.
- Teo, Timothy. 2019. 'Students and Teachers' Intention to Use Technology: Assessing Their Measurement Equivalence and Structural Invariance'. *Journal of Educational Computing Research* 57 (1): 201–25.
- The Teaching Council. 2020. *Céim: Standards for Initial Teacher Education*. Maynooth: The Teaching Council. <https://www.teachingcouncil.ie/en/News-Events/Latest-News/Ceim-Standards-for-Initial-Teacher-Education.pdf>.
- The Teaching Council. 2021. *Guidelines on School Placement: Revised Edition 2021*. Maynooth: The Teaching Council.
- Tikly, L. (2015). What works, for whom, and in what circumstances? Towards a critical realist understanding of learning in international and comparative education. *International Journal of Educational Development*, 40, 237–249. <https://doi.org/10.1016/j.ijedudev.2014.11.008>
- Tomczyk, Łukasz. 2024. 'Digital Competence among Pre-Service Teachers: A Global Perspective on Curriculum Change as Viewed by Experts from 33 Countries'. *Evaluation and Program Planning* 105 (August):102449.
- Tondeur, J., van Braak, J., Sang, G., Voogt, J., Fisser, P., & Ottenbreit-Leftwich, A. (2012). Preparing pre-service teachers to integrate technology in education: A synthesis of qualitative evidence. *Computers & Education*, CAL 2011, 59(1), 134–144. <https://doi.org/10.1016/j.compedu.2011.10.009>
- Tondeur, Jo, Natalie Pareja Roblin, Johan van Braak, Joke Voogt, and Sarah Prestridge. 2017. 'Preparing Beginning Teachers for Technology Integration in Education: Ready for Take-Off?' *Technology, Pedagogy and Education* 26 (2): 157–77.
- Ursavaş, Ömer Faruk, Yasin Yalçın, and Eda Bakır. 2019. 'The Effect of Subjective Norms on Preservice and In-service Teachers' Behavioural Intentions to Use

- Technology: A Multigroup Multimodel Study'. *British Journal of Educational Technology* 50 (5): 2501–19.
- Vlies, Reyer van der. 2020. Digital Strategies in Education across OECD Countries: Exploring Education Policies on Digital Technologies. OECD Education Working Papers 226. Paris, France: OECD Publishing.
- Walsh, Mary E., and Sarah Backe. 2013. 'School–University Partnerships: Reflections and Opportunities'. *Peabody Journal of Education* 88 (5): 594–607.
- Wang, Zhaorui, and Zuwang Chu. 2023. 'Examination of Higher Education Teachers' Self-Perception of Digital Competence, Self-Efficacy, and Facilitating Conditions: An Empirical Study in the Context of China'. *Sustainability* 15 (14): 10945.
- Wengraf, T. (2001). Qualitative Research Interviewing. SAGE Publications, Ltd.
<https://doi.org/10.4135/9781849209717>
- Wiltshire, Gareth, and Noora Ronkainen. 2021. 'A Realist Approach to Thematic Analysis: Making Sense of Qualitative Data through Experiential, Inferential and Dispositional Themes'. *Journal of Critical Realism* 20 (2): 159–80.
<https://doi.org/10.1080/14767430.2021.1894909>.
- World Trade Organisation. 2020. *World Trade Report 2020: Government Policies to Promote Innovation in the Digital Age*. Geneva: WTO.
https://www.wto.org/english/res_e/publications_e/wtr20_e.htm.
- Young, Ann-Marie, and Ann MacPhail. 2015. "'Standing on the Periphery": Cooperating Teachers' Perceptions and Responses to the Role of Supervision'. *European Physical Education Review* 21 (2): 222–37.
- Yung, Kevin Wai-Ho. 2020. 'Becoming a Teacher Educator through Being a Student Teacher: An Autoethnography in the Practicum'. *Journal of Education for Teaching* 46 (2): 248–50.
- Zeichner, Ken. 2010. 'Rethinking the Connections Between Campus Courses and Field Experiences in College- and University-Based Teacher Education'. *Journal of Teacher Education* 61 (1–2): 89–99.
- Zeichner, Ken. 2021. 'Critical Unresolved and Understudied Issues in Clinical Teacher Education'. *Peabody Journal of Education* 96 (1): 1–7.
- Zeichner, Kenneth M., and B. Robert Tabachnick. 1981. 'Are the Effects of University Teacher Education "Washed Out" by School Experience?' *Journal of Teacher Education* 32 (3): 7–11.