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Introducing the PEAT model to frame professional digital competence in teacher education

Adrian McDonagh[1]
University of Limerick
Patrick Camilleri
University of Malta
Bård Ketil Engen
Oslo Metropolitan University
Oliver McGarr
University of Limerick

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Abstract

This paper puts forward a case for using the PEAT model in teacher education, a framework designed to capture the different dimensions of teachers' professional digital competence (PDC). The model arose from an Erasmus+ funded project exploring digital competence in teacher education. While existing frameworks and conceptualisations of teachers' digital competence exist, this paper argues that the PEAT model has unique affordances and characteristics. This paper outlines the importance of digital competence before exploring how it is currently conceptualised in teacher education. Following this, some of the current frameworks encapsulating the elements of teachers' professional digital competence are briefly presented. Finally, the paper presents the PEAT framework and discusses its unique affordances.

Keywords: Professional Digital Competence, Teacher Education, Attitudes, Ethics

Introduction

The pervasiveness of digital technologies in even the most mundane aspects of life has highlighted the importance of all citizens having the capabilities to navigate this digital world. Terms such as digital literacy and digital competence are now commonly used to describe a range of skills and abilities. While some argue that there are distinct differences between the terms digital literacy and digital competence, Spante et al.'s (2018) review of the use of the terminology in the global literature indicates that they generally refer to the same concept, but that linguistic and cultural preferences influence which particular term is used at a national

[1] Corresponding author: Adrian.McDonagh@ul.ie

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level. For the purposes of this paper, we will use the term digital competence but acknowledge that in other jurisdictions, the term digital literacy is preferred. Turning to what digital competence represents, Johannesen et al. (2014) argue that it represents skill-oriented aspects, knowledge, and the development of attitudes towards digital technologies. As this description highlights, digital competence is not confined to a narrow range of technical competences but instead encompasses a much wider range of knowledge and attitudes. To be digitally competent one must also possess a critical awareness of the function of digital technologies in all aspects of life and the ability to use them effectively. Also, what digital competence entails goes beyond the knowledge and skills of how to use digital devices and products; invariably, digital technologies continue to evolve, opening up the need for new technical skills. Furthermore, the development of new technologies also influences social practices which, in turn, calls for new understandings of how technologies influence and are influenced by educational, social, political, environmental and economic factors. Specific societal and cultural needs will also influence regional and national understanding and applications of the term digital competence.

Digital competence is considered an important 21st Century skill. Consequently, it is then understandable that attention has focused in recent decades on teachers' role in helping students achieve digital competence. This, in turn, has directed the spotlight on teachers' (both in-service and pre-service) preparedness to meet these expectations and the need to address digital competence in teacher education. As Starkey (2020) notes, "Teachers entering the profession need to be prepared for schools and education systems that are becoming increasingly digitised" (p.38). Therefore, as digital technologies advance and increase in proliferation within the classroom, so too will the assumption and belief that teachers are competent in including these new technologies in the teaching and learning process (Freeman et al., 2017).

While there is no doubt that preparing future teachers to employ digital technology in their profession is an enduring challenge for teacher training institutions (Tondeur et al., 2021; Falloon, 2020), preparing future teachers to adopt an open and engaging attitude towards technology is arguably just as important. A well-prepared, digitally competent teacher will not be one who can only manipulate technologies, but as Tondeur et al. (2012) state, will be the one who has the ability to adapt their understanding of digital technology as its nature and practices evolve with time. As a result of increasing pressure on schools and teachers from government agencies and society to become more digitally competent, tools and frameworks that set out to describe the different elements of teachers' digital competence now exist. Many of these frameworks also describe different levels of competence in various areas. These frameworks have been heavily reported in research, spanning over two decades. Although current frameworks vary in their presentation and perceived potential outcomes, they also vary in terms of whether they present a hierarchical structure detailing an order of levels of skills and knowledge ranging from basic levels of higher, more desired, levels.

As part of an Erasmus+ funded project focusing on the need in EU policies for newly graduated student teachers to be able to teach using ICT, one aim was to identify the student teachers' levels of digital competence when entering teacher education and compare these across teacher education programs in Ireland, Malta, Norway and Spain. Insight and knowledge about student teachers' digital competence are crucial regarding how teacher education should prepare teacher students to be digital competent as professional in-service teachers.

To achieve this, the project needed to firstly employ a framework that captured the different dimensions of teachers' professional digital competence. This was required so that the planned survey instrument could be structured as necessary. In this process, several existing frameworks on teachers' professional digital competence were explored (For further information on this analysis of existing frameworks (see McGarr & McDonagh, 2019). However, despite the strengths of many of the models reviewed as part of this scoping exercise, it was felt that no existing framework adequately met the needs of the project. For that reason, the project team synthesised the current literature in this area and devised a new framework, the PEAT model. The PEAT model, an acronym for Pedagogical, Ethical, Attitudinal and Technological, was subsequently employed as a model to frame the development of the survey instrument used in the study. This paper outlines the development of the PEAT framework, but before looking at this, the paper firstly explores the current approaches to conceptualising and framing professional digital competence (PDC) and the existing PDC frameworks present in the literature.

Current approaches to conceptualising and framing Professional Digital Competence

Before discussing other professional digital competence (PDC) frameworks and developing this new framework, it is important to address issues around digital technologies in schools and teacher education. We will also further explore the understanding of the term PDC. When Information Technology (IT) was first introduced into the education system, the primary focus was on increasing teachers' digital competencies in the practical use of these new technologies. However, the user interface of these early systems resulted in an emphasis on developing the practical skills to utilise the technologies due to the complicated nature of early IT systems. Today, the situation is somewhat different. Digital technologies like computers, tablets or smartphones are significantly easier to use, with a much more user-friendly interface. Consequently, the emphasis within the education system has shifted from focusing on how to work the technology to how to adapt the technologies to a pedagogical and didactic framework (Engen, 2019).

In conjunction with the technologies becoming easier to use and more widespread in society, the research focus also changed from examining the prevalence of technology in schools and its instrumental use; towards surveying teachers' and preservice teachers' abilities to integrate digital technologies to support teaching and learning activities. In the public discourse, schools and the teaching profession are still subject to claims that teachers are too slow in adapting to new technologies and that teachers lack competencies to carry out such a desired transformation. To a certain extent, such argumentation has found support in research that documents an apparent discrepancy between available technology and the actual use in the classroom (Amiel & Reeves, 2008; Cuban, 2001; Jurica & Webb, 2016; Selwyn, 2010; Wachira & Keengwe, 2011; Winner, 2009). It has also been claimed that teacher education has not succeeded in preparing student teachers to be able to use digital technologies in didactic and pedagogical work (Elstad & Christophersen, 2017; Instefjord & Munthe, 2017). However, it could be questioned if too many of these studies have been one-sidedly aimed at looking for effects? That is, that it is aimed at the extent to which digital technologies have the potential to

strengthen and improve learning (Beckman et al., 2018; Oliver, 2011; Selwyn, 2012), and to a lesser extent at the broader social and the professional conditions for the use of digital technologies in schools.

It is on the basis of these issues, the term professional digital competence (PDC) was introduced by Tømte et al. (2013). Where a discrepancy was addressed between the digital challenges student teachers face in the field of practice and how they have been prepared for this from the teacher education institutions (Tømte et al., 2013; Lund et al., 2014; Johannesen et al., 2014). Nevertheless, professional digital competence is a relatively new concept in the research community that suggests a shift from understanding digital competencies as more complex than generic instrumental skills, which are suitable for every situation, to include context sensitive and teacher professional skills (Gudmundsdottir & Hatlevik, 2018). Regarding teacher education, PDC emphasises a need to educate pre-service teachers with abilities to use digital technologies to make it relevant for different situations and subjects. Professional digital competencies include technical, practical skills in using digital technologies, but it also includes pedagogical skills in making digital devices relevant and applicable to different subjects and situations in schools. Mishra and Koehler (2006) identified this in their model of Technological Pedagogical Content Knowledge (TPACK). The TPACK framework was later extended by Falloon (2020) to include two sets of integrated competencies, namely personal-ethical and personal-professional. The personal-ethical competence adds complexities in the areas of cyber ethics, digital citizenship and digital safety as important competencies in relation to the TPACK model. The personal-professional competence includes the necessity of the professional teachers' well-developed information literacies and the ability to strategically engage in online professional networks. Personal-professional competence also addresses the professional teachers' ability to respond to change and attitudes to transform their practice according to new technologies (Falloon, 2020). While similarities could be drawn between the model presented by Falloon and the PEAT model presented in this paper, it should be noted that Falloon's model is built on TPACK, and therefore was not considered because of the limitations of the model as outlined above.

It is important to accentuate professional digital competence as a dynamic concept because it implies both professional practice and professional development of these practises. However, given the complexity of today's digital society, being a professional, digitally competent teacher must also include attitudinal and ethical dimensions to teach and prepare pupils to become naturalised digital citizens. Therefore, being a professional digitally competent teacher requires abilities that draw on their own experiences and knowledge from their role of being responsible digital citizens in society and transfer these experiences and competencies to a given professional context. This implies a much more complex set of competencies rather than just being able to adapt to new digital technologies when they are introduced into the classroom. The term professional digital competence is thus so complex that it could be argued that a conceptual definition or demarcation would be an impossible task (Engen, 2019). Given this complexity, the teacher education programs must ensure that pre-service teachers develop the necessary professional competencies to function in a professional practice where dealing with digital technologies is of unequivocal importance in framing their professional careers. Furthermore, it is crucial that teacher education programs ensure that student teachers develop a professional approach and mindset that includes a deep understanding of the ethical aspects

of digital technology. This set of professional competencies, measuring their effectiveness and the level of a teachers' digital competence, has been the focus of multiple studies and frameworks for several years, and these will be explored in the next section of this paper.

Discussing and examining existing Digital Competence frameworks

One of the Erasmus+ project outcomes was an alternative digital competence framework encompassing essential elements that the project partners believed were necessary when conceptualising professional digital competence for teachers and teacher educators. From the onset of the project, it was not the intention to devise our own conceptualisation of teachers' professional digital competence; however, in our extensive review of existing frameworks (McGarr & McDonagh, 2019), there were a multitude of perspectives and no one model suited the needs of the research exercise to be undertaken. While it is not the intention of this paper to re-examine the review of literature that was undertaken as part of the Erasmus+ project (see McGarr & McDonagh, 2019 for this review), this section of the paper highlights some of the key insights from this review of existing frameworks, and in doing so, provides a rationale for the PEAT framework that is described in the subsequent section of the paper.

Given the importance of PDC, many frameworks have been designed and created in an effort to guide users in how to grow or improve their digital competence. Most, but not all of these frameworks, can be described as hierarchical in that they specify key criteria and describe levels of competence under each criteria ranging from basic levels to higher, more desired levels. In this respect, and as a means of understanding observed digitally mediated competencies, behaviours, attitudes and intentions underlying technology, several technology acceptance models and theories have been applied (Alshammari & Rosli, 2020). This variety is to be welcomed at one level, but for teacher educators attempting to critique their levels of digital competence in pre-service and in-service teacher education programmes, the lack of consensus makes the task more challenging. In addition, various studies have invariably fuelled the need to develop several models and theoretical frameworks that were either used on their own or extended with previous models within the teaching and learning processes (Granić & Marangunić, 2019). Yet again, the deliberate refinement of technology usage models for education, such as the Theory of Reasoned Action, TRA (Ajzen & Fishbein, 1975) to Technology Acceptance Model, TAM (Davis, 1989) to the Extended Technology Acceptance Model, TAM2 (Venkatesh & Davis, 2003) and ultimately to the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh 2003) may reflect on the limitations that these models may harbour.

For instance, TRA ignores contextuality and limits variations in users' behavioural intentions to attitudinal and subjective qualities. This has also been attributed to other prominently employed technology acceptance models in teaching and learning contexts (Granić & Marangunić, 2019), such as TAM, where, as Tarhini et al., (2017) state, the focus should go beyond technological solutions to include social and cultural contexts. However, this might not provide a clear explanation of how users accept technology (Alshammari & Rosli, 2020). The extended TAM 2 model limits the influence of Behavioural Intentions to Perceived Use and ignores the underlying relations that the Perceived Ease of Use (PEU) may also have. In the case of the UTAUT the same intrinsic high exploratory power and the complex relations

between the various constructs within the theory may potentially lead to low parsimony and therefore adoption (Alshammari & Rosli, 2020, p.17). Ultimately these frameworks are hierarchical, move in one direction and do not consider that as humans, teachers and educators can learn from their own experiences. Subsequently, as they retrace back on their own choices and even start over again from a differently chosen vantage point this asks for an analytical approach such as the PEAT model which, as will be expressed further on, is capable of offering equally important points of initiation that can invariably suit the unpredictability of human nature.

Perhaps more widely recognised frameworks appear less hierarchical in nature and offer a taxonomy of independent or interlinked elements. The Technological Pedagogical Content Knowledge (TPACK) model from Mishra and Koehler (2006) could be considered a model that does not impose a hierarchy or staged framework to its structure. This framework combines technological pedagogical and content knowledge. It is most commonly shown as a Venn diagram with three intersecting circles, thus showing the combination of, for example, technological and pedagogical or content knowledge and technical. The research community quickly adopted this framework, yet as Graham (2011) observed, "very little theoretical development of the model has occurred". In his critique of the framework, Graham (2011) concluded that the framework "has the potential to provide a strong foundation for future technology integration" while also stating that for this to take hold researchers must "shore up weaknesses in the clarity of TPACK". One such weakness, it could be argued, is the lack of explicit reference to ethical and professional issues. Falloon (2020), for example, in his paper reporting on digital competence frameworks, argues for the inclusion of ethical and professional components to be included or aligned with the TPACK model.

A second influential model that has attempted to frame teachers' digital practice is the SAMR model. According to Puentedura (2006, in Hamilton et al., 2016, p. 433) the Substitution, Augmentation, Modification and Redefinition (SAMR) model is a "taxonomy-based approach for selecting, using and evaluating technology in K-12 settings". This model, widely referenced in the US, details digital competence with growth to the forefront. Growth is initially identified as teachers simply using technology, substituting old methods for new. This evolves after augmentation, where a teacher uses technology to somehow or in any way improve how a lesson or idea is delivered using technology. The next step in this framework is a modification, where the learning is somehow "redesigned" to finally "redefinition", where technology has now become the norm in the delivery of teaching and learning (Hamilton et al., 2016). In her research exploring the SAMR model, Hamilton et al. (2016), critically evaluates the model based on its hierarchical or "ladder" type structure. Hamilton et al. (2016), critique this model under three main headings. Firstly "absence of context" where this model allows no affordances for a school or a teacher's access to technology or resources. Thus, as no consideration is given to how or who is using the technology in question this can invariably lead to misuse (Cherner & Mitchell, 2021). Secondly, its "rigid structure" describes the hierarchical structure of this model and how this limits its effectiveness. Thirdly, its "product over process" where this model centres around introducing technology instead of focussing on how using technology can improve how we teach or how students learn, the pedagogical element of digital technology. It could be argued that the SAMR model is not specifically a model framing teachers' digital competence, but it has been included here to highlight how the

wider discourse related to teachers' use of technology is strongly influenced by a 'levels of use' perspective that sees technology use ranging from less favoured levels to more desired levels. This has been evident in many frameworks of teachers' digital competence that detail specific teacher standards concerning specific areas.

The UNESCO ICT competence framework for teachers is another framework that identifies factors necessary for the successful integration of ICT in teaching and learning, and was "specifically designed to improve teachers' practice by providing guidelines for teacher education and training" (Voogt & Roblin, 2012, p. 303). The framework, first published in 2011 but revised in 2018, adopts quite a different structure to its framing of digital competence than the TPACK model. The model proposes a range of criteria encompassing digital competence (DC) and a series of levels that can be achieved under each area. For example, in the area of policy, the framework presents levels ranging from having an awareness of policy to being innovative with policy (UNESCO, 2011). The UNESCO, 2018 model for ICT competence framework for teachers clearly identifies initial stages of digital competence where teachers begin acquiring knowledge to then deepen knowledge and finally knowledge creation (UNESCO, 2018).

The DigiCompEdu is another framework that employs a hierarchical structure and has been quite influential in shaping policy in relation to teacher education and technology in many European countries (Vuorikari et al., 2016). According to Redecker (2017), the framework was a response to;

> the growing awareness among many European Member States that educators need a set of digital competencies specific to their profession in order to be able to seize the potential of digital technologies for enhancing and innovating education (p. 8)

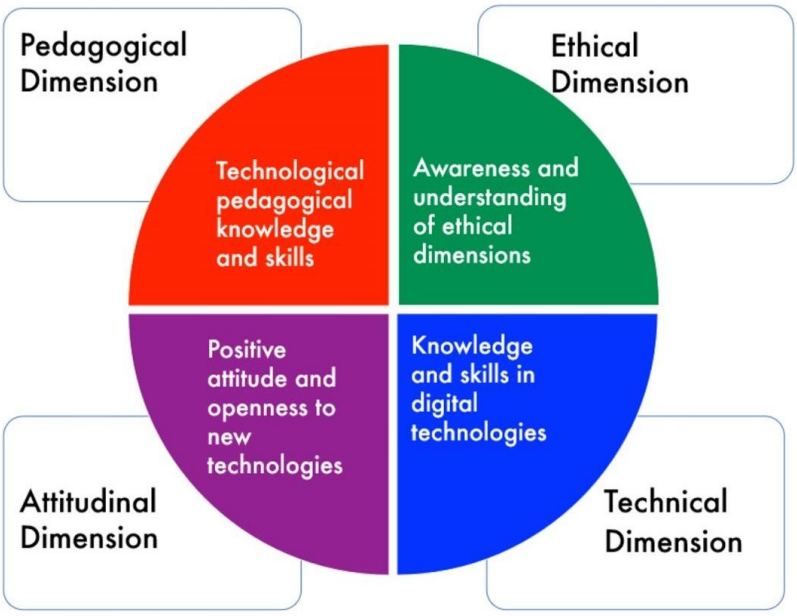
The framework explores three levels of digital competence across 22 elementary competencies divided into six areas. Redecker (2017, p. 9) states that the framework offers "a progression model to help educators assess and develop their digital competence". This indicates that the framework sets out areas of growth, development and progression of competence for educators across key areas. A strength of this framework is the detailed way it describes each section or area of digital competence. However, this conversely could also be seen as a significant weakness as its over prescriptive approach restricts its ability to respond to new and evolving technologies and practices, thus raising questions about its ongoing relevance in an ever-changing landscape.

This brief review of some of the more referenced existing frameworks and conceptualisations of teachers' digital competence highlights several models. An output for the Erasmus+ project, from where PEAT model evolved, was an extensive review of all digital competency frameworks (McGarr & McDonagh, 2019). This more extensive review discusses aforementioned and other frameworks that provided the scaffolding from which the need for a more non-hierarchical, generic framework grew. Identified from this literature review was that to capture the various dimensions of teachers' digital competence, none of the existing models was deemed suitable. As a result, it was decided to develop a broad framework that captured the key dimensions of teachers' professional digital competence in a way that could be readily deployed to the design of a survey instrument. The following section describes the framework and the rationale behind its structure.

The PEAT model

Having reviewed different conceptualisations of teachers' professional digital competence, we developed a four-part model encompassing Pedagogical, Ethical, Attitudinal and Technical dimensions and used the PEAT acronym as a cohering abbreviation. This model represents a synthesis of all key areas present in the review of the existing models. While some existing frameworks present elements in a hierarchical manner, prioritising some aspects over others, the PEAT model does not adopt such an approach. Instead, it recognises all dimensions as interconnected and equally important. Therefore, the order of the components should not be interpreted as a reflection of their level of importance.

Figure 1. The PEAT model



Looking at the four dimensions in greater detail, a common and obvious element of all existing models and conceptualisations of PDC was the teacher's technical competencies. These have traditionally been the most common dimensions of teachers' digital competence, as historically, when technologies in education were originally promoted, teachers (and the general public) frequently did not have the necessary technical skills. Hence from very early technology integration initiatives, ensuring teachers had the technical skills to use the technology has been a central concern, often to the detriment of other aspects such as pedagogical competencies. This technical dimension, therefore, encompasses teachers' understanding and skills of using various technologies. Recognising the vast range of possible technical skills and knowledge that this could encompass (and the challenge brought about by the constant obsolescence of older technologies and the continual emergence of new technologies), this technical dimension does not reflect a fixed list but is instead open to define contextual or local interpretation. This could be criticised as an anything goes approach, but the specific technical aspects deemed important are dependent on priorities at a school, regional or national level, and as such, any model needs to cater for this.

The pedagogical dimension captures the range of pedagogical competencies required by teachers, including their ability to evaluate the pedagogical merits of different technologies for their teaching and the ability to effectively integrate them into their practice. Importantly, this dimension overlaps with teachers' broader repertoire of pedagogical skills. For example, suppose a teacher does not have a good understanding of how to facilitate an inquiry-based learning strategy in their practice. In that case, it is unlikely that they will consider how this could be enhanced through the use of digital technologies. Understandably, this pedagogical dimension is universally recognised in all existing competence models.

Less common but becoming increasingly recognised as an important element is the ethical dimension of teachers' professional digital competence. This ethical dimension encompasses a broad range of cyber-ethics issues related to the general use of digital technologies and specific cyberethics issues related to teachers' use of digital technologies. This includes issues such as online privacy, data security, copyright and licensing, and issues related to online safety, including child welfare and safe internet practices. Cyberethics, which has also been referred to as computer ethics, information ethics, e-safety, digital responsibility (Pusey & Sadera, 2011; Ribble, 2015; Wessels, 2012), etc. is defined as applied ethics because it has to do with the concrete use of digital media (Ramadhan et al., 2011; Spinello & Tavani, 2001). Cyberethics is an applied ethic that deals with normative, legal, and social aspects related to the development and use of digital media. The unique ethical issues arising from increasing digital technology in education is a particularly important part of this dimension. For example, with the increasing use of data analytics in education, what ethical issues does this raise? Further still, with the greater commercialisation of the educational arena, driven primarily through the increasing levels of digital technology integration, what ethical issues does this raise about teachers' professional practice? While these, and other questions, do not have simple answers, it is important that teachers are encouraged to reflect and think about such matters. Simply bringing these issues to the attention of the profession may be sufficient to start a conversation about some of these broader questions in the teaching profession that often transcend issues related to technology use. For instance, emerging areas related to the sustainability of digital technology manufacturing from both an environmental and human rights perspective (Emejulu & McGregor (2019)) also have a natural home in this dimension.

The fourth dimension of the PEAT framework is the attitudinal dimension. This aspect is not prominent in the existing conceptualisations of teachers' digital competence, but it is one that we believe is a critical element. The attitudinal dimension encapsulates the teachers' general attitude to digital technologies in education. While a teacher may possess the relevant technical, pedagogical and ethical dimensions to guide their practice, the attitudinal dimension captures the teacher's openness to exploring new digital technologies. Without this aspect, we argue that teachers could become fixed to particular technologies. While they may be able to use existing technologies very competently in their practice, a lack of willingness to explore and experiment with new and emerging technologies and continually critically evaluate the digital practices they currently employ, would represent a significant shortfall in a teacher's professional digital competence. Importantly, this dimension also encompasses a critical element to ensure that the teacher can critically interrogate digital practices and make informed decisions about their educational merits so as to avoid the unquestioning, evangelical perspective on digital technology use. While research indicates that a positive attitude to

technology is a significant predictor of teachers' technology use (Aslan & Zhu, 2017), it is important to highlight that the use of the term attitude does not necessarily refer to a positive attitude but more a critically engaged attitude that thoughtfully reflects on digital technology developments and uses in education and in society in general. Therefore, as is evident, this attitudinal dimension overlaps with pedagogical and ethical dimensions of the framework highlighting the interconnectedness of each dimension.

Teacher educators can use the four key interconnected dimensions of the PEAT model to evaluate the extent to which these important aspects are addressed in teacher education programmes and can also be used as a guiding framework in evaluating the extent of teachers' professional digital competence. While acknowledging that there are a multitude of existing frameworks aiming to capture teachers' digital competence, we argue there are several unique benefits to the use of the PEAT framework.

Firstly, an overarching value of this model is that it does not prescribe a detailed list of aspects for each dimension; instead, it provides an overall guiding framework for education programme designers to ensure that the key dimensions are addressed. The absence of specificity, present in other digital competence frameworks, could be seen as a drawback, but we strongly argue that, while PDC frameworks that provide a high level of specificity have enormous value, a strength of the PEAT model is that it allows for autonomy and agency and for local interpretations of the four dimensions to be enacted. Furthermore, frameworks with detailed descriptions of what constitutes the different skills and knowledge required can become too prescriptive and stifle innovative practices that have the potential to broaden the margins of what constitutes PDC. Finally, the holistic manner in which the PEAT framework is conceptualised provides an overall framework through which teacher educators can realise the enactment of PDC building on the unique characteristics and affordances of their own professional setting.

A further important value of the PEAT framework is its elevation of the ethical and attitudinal dimensions of digital competence to an equivalent significance as the traditionally dominant technical and pedagogical dimensions. The study of educational technology in teacher education originally emphasised assisting teachers to master the use of technological digital devices and use them within an educational context. However, with the proliferation of digital technologies across society and their central role in the lives of young people, teachers cannot ignore the critical questions they pose about broader ethical aspects related to information, security and well-being. Issues such as these transcend individual subject areas and are not the responsibility of any one teacher as these issues have implications for the entirety of the student experience. Therefore, knowledge of these issues is critical for all teachers to identify and capitalise on the opportunities within their own subject areas to address related ethical issues as they arise.

Another unique contribution of the PEAT model is the importance afforded to teacher attitudes. The importance of positive teacher attitudes to advance the integration of digital technologies in education has been a prominent aspect of the research literature for many decades. While recognising this as an important aspect, focusing on positive attitudes towards educational technology rather than developing a more critical perspective on digital technologies can lead to teachers using technology in an enthusiastically positive manner without critically questioning its educational merits. To address this, the attitudinal dimension

of the PEAT model not only aims to encourage teachers to be inquisitive about new and emerging technologies, but it also emphasises that in developing this inquisitiveness it could also be accompanied by a healthy scepticism that is open to considering the affordances and limitations of all technologies. Therefore, instead of aiming to technologically evangelise teachers in relation to digital technology use, this component aims to develop teachers' criticality, achieving a balance between openness to embracing new technologies and critical interrogation of them.

A further distinctive feature of the PEAT framework is its simplicity and generic applicability. Its four-part structure enables all teacher educators to conceptualise the different components regardless of their expertise in this area. It can therefore be used as a framework by all teacher educators when considering how they can contribute to student teachers' PDC and, when used to guide overall programme design, it ensures that all dimensions are afforded appropriate attention as it is not hierarchical in its layout and affords equal status to all components. Further still, recognising the interconnected nature of all aspects ensures that while there is flexibility in terms of what is decided to be included in each dimension, all dimensions are necessary to achieve a comprehensive professional digital competence.

Conclusion

Returning to the aim of the paper, which was to identify a framework designed to capture the different dimensions of teachers' professional digital competence (PDC), this paper has presented the PEAT model. It has been argued that notwithstanding the benefits and contributions of existing conceptualisations of teachers PDC, there are several unique affordances offered by the PEAT framework. Specifically, as it is developed from the existing literature in this area, it draws on the current knowledge rather than being ideologically driven. In addition, by placing the ethical and attitudinal aspects as key dimensions it elevates their importance to an equal footing with the technical and pedagogical aspects and recognises the interconnected nature of all four dimensions. Further still, the generic structure of the PEAT framework allows for local autonomy when implementing the model and the intentional lack of specificity within the model helps to overcome issues of obsolescence, suffered by other frameworks, ensuring that it is flexible enough to incorporate new and emerging technologies, practices and ethical issues. Finally, we argue that a key strength of the model is that it is presented in a manner that makes it accessible to teacher educators and teachers not experienced in digital technology use, and for that reason, it can be used as a guide to help all teacher educators to audit the nature of their practices to determine if and how their practice can incorporate and contribute to the development of teachers' PDC. Thus, for example, teacher educators not working in the traditional areas of technology on teacher education programmes can use the model to identify how they can contribute to PDC beyond the specific digital practices that are frequently confined to specialist digital technology courses and modules. For that reason, it aims to liberate PDC from its traditional technical past.

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