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Digital Professional Competence (DProCom) for Higher Education: A Systematic Review of Literature

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Abstract: *The need to discuss and refine the concept of Digital Professional Competence (DProCom) has become vital in the rapidly advancing and extensively digitized information and knowledge society. The Coronavirus pandemic revealed the usage divide among teachers and its impact on learning outcomes, thus surfacing the need to explore DProCom in Higher Education (HE) for future researchers to use findings of this review for developing pragmatic research models and professional development initiatives for student teachers of all levels. The aim of this systematic literature review is to provide the scholarly community with an overview of the definition, range of attributes, and gaps in research on DProCom from 2012 to 2022 in the context of HE. The initial search yielded 3903 outcomes, which were iterated through inclusion criteria, and 39 research articles relevant to HE were thoroughly reviewed. The results assert a lack of consistency and uniformity in terminologies being used to denote the concept of DProCom and their description in the literature. The findings confirm that DProCom is in its infancy stage. There is a need to continue research on professional competence from a global perspective to predict changes in HE teaching, professional development and quality assessment of learning outcomes to respond to the needs of HE in a digital era.*

Key Words: DProCom, Digital Professional Competence, Higher Education, Literature Review

Introduction

The utility of Information and Communication Technologies (ICT) has evolved from an optional pedagogical support tool to an essential ingredient for modern pedagogy, thus necessitating instructors at all levels to professionally develop themselves in Digital Proficiency for better adoption of the changing context of their practice field. The massive shift to remote teaching that stemmed from the COVID-19 pandemic exponentially increased the pedagogical use of digital technologies and can be identified as evidence of the digital revolution in teaching and learning (Joshi, Neupane, & Joshi, 2021). Consequently, there is a pressing need to explore the depth of professional knowledge and behaviours that instructors must harness to demonstrate proficient use of digital tools and media. Against this backdrop, the notion of digital competence has been frequently discussed from the perspective of students who are believed to be digital natives and immersed in state-of-the-art technologies to guide the everyday occurrence of social, personal, professional, and academic experiences (Falloon, 2020). The pandemic also brought to light the acute digital usage divide caused by educators' varying understanding of digital competence. The lack of critical, creative, relevant, and confident use of ICT and digitized media resources within the repertoire of Higher Education (HE) is undoubtedly a great challenge to accomplish Global Sustainable Development Goal 4 of Quality Education, which standardizes effective integration of ICTs to promote learning outcomes (Wulff, 2017). Quality education for all is pertinent to the instructor's digital professional competence (hereafter DProCom). In recent years, there has been a prominent focus on defining the depth and breadth of DProCom in the context of various professions. In the context of HE, this is still a boundary term in its infancy stage (Cabero-Almenara, Gutiérrez-Castillo, Palacios-Rodríguez, & Barroso-Osuna, 2020).

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This systematic literature review explores the concept of digital competence by reporting the range of available definitions and dimensions cited in globally accepted frameworks (DQ Institute, 2017; Falloon, 2020). A second goal of the literature review is to identify the limitations and gaps in current research on DProCom in HE. The review is guided by the following research questions:

1. How does the research in HE define DProCom?
2. What does the recent literature indicate are the essential attributes of DProCom for HE faculty to ensure full digital inclusion?
3. What are the gaps in research on DProCom in HE?

Methodology

The systematic literature review abides by the principles and protocols defined by researchers to advance accountability and reliability of results (Gough, Thomas, & Oliver, 2012). The review systematically presents empirical evidence from the last ten years shortlisted according to eligibility criteria. The inclusion criteria were established by adhering to the principles of inclusion defined by Nightingale (2009) to remove the possibility of bias in the process of searching, identifying, coding, appraising, and synthesizing evidence (Nightingale, 2009).

Search Process

The centrifugal force to guide this review is to explore the phenomenon of instructors' digital professional competence in the context of Higher Education. For a better understanding of how the concept has evolved over the years, a few combinations were developed to scan the extant literature. These search terms were used to scan the title, abstract, and keywords: *Digital + competence + Higher + Education, professional + competence + Higher + Education, ICT + literacy + digital + literacy + Higher + Education,* and *Teachers + Higher + Education + Digital + Skills.*

The data were extracted from six academic databases: IEEE Xplore, ERIC, Science Direct, Springer Link, ACM Digital Library, and Web of Science. Google Scholar was used to explore relevant frameworks and policy reports.

To ensure relevancy with the latest trends, only articles published between January 2012 and December 2022 were included in this review.

Inclusion Criteria

The inclusion criteria, based on the level of relevance, clarity and depth of concept in the context of Higher Education, was first described by the researchers and later was validated by experts (n=6) from the Punjab Higher Education Commission (PHEC), National Academy of Higher Education (NAHE), and Higher Education Institutes. Table 1 outlines the criteria that are used to select literature for this review.

Table 1

Inclusion Criteria

Inclusion Criteria
The term "Digital Competence" is being defined, discussed, and cross-referenced to prior research.
The research is set in the context of Higher Education.
The research is related to teachers' digital competence.
The research is reported in the English Language.
Research is published between 2012 – 2022.
The research has been published after following a peer-review process.
The impact of the research is also discussed.

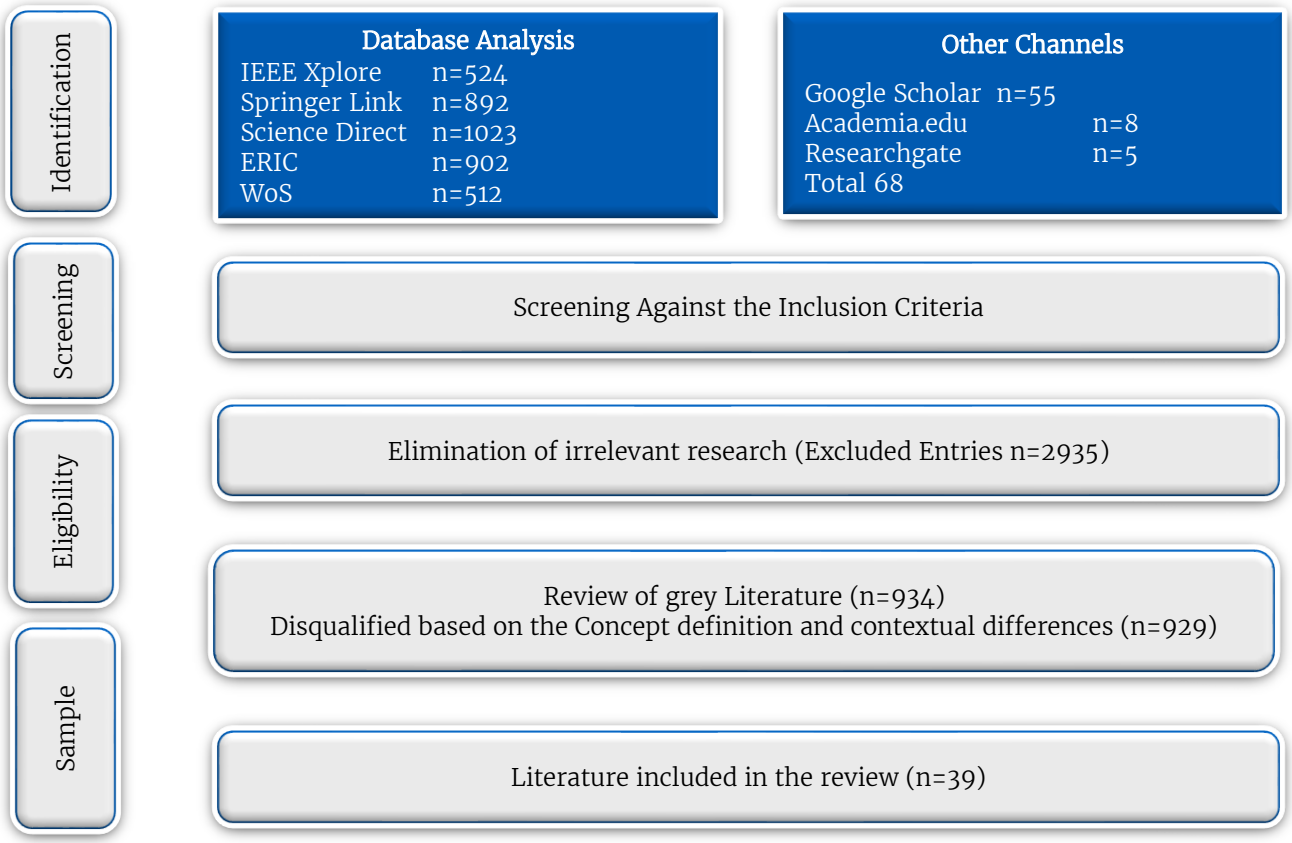
A total of 3903 articles were retrieved through initial screening. Out of these, 934 articles were eliminated because they were considered to be grey literature based on principles defined in prior studies (Nightingale, 2009):

1. Insufficient description and detail of digital competence.
2. Focus on digital competence assessment.
3. Characteristics of digital competence in the context of the HE profession have not been discussed.

The full screening process is illustrated in Figure 1.
The initial search produced 3903 studies, out of which 68 were retrieved using Google Scholar, Academia.edu, and ResearchGate. Some results were duplicated as all different sources were scanned against the same keywords.

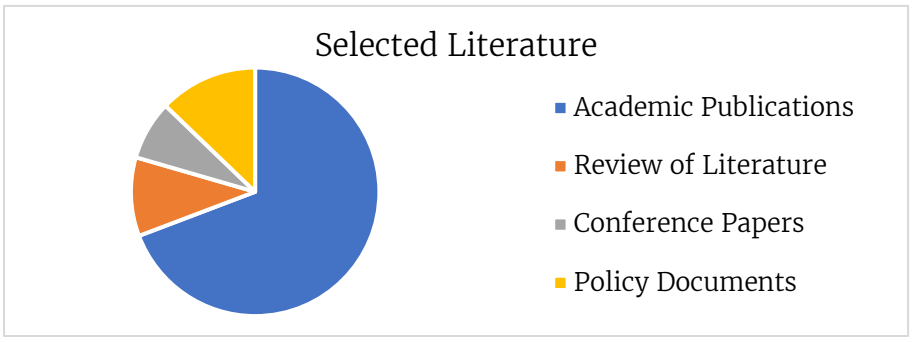
Figure 1

Research Study Screening Process



Nine hundred thirty-four studies were listed as grey literature and required further evaluation before a decision was made on their inclusion in the current study. The researcher screened grey literature through the lens of inclusion criteria, and a total of 39 relevant studies were selected.

The selected literature comprised academic publications (n=27), policy documents (n=), review of literature (n=), and Conference papers (n=).



Coding Process

The contents of 39 selected papers were detailed with the aim of exploring five essential aspects: (1) definition of digital competence; (2) discipline of study; (3) digital context; (4) outcomes in terms of

suggestive competence; (5) Depth in the description of digital competence. Prior research establishes that different disciplines perceive digital affluence differently; therefore, selected research was interpreted based on descriptors of behavioural studies, technology skills, social and communication skills, and intra-personal skills.

Results

The literature under review for this study frequently cross-referenced two policy frameworks to describe the concept of Digital Competence. Most articles cited the European Commission's Digital Competence Framework (Digcomp). This Framework was first developed to identify the digital competence of EU citizens and later served as a measure of digital competence in societies. The comprehensive classification of information and data literacy, communication and collaboration, digital content creation, digital safety, and problem-solving using technology is consolidated and widely used by academic researchers around the world. The original framework was revisited by researchers and upgraded in 2017 (Cabero-Almenara, Gutiérrez-Castillo, Palacios-Rodríguez, & Barroso-Osuna, 2020).

Some publications cross-referenced an analysis of the European Commission report authored by Ferrari (2013). This report played a pivotal role in describing the concept of digital competence in an educational context and emphasized that a fundamental proficiency in digital competence is integral to individual growth in modern society and prepares individuals for a technologically affluent future (Ferrari, 2013).

This study also surfaces a range of different terms associated with the term Digital Competence in the literature. The choice of alternate terminology varies within disciplines. The frequency of different terms used interchangeably to describe the concept of Digital Competence is illustrated in Table 2.

Table 2

The terminology used in the literature to describe Digital Competence

Term	Discipline				
	Media Studies	Education	Language & Literacy	Performing Arts	Philosophy
Digital Literacy	6	9	8	7	6
Media Literacy	11	6	9	7	5
COT	5	8	7	8	4
Web literacy	6	5	7	11	7
New Literacy	1	-	-	-	1
e-literacy	1	2	1	-	-
Multimodal Literacies	1	2	-	2	-

Until 2017, Digital Competence had remained a fluid term that did not seem to have an accepted standard description in the literature, and the concept was novel in many parts of the world, such as the earliest occurrence of the term Digital Competence in the Australian body of research dates to 2017. The use of a variety of terms in the literature indicates a lack of a unanimously agreed description of the term (Laar, Van Deursen, Van Dijk, & Haan, 2017; Janssen et al., 2013). The choice of variable terms also reflects that multiple perspectives hyperlink the phenomenon of digital competence to a range of philosophies, yet none of the terms conceptualizes the full range of behaviours, skills, and attitudes essential for a specific profession. Some terminologies have a singular, concise description, for instance, Web Literacy, which limits the scope of DProCom only within the World Wide Web, merely one strand in the assortment of pedagogical tasks performed by an instructor for course preparation, delivery, and assessment. Another synonymously used term is Digital Literacy, coined by Paul Gilster in 1997, and early research defines it as an open term referring to one's ability to properly use, evaluate and be creative within a given digital environment (Mallinson & Krull, 2013; Falloon, 2020). Generally, the term *Digital* seem to be closely associated with the use of computers and Web resources and the term *Literacy* is defined as the ability to read and interpret information in a text or audio form, to re/produce content through a range of computerized resources, and the ability to communicate new knowledge with a wider audience (Krumsvik, 2014). Literature sets *Digital Literacy* within the interdisciplinary conceptual domains of cognitive, social

and emotional sciences (Ilomäki, Paavola, Lakkala, & Kantosalo, 2016). *Command Over Technology (COT)* is another expression to guide the scope of Digital Competence into a more open space for researchers to navigate and continue to re/imagine agents that lead to an independent and confident use of technology. The concept builds on the intricate theoretical domains of Information Technology, Psychology, and behavioural science (Bravo, Conde-Jiménez, & Cózar, 2019).

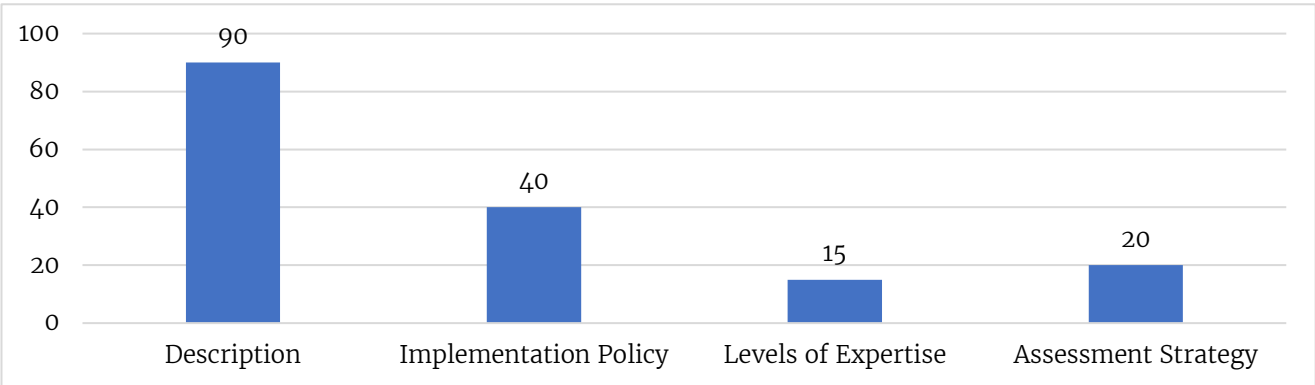
The terminology used in literature exhibits geographic bias in the context and scope of concept use. The term *Digital Competence* has been widely used in the literature that originates from Europe, Scandinavia and South America (Ala-Mutka, Punie, & Redecker, 2008; Cabero-Almenara, Gutiérrez-Castillo, Palacios-Rodríguez, & Barroso-Osuna, 2020; Janssen et al., 2013) whereas, most literature published by researchers from Asia, USA, and Asia Pacific showcases the term *Digital Literacy* (Ilomäki, Paavola, Lakkala, & Kantosalo, 2016; Mallinson & Krull, 2013).

Digital Competence has been discussed as an essential characteristic for advancing in the modern information knowledge society that mostly emerges in policy documents along with an application framework. Most frameworks refer to this attribute in a social and personal capacity for individuals; however, a few discussed in this review encompass the pedagogical affordances of DProCom. The pioneer framework that has defined sub-categories of Digital Competence has been produced in Europe. DigComp and DigCompEdu are the most cited scientific frameworks with details of what it means for educators to be digitally competent (Redecker & Punie, 2017). Malaysian 21st Century Skills Instrument (M-21CSI) elaborates on five core attributes of what it means for instructors to be digitally able (Osman, Mastura, & Mohamad Arsad, 2010). The Digital Intelligence (DQ) Framework developed in 2017 presents eight overarching characteristics of Digital Competence (DQ Institute, 2017), whereas in the same year, the Professional Digital Competence Framework for Teachers proposed by Kelentric et al. (2017) presented seven indicators for Digital Competence (Kelentrić, Helland, & Arstorp, 2017). The National Institute of Educational Technologies and Teacher Training in Spain developed a model for teachers by building on the five indicators listed in DigComp (MINECO, 2021). Ally (2019) proposed a Competency Profile for Digital Teachers (CPDT) sprawling the scope of operation in the use of interactive digitized resources and innovative pedagogies of EdTech (Ally, 2019). A similar framework was presented by Barajas and Frossard (2019) that elaborates on instructors' professional digital and pedagogical competencies (Barajas, Frossard, & Trifonova, 2019). The government of Quebec GoQ (2019) approved a Digital Competency Framework for students and HE instructors that breaks down the phenomenon of Digital Competence into 12 tangible indicators (GoQ, 2019). International Telecommunication Union (2018) provides a toolkit for policymakers with a description of basic, intermediate, and advanced levels of skills for a range of professions, including HE (Coward, Fellows, & Schorr, 2018).

Some frameworks project levels of expertise by detailing basic, intermediate and advanced level skills of digitally smart instructors. For instance, the Education and Training Foundation, UK, proposed an EdTech Strategy Framework (2018) that includes eight indicators in three progressive stages of proficiency levels (Joshi, Neupane, & Joshi, 2021). An overview of the depth of the concept discussed in the reviewed literature is illustrated in Figure 2. Digital Competence is still in its infancy stage of being fully understood, and more emphasis remains on concept description (90%) than implementation strategy (40%) and evaluation mechanisms (20%).

Figure 2

Distribution of Concept Depth



Concept Definition – Description and Attributes of DProCom in Higher Education

The earliest description of Digital Competence defines it as an individual's ability to navigate within the digital panorama through an exhibition of functional use of technology (Gourlay, Hamilton, & Lea, 2014; Falloon, 2020). The term extensively refers to the concept proposed by the European Union in DigComp as a key attribute for lifelong learners, which they manifest in critical, mindful, and confident use of technology for work, personal development, leisure, and social relationships.

The selected literature discusses the concept of DProCom in HE as a multifaceted set of skills that intersect with aspects of digital literacy, transliteracy, and operational IT skills (Spante, Sofkova Hashemi, Lundin, & Algers, 2018). Some definitions and descriptions give away a hint of tangible actions, skills, attitudes, behaviours, and expertise. For instance, an encompassing working definition submitted by Ferarri (2013) suggests that 'Digital Competence is the set of knowledge, skills, attitudes, abilities, strategies and awareness that is required when using ICT and digital media to perform tasks; solve problems; communicate; manage information; behave in an ethical and responsible way; collaborate; create and share content and knowledge for work, leisure, participation, learning, socializing, empowerment and consumerism (Ferrari, 2013). Cazco et al. (2016) elaborate the term competence as a 'combination of values, beliefs, knowledge, capacity and attitudes to select from a range of technology and use it to research and reproduce knowledge' (Cazco, González, Abad, Altamirano, & Mazón, 2016). Janssen et al. (2013) conducted a Delphi study with 95 experts from academia, training and development, government sector, policy planners and IT industry. They proposed 12 attributes of digital competence to assert that it is a hybrid concept involving more than mere knowledge and the ability to use different devices. The functional, integrative, and specialized uses of digital technology were pronounced as core competencies supported by communication, legal, social, and behavioural attributes. Experts suggest that an individual may be said to advance DProCom as the frequency of critical, conscious, and reflective use of EdTech increases across their professional lifespan (Janssen et al., 2013).

Research by Tømte et al. (2015) and Krumsvik (2014) is strictly in the context of teaching, and their work can be claimed as the first evidence of DProCom in extant literature. They argue that DProCom is the professional capacity to use EdTech with a degree of pedagogical-didactical judgment to enrich learning experiences and enhance learning outcomes (Tømte, 2015; Krumsvik, 2014). In the context of HE, the framework proposed by Redecker (2017) presents 22 professional and pedagogical abilities of HE instructors under six domains that encompass abilities to use EdTech for research, collaboration, professional development, content development and modification, teaching, evaluation and feedback and learners support in digitized learning environments (Redecker & Punie, 2017). Kelentrić et al. (2017) expanded the list by including skills concerning data analysis, digitizing learning resources, privacy, security, and ethical use of technology (Kelentrić, Helland, & Arstorp, 2017).

Other frameworks highlight the use of EdTech for the development of digital resources, adaptation of modern pedagogy and assessment strategies, and enhancing performance in their professional environment (Ally, 2019; Coward, Fellows, & Schorr, 2018).

Gaps in Research

This systematic review surfaces that DProCom does not emerge as an independent concept and shares blurred boundaries with Digital Literacy (Ally, 2019; Cabero-Almenara, Gutiérrez-Castillo, Palacios-Rodríguez, & Barroso-Osuna, 2020). The research conducted in Europe and Scandinavia mostly supplements the concept of Digital Competence (generic) with a policy framework for macro-level implementation, whereas the English-speaking countries have mostly denoted this phenomenon by the term Digital Literacy and have not proposed a macro- or meso-level policy for successful implementation (Falloon, 2020).

This review also reveals that literature referring to both terminologies, digital literacy and digital competence, has presented attributes in a more commonsensical manner without making references to previous research or policy documents, which indicates a scarcity of research in a range of professional contexts (Joshi, Neupane, & Joshi, 2021). In this review, 39 research outputs were analyzed, two of which have been meant truly for the context of Higher Education.

The description of DProCom in the setting of HE is significantly shallow. One of the models proposed for HE by Redecker (2017) is the most relevant as it explicitly defines the concept of Digital Competence for HE educators by referring to their professional abilities, pedagogical commands, creativity in assessment, and the overall impact of EdTech on learning outcomes. The overarching categories that encompass twenty-two attributes are instructional strategies, content development, professional development, research and collaboration, reflection and feedback, and learners' support (Redecker & Punie, 2017). However, even this model does not present the depth of HE instructors' role and requires further extension on missing attributes such as leadership with EdTech, didactical use of digital resources, self-regulated development and assessment of DProCom.

In sum, in the context of HE, the global literature lacks a well-articulated description of DProCom, along with defined levels of proficiency for each competence indicator. Such a framework also necessitates cross-pollination with a policy proposal and assessment strategy to drive forward progress and innovation in DProCom in HE. It is essential to determine these aspects to inform future trends in faculty's professional development, redefinition of performance indicators, and quality of instruction.

Conclusion

This systematic literature review explores the concept of DProCom in HE by analyzing 39 publications. It reveals the tension in the understanding of terminologies, how they are defined in the context of HE instructors, and deficiencies in implementation and assessment policies. According to this review, the existing research does not pay enough attention to appropriate pedagogical approaches and research collaborations through EdTech as key catalysts for advancing SDG4: Quality Education. Moreover, a range of proficiency levels should be defined for the faculty to self-regulate their professional development. Through this review, these gaps have been identified, and as the next step, a Delphi study will be planned to articulate a well-rounded description of DProCom and quantify the order of proficiency through the description of competence indicators.

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