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Article

Digital Competence in Education: A Comparative Analysis of Frameworks and Conceptual Foundations

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Abstract

Digital competence is the holistic ability to confidently, critically, and responsibly engage with digital technologies across personal, educational, professional, and societal contexts. It integrates knowledge (understanding digital tools and systems), skills (technical, cognitive, and socio-emotional proficiencies), attitudes (responsibility, ethical judgement, adaptability, and resilience), and strategic awareness (critical evaluation, creativity, and problem-solving) to access, manage, create, and communicate information effectively. The study aims to analyse the various definitions of Digital Competence. The study also aims to analyse and compare various digital competence frameworks for educators, focusing on their key competencies, proficiency levels, and implementation strategies. A qualitative comparative analysis was employed to compare six prominent digital competence frameworks for educators (DigCompEdu, Norwegian Framework, ICT CFT, DTPF, SFDCT, and EDCF) through content analysis, focusing on their key competencies and proficiency levels. The frameworks were selected based on their relevance to education, international scope, and recent updates. The analysis identifies commonalities and differences across frameworks, particularly in terms of collaboration, ethical practices, digital tool integration, and continuous professional development. The findings provide insights for policymakers, educators, and institutions to design effective professional development programs and integrate digital competence frameworks into educational practices. This research offers a comprehensive comparison of digital competence frameworks, contributing to the ongoing discourse on digital transformation in education.

Keywords: Digital Competence; Framework; UNESCO; UNICEF; Education; International; National; European Union; DigiCompEdu

INTRODUCTION

In the 21st century, technology has greatly changed many aspects of human life, including education. These changes are becoming more visible at all levels of the education system, and they will continue to grow in importance. The integration of digital technologies into education has transformed traditional teaching and learning paradigms. This shift brings new challenges for teachers in how they teach, manage classrooms, and handle administrative tasks. It also affects how students develop digital literacy and specialised knowledge and skills. Today, it's more important than ever that children and young people are not just passive consumers of technology but also active creators and critical users of content. Teachers play an important role in helping students learn to identify reliable information, cite sources, protect intellectual property, apply ethical values in communication, and produce their own digital content. Additionally, teachers help students develop a reflective attitude toward their actions, respect cultural differences, and understand rights and values. To teach these skills and knowledge effectively, teachers must first develop their own digital competence during their initial training and continue to improve it throughout their careers through ongoing professional development. This is crucial to their ability to guide students in adapting to the digital world. It is essential that student teachers in their teacher preparation programs develop at least a foundation of basic digital skills and specialised digital knowledge. This

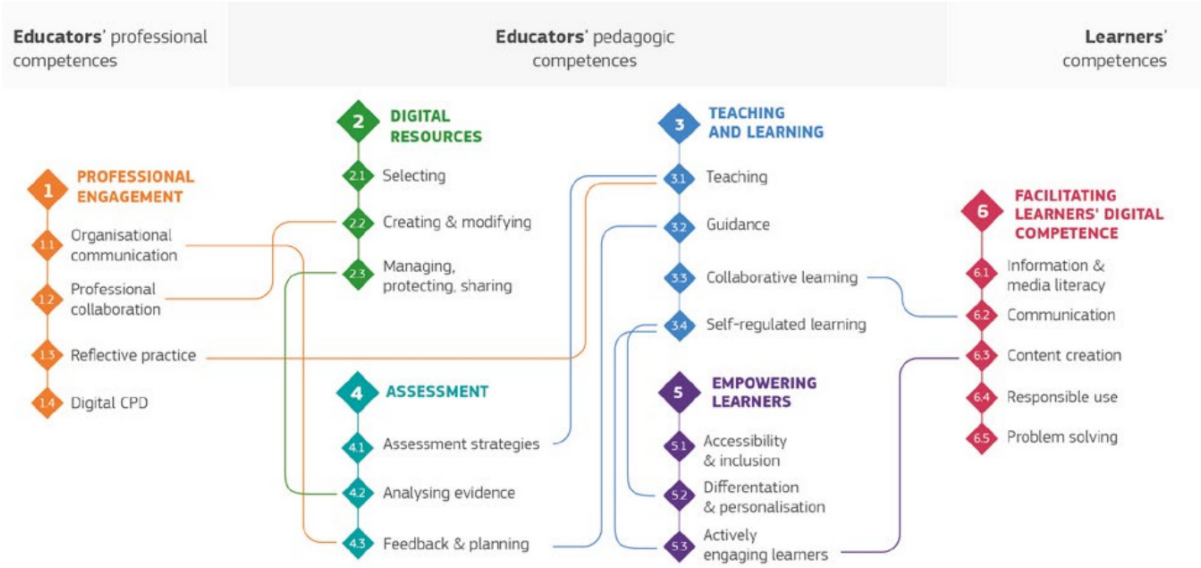
includes the ability to search for and analyse information, create and share content online, and make sound digital decisions. Additionally, national regulations and guidelines for teacher education emphasise that future teachers must develop the necessary competencies to effectively incorporate digital tools into both their teaching methods and administrative tasks (Asagar, 2025). This ensures that teachers are prepared to guide their students in mastering essential digital skills and knowledge.

OVERVIEW OF DIGITAL COMPETENCE FRAMEWORK

1. Digital Competence Framework for Educators (DigCompEdu)

Developed by the **European Commission**, DigCompEdu defines six areas of educators' digital competence with 22 competences (Redecker, 2017):

1. **Professional Engagement**: Using digital tools for communication, collaboration, and professional development.
2. **Digital Resources**: Creating, selecting, and sharing digital teaching materials.
3. **Teaching and Learning**: Integrating digital technologies into teaching.
4. **Assessment**: Using digital tools for formative and summative assessments.
5. **Empowering Learners**: Enhancing inclusion and active engagement with digital tools.
6. **Facilitating Learners' Digital Competence**: Developing students' skills in digital communication, content creation, and problem solving.



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Source: DigiComEdu: Digital Competence Framework for Educator

It categorises educators' proficiency levels from **Newcomer (A1) to Pioneer (C2)**.

2. Professional Digital Competence Framework for Teachers (Norway)

Introduced by the **Norwegian Centre for ICT in Education**, this framework focuses on (Kelentrić et al., 2017):

1. **Digital pedagogy**: Integrating technology into subject-specific teaching.
2. **Ethics**: Teaching students about digital responsibility.
3. **School in Society**: Preparing students for digital citizenship.
4. **Leadership in Learning**: Managing digital learning environments effectively.
5. **Professional Development**: Continuous upskilling in digital education.

Source: Visualisation of the Professional Digital Competence Framework for Teacher

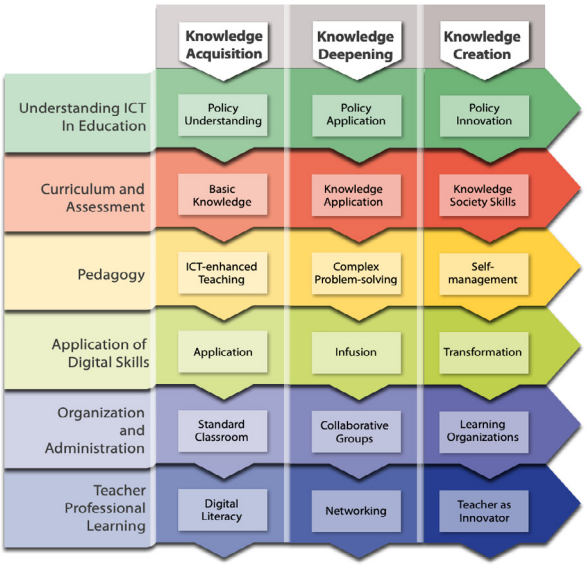
3. ICT Competency Framework for Teachers (ICT CFT) - UNESCO

Published in **2008, 2011, and 2018**, this framework focuses on **teachers' use of ICT in education** (UNESCO, 2018):

1. **Education Policy & ICT**: Aligning ICT use with national education goals.
2. **Curriculum & Assessment**: Integrating ICT into teaching and assessment.
3. **Pedagogy**: Using ICT to enhance student-centered learning.
4. **Digital Skills**: Training teachers in ICT use.
5. **School Organisation**: Managing ICT infrastructure in schools.
6. **Professional Learning**: Developing teachers' ICT competencies.

It follows **three levels of ICT use**:

1. **Knowledge Acquisition** (basic use of ICT)
2. **Knowledge Deepening** (applying ICT in the curriculum)
3. **Knowledge Creation** (innovating with ICT in education)

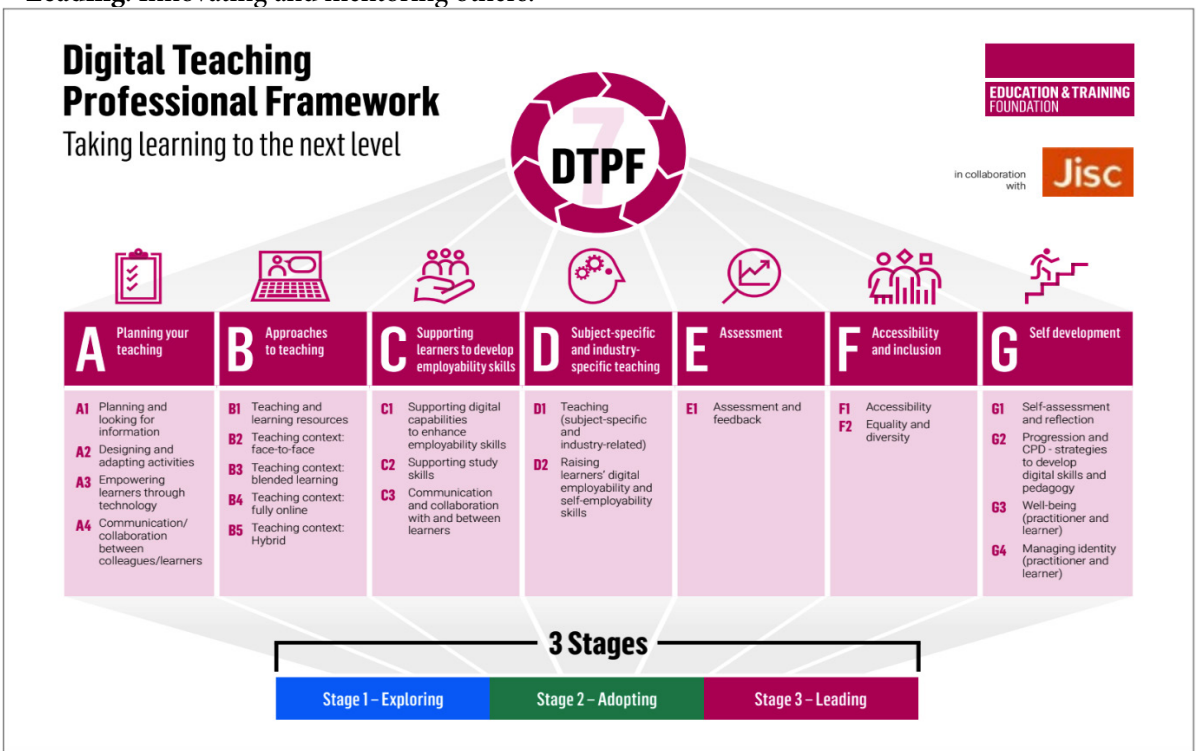


Source: UNESCO ICT Competency Framework for Teachers V3

4. Digital Teaching Professional Framework (DTPF) - UK

Developed by the **Education and Training Foundation (ETF)**, this UK-based framework is structured around (Education & Foundation (ETF), 2018):

1. **Seven Key Elements**: Planning, teaching approaches, employability skills, subject-specific teaching, assessment, accessibility, and professional development.
2. **Three Stages:**
   - **Exploring**: Learning basic digital teaching skills.
   - **Adopting**: Implementing digital strategies.
   - **Leading**: Innovating and mentoring others.



Source: Digital Teaching Professional Framework (DTPF)

5. Spanish Framework for the Digital Competence of Teachers (SFDCT)

Created by the **Spanish Ministry of Education (2022)**, this framework aligns with **DigCompEdu** and has six areas (Spanish Ministry of Education et al., 2022):

1. **Professional Engagement**: Digital communication and collaboration.
2. **Digital Content**: Creating and managing digital materials.
3. **Teaching and Learning**: Using technology to support instruction.
4. **Assessment and Feedback**: Digital assessment strategies.
5. **Empowering Learners**: Personalisation and inclusion.
6. **Developing Learners' Digital Competence**: Preparing students for digital literacy.

It includes **three developmental stages** (Entry, Intermediate, Advanced) and focuses on **personal data protection and AI integration**.

6. Educators' Digital Competency Framework (EDC) - UNICEF

Developed in **2022**, this framework supports **inclusive education** and aligns with **SDG 4 (Quality Education)** (UNICEF, 2022).

Source: UNICEF, 2022. Educators' Digital Competence Framework (p. 2). Retrieved from https://www.unicef.org/eca/media/24526/file/Educators'%20Digital%20Competence%20Framework.pdf

It covers:

1. **Knowledge Development**: Enhancing educators' digital teaching skills.
2. **Knowledge Application**: Developing students' digital literacy.
3. **Knowledge Sharing**: Collaboration among educators.
4. **Knowledge & Communication**: Using digital tools for communication and leadership.

The **EDC framework** promotes **equity, diversity, and lifelong learning** and was created based on research across multiple countries.

OBJECTIVE

The objectives of this study are:

1. To investigate the various definitions of digital competence as presented in policy documents and research articles.
2. To investigate the similarities and variations among worldwide digital competence frameworks for education based on the competencies most frequently cited by these frameworks.
3. To analyse and compare various digital competence frameworks for teachers in terms of the most commonly used competencies and proficiency levels.

METHODOLOGY

This study analyses policy documents and research articles that define digital competence, categorising the different definitions and identifying key themes and trends. This study also uses various digital competence

frameworks for teachers. The framework has been selected based on the following criteria:

1. The document should be a specialised and specific framework for digital competences.
2. The framework should apply to education, such as the European Union's *DigCompEdu*, Norway's *Professional Digital Competence Framework for Teachers*, UNESCO *ICT-CFT*, the United Kingdom's *Digital Teaching Professional Framework*, the Spanish Framework for the *Digital Competence of Teachers*, and UNICEF's *Educators' Digital Competency Framework*.
3. The framework must possess either an international or national scope.
4. The framework must possess a recent or revised version.

RESULT

In this section, there are key findings of definitions of digital competence, analysis of various digital competence frameworks, and focusing on competencies, proficiency levels, and the overall themes that emerge across the data.

1. Analysis of Definitions of Digital Competence

Digital competence has become an essential skill in today's digitalised society, transcending the mere ability to operate technological devices and software. It encompasses a broad range of knowledge, skills, attitudes, and values required to effectively and responsibly use digital technologies in various contexts—whether in education, the workplace, or everyday life. As defined by Vuorikari et al. (2016), digital competence involves the "confident, critical, and responsible use of digital technologies for learning, work, and participation in society." This definition underlines the importance of not only having technical proficiency but also the capacity to evaluate and use digital tools ethically and effectively.

Historically, digital competence has been associated with various dimensions of literacy. Bawden (2008) pointed out that it is closely related to information and digital literacy, a perspective that emphasises the need to navigate, evaluate, and use digital information responsibly. This interpretation aligns with early conceptions that linked digital skills to broader literacy practices, thereby expanding the traditional understanding of literacy to include digital contexts. In this way, digital competence is seen as a dynamic interplay between technological skill and critical thinking.

The European Centre for the Development of Vocational Training (Cedefop, 2014, p. 47) elucidates the concept of competence as "the ability to apply learning outcomes appropriately in a specified context," encompassing education, training, employment, or professional advancement. This viewpoint situates digital competence within the broader context of lifelong learning and professional advancement, indicating that the capacity to proficiently utilise digital technology is not merely an individual talent but also a fundamental element of ongoing professional and academic development.

In the European Union, digital competence is frequently regarded as a fundamental competency for lifelong learning. The European Commission's framework (2006) identifies digital competence as "the confident and critical use of information society technology (IST) for work, leisure, and communication." This framework highlights the need for individuals to be adept at both using digital tools and critically evaluating the digital environment in which they operate. Such a dual focus is critical in a world where information is abundant and the ability to discern credible sources from unreliable ones is more crucial than ever.

Lindroth and Bergquist (2009) build on this idea by emphasising that digital competence requires a sound understanding of the nature, role, and opportunities of information society technologies in everyday life. Their definition suggests that digital competence is not solely about operating digital tools but also about understanding how these tools can transform personal, social, and professional landscapes. This comprehensive viewpoint suggests that digital competence encompasses a critical understanding of the ramifications of digital technology utilisation, ranging from privacy and security concerns to the wider societal effects of digital media.

In the realm of academic research and practical application, Ferrari (2012, 2013) offers one of the most comprehensive definitions of digital competence. Ferrari describes it as a "set of knowledge, skills, attitudes, strategies, and awareness" necessary for effectively using ICT and digital media to perform a wide array of tasks—from problem-solving and communication to information management and content creation. This definition has been widely endorsed by subsequent researchers such as Mattila (2015), Moncada Linares and Díaz Romero

(2016), and Guzman-Simon et al. (2017), who emphasise that digital competence supports the development of other key abilities, including language proficiency, mathematical reasoning, and cultural awareness. Such a holistic approach underscores the role of digital competence as a foundational skill that enhances multiple facets of learning and professional practice.

Despite the broad consensus on the importance of digital competence, there remains a considerable debate regarding its precise definition. Ala-Mutka (2011) highlights the complexity of the concept, noting that it has multiple facets that make it difficult to pin down a unique, all-encompassing definition. This sentiment is echoed by Virkus (2012) and Iordache et al. (2017), who point out that the terms "competence," "skills," and "literacies" are often used interchangeably, leading to conceptual ambiguities. In this regard, Ilomäki et al. (2011, 2016) contend that digital competence encompasses not just technological proficiency but also a range of cognitive, social, and ethical qualities essential in the knowledge society. They emphasise that as digital technologies advance, the notion of digital competence also evolves, making it a dynamic term that requires ongoing reassessment (Wang et al., 2021).

Several scholars have attempted to deconstruct the components of digital competence to provide more detailed frameworks. Scuotto and Morellato (2013) cite Calvani et al. (2009) in their definition of digital competence as "the ability to explore and face new technological situations in a flexible way, to analyse, select, and critically evaluate data and information, to exploit technological potentials to represent and solve problems, and to build shared and collaborative knowledge." This comprehensive definition emphasises the significance of adaptability, critical assessment, and collaboration—attributes that are essential in a period characterised by swift technological advancement.

Janssen et al. (2013) offer a more focused view by describing digital competence as the ability to operate digital tools and to communicate effectively through digital technologies. Meanwhile, Morellato (2014) and Krumsvik (2012) emphasise the pedagogical dimensions of digital competence, particularly in the context of education. They contend that for educators, digital competence encompasses not merely the mastery of technology tools but also the integration of these resources into pedagogical practices to improve learning outcomes. Krumsvik (2012) elaborates on this concept by differentiating between a "mental digital competence journey," characterised by self-awareness and reflection, and a "practical competence journey," which relates to the tangible use of digital skills.This layered model illustrates how digital competence operates at multiple levels—from personal attitudes to professional proficiency.

In addition to the technical and pedagogical aspects, several authors have highlighted the ethical and societal dimensions of digital competence. Hatlevik et al. (2014) and Cazco et al. (2016), referring to Gutiérrez (2011), underscore that digital competence also involves values and attitudes related to the ethical use of digital tools. This includes understanding issues of digital well-being, cybersecurity, and intellectual property, which are increasingly important as digital environments become more complex and interconnected.

Mengual-Andrés et al. (2016) and Skov (2016) further link digital competence with broader notions of literacy, arguing that it represents a means of achieving the level of literacy required in today's society. They contend that digital competence is not just about technical proficiency but is also about developing a critical and reflective stance towards digital information and media. In line with these views, Tsankov and Damyanov (2017) and Khan and Bhatti (2017) elaborate on the role of digital competence in professional development, particularly for educators. They suggest that digital competence enables teachers to leverage digital technologies to enhance their pedagogical practices, thereby improving learning outcomes for students.

Finally, the Council of the European Union (2018) offers a comprehensive definition that encapsulates the multifaceted nature of digital competence. According to this policy document, digital competence involves "the confident, critical, and responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society" (p. 9). It explicitly incorporates aspects such as information and data literacy, communication and collaboration, media literacy, digital content creation, safety, and problem-solving. This definition not only reflects the complexity of digital competence but also highlights its importance as a key component of lifelong learning in the 21st century.

The concept of digital competence varies in its meaning, depth, and scope across different authors and perspectives. In the context of my study, Digital competence is defined as the holistic ability to confidently, critically, and responsibly engage with digital technologies across personal, educational, professional, and societal

contexts. It integrates *knowledge* (understanding digital tools and systems), *skills* (technical, cognitive, and socio-emotional proficiencies), *attitudes* (responsibility, ethical judgement, adaptability, and resilience), and *strategic awareness* (critical evaluation, creativity, and problem-solving) to access, manage, create, and communicate information effectively. This competence empowers individuals to collaborate, innovate, and participate actively in society while ensuring digital safety, respecting intellectual property, and promoting well-being in a rapidly evolving digital world.

2. Analysis of Digital Competence Frameworks for Teachers

The following frameworks are analysed in terms of competency categories, structure, progression, and unique features:

Table 1: Analysis across various Digital Competence Framework

Competency Area	DigCompEdu (EU)	Norwegian Framework	UNESCO ICT CFT	UK DTPF	Spanish SFDCT	UNICEF EDC
Professional Engagement	Area 1	Interaction & Communication	Dimension 6	Self-Development	Area 1	Knowledge Sharing & Communication
Digital Resources	Area 2	Digital Resources	Dimension 4	Planning Your Teaching	Area 2	Knowledge Development
Teaching & Learning	Area 3	Pedagogy & Subject Didactics	Dimension 3	Approaches to Teaching	Area 3	Knowledge Application
Assessment	Area 4	Leadership of Learning	Dimension 2	Assessment	Area 4	Knowledge Development
Empowering Learners	Area 5	Accessibility & Inclusion	Dimension 3 (Knowledge Creation)	Accessibility & Inclusion	Area 5	Inclusive Practices & SDGs
Learners' Digital Skills	Area 6	School in Society	Dimension 4	Supporting Learners	Area 6	Learners' Competences
Ethics/Responsible Use	Implicit in Areas	Ethics	Dimension 6	Self-Development	Area 1 (Data Protection)	Responsible Use
Leadership & Innovation	Levels C1-C2	Change & Development	Knowledge Creation	Leading Stage	Stage 3 (C)	Knowledge Sharing
CPD	Area 1.4	Professional Learning	Dimension 6	Self-Development	Professional Engagement	Knowledge Sharing

The various digital competence frameworks, including DigCompEdu, the Norwegian Framework, UNESCO's ICT CFT, the UK DTPF, the Spanish SFDCT, and UNICEF's EDC, exhibit a common focus on advancing digital skills and competencies while ensuring alignment with global educational goals. They emphasise progressive skill development, with proficiency levels ranging from A1 to C2, and promote learner empowerment through digital citizenship and ethical use of technology. These frameworks consistently address the societal impact of

digitalisation, integrating concepts such as algorithmic thinking, democratic engagement, and the ethics of AI and data protection. Key similarities include a shared emphasis on digital resource creation, pedagogical integration, and the use of digital tools for assessment and feedback. Furthermore, all frameworks prioritise continuous professional development (CPD) and align with broader national and international policies, including EU standards and the United Nations' Sustainable Development Goals (SDGs), reinforcing their global applicability and relevance. Notably, frameworks like UNESCO's ICT CFT and UNICEF's EDC also stress inclusive education, equity, and the use of self-assessment tools such as TPACK and SELFIE, contributing to the broader discourse on digital education policy and practice.

3. Most Competencies used in Digital Competence Frameworks for Teachers

Table 2: Most Competencies Mentioned Across Various Digital Competence Framework

Key Area	DigCompEdu	Norwegian Framework	ICT CFT	DTPF	SFDCT	EDCF
Collaboration	Use digital technologies for collaboration, sharing knowledge, and innovating pedagogic practices.	Collaboration with pupils, guardians, and other stakeholders to build trust and interaction.	Use digital tools to support student collaboration within and beyond the classroom.	Communication and collaboration with colleagues and learners enhanced by technology.	Collaboration with learners, guardians, and other stakeholders within the school community.	Collaboration with teachers and other institutions in developing plans and projects.
Information and Data	Incorporate activities for learners to find, organise, analyse, and evaluate information.	Handle personal data of pupils, guardians, and colleagues.	Guide students to search, manage, analyse, evaluate, and use information.	Support for learning and support activities, empowering learners through technology.	Media, information, and data literacy, including secure use of digital content.	Encourage learners to access, evaluate, and organize information in digital environments.
Communication	Use digital technologies to enhance organisational communication.	Use digital communication channels to build trust and encourage participation.	Set up digital communication mechanisms for disseminating information.	Communication and collaboration with learners and between learners.	Communication, collaboration, and digital citizenship.	Use digital technologies to enhance communication with learners, parents, and third parties.
Technical Competence	Facilitate learners' digital competence.	Understand technical opportunities for digital interaction and sharing culture.	Use digital technologies to solve problems and encourage trial and error.	Include digital technologies in teaching methods for creative expression.	Digital problem-solving, including recognizing and resolving technical issues.	Guide students in developing self-regulated learning skills in collaborative settings.

Sharing	Use digital technologies to connect with colleagues and share knowledge.	Recognise the importance of digital developments in facilitating knowledge sharing.	Use ICT to promote learning by creating communities for knowledge sharing.	Share educational content via email and digital environments.	Protecting, managing, and sharing digital content.	Share organizational procedures, materials, and resources digitally.
Content	Manage, protect, and share digital resources efficiently.	Recognise how digital developments transform subject content and assessment methods.	Integrate technologies and digital content to support teaching.	Publish self-created digital teaching content and allow others to modify.	Searching, selecting, creating, and modifying digital content.	Develop learning material and apply teaching practices for digital content creation.
Teaching and Pedagogy	Plan and implement digital tools to enhance teaching effectiveness.	Possess knowledge of pedagogy and subject didactics in a digital learning environment.	Incorporate ICT resources to support teaching, learning, and assessment.	Teaching contexts: face-to-face, blended, fully online, and hybrid.	Informally advise other teachers on the use of digital technologies.	Search, plan, and integrate digital tools to enhance teaching.
Learning	Use digital technologies to enhance interaction with learners.	Help pupils develop digital skills for effective engagement with content.	Make appropriate ICT choices to support teaching and learning methodologies.	Guidance and learning support, empowering learners through technology.	Peer learning and linking curriculum standards with technology use.	Understand how digital environments improve teaching practice and learning experience.

The competencies emphasised by the various digital competence frameworks reveal both shared priorities and distinct differences in how collaboration, information management, communication, technical skills, content creation, pedagogy, and learning are framed within educational contexts. In terms of **collaboration**, all frameworks highlight the importance of using digital tools to facilitate communication and teamwork with colleagues, students, and external stakeholders. A common theme is the role of technology in co-creating knowledge and enhancing peer support, with frameworks like DigCompEdu and ICT CFT stressing collaborative engagement. Additionally, the Spanish SFDCT and the EDCF emphasise collaboration in continuous professional development (CPD) through peer networks. A unique aspect of the Norwegian Framework is its broader approach to collaboration, extending it to guardians and external bodies, particularly to address issues like cyberbullying. In **communication**, digital tools are universally recognised as essential for engaging stakeholders such as learners, parents, and colleagues. Frameworks like DigCompEdu and the Norwegian Framework stress trust-building and participatory interactions, while the EDCF and SFDCT see communication as a means for teacher development and resource sharing. However, ICT CFT prioritises technical aspects, such as the use of mobile technologies, while EDCF focuses more on leadership in school-wide communication, aiming to improve information dissemination.

For **information and data competencies**, protecting data, enhancing media literacy, and fostering critical information evaluation are central across frameworks. Most emphasise organising and ethically managing digital content, with frameworks like DigCompEdu leading this effort. However, differences arise in the emphasis on cyber safety in ICT CFT, and the EDCF's focus on synthesising data to inform instructional improvements. When it comes to **technical skills,** there is an emphasis across frameworks on integrating technology into pedagogy and fostering problem-solving skills. The use of emerging technologies such as AI and VR is particularly highlighted in the ICT CFT, while the Norwegian Framework ties technical skills to foundational competencies like reading and writing. The UK DTPF also stands out by focusing on self-employment skills, a unique emphasis not seen in the other frameworks. The EDCF links technical proficiency to CPD, encouraging educators to improve productivity through ICT skills.

In the area of **sharing**, frameworks stress the ethical sharing of resources and participation in professional networks. DigCompEdu and ICT CFT emphasize collaborative practices and resource-sharing communities, while the Norwegian Framework uniquely calls for ethical reflection in digital spaces. The DTPF provides practical steps for sharing, such as email attachments and copyright compliance, while other frameworks lean towards strategic collaboration. For **content creation,** most frameworks advocate for equitable access to digital content and emphasise ethical practices, such as copyright considerations. They also encourage content creation and adaptation, with the Norwegian Framework integrating digital materials to enhance cross-subject learning. The Spanish SFDCT uniquely structures competencies into specific steps, such as searching, creating, and protecting content, as opposed to the broader approaches found in other frameworks.

In **teaching and pedagogy**, all frameworks promote the integration of technology into teaching strategies, with a shared focus on evidence-based practices and fostering creativity and innovation. The Norwegian Framework further links pedagogy to basic skills like reading and writing, while the EDCF highlights inclusive approaches and alignment with educational policies. ICT CFT, however, focuses on practical ICT solutions to enhance subject-specific knowledge. Lastly, in **learning competencies,** continuous professional development and self-regulated learning are emphasised across the frameworks, with most advocating for project-based learning and adapting to diverse learner needs. The Norwegian Framework particularly highlights multicultural interactions, while DTPF categorises learning contexts like blended and hybrid learning. The SPDCT stands out by emphasising scaffolding learner autonomy, ensuring that students have the tools to take charge of their learning journey.

4. Proficiency Levels:

Different frameworks define proficiency in varying ways:

Table 3: Proficiency Levels Across Various Digital Competence Framework

Framework	Structure	Progression Levels	Target Audience
Dig-CompEdu	6 areas, 22 competencies	6 levels (A1-C2) Newcomer (A1) → Explorer (A2) → Integrator (B1) → Expert (B2) → Leader (C1) → Pioneer (C2)	EU educators
Norwegian	Thematic sections (e.g., Ethics, Pedagogy)	No explicit levels, focuses on knowledge/skills/competence	Norwegian teachers
UNESCO ICT CFT	6 dimensions, 18 competencies	3 levels: Knowledge Acquisition → Advancement → Creation	Global educators
UK DTPF	7 elements, 3 stages	3 stages: Exploring → Adopting → Leading	UK FE/TVET educators
Spanish SFDCT	6 areas, aligned with DigCompEdu	3 stages (A-C) with sub-levels 1. Access (A1. Knowledge → A2. Initiation) 2. Experience (B1. Adoption → B2. Adaptation 3. Innovation (C1. Leadership → C2. Transformation)	Spanish teachers

UNICEF EDC	4 components (Knowledge-focused)	No explicit levels, holistic approach	Global (focus on inclusive education)

Proficiency levels across various digital competence frameworks outline the progression pathways for educators to develop their digital skills. These frameworks differ in granularity and structure, ranging from tiered models to more flexible approaches. **Structured Tier Systems** form the backbone of many frameworks. For instance, **DigCompEdu** (EU) offers a comprehensive six-level hierarchy (A1–C2), mirroring language proficiency scales, where educators progress from "Newcomer" to "Leader," emphasizing incremental mastery of digital competencies. **Spain's SFDCT** uses a three-stage model—Access (knowledge acquisition), Experience (application), and Innovation (leadership/transformation)—with sub-levels (A1–C2) to combine skill acquisition with pedagogical innovation. Similarly, **Norway's PDC Framework** simplifies progression into three tiers: Knowledge, Skill, and Competence, focusing on how educators apply these competencies in teaching contexts. The **UK's DTPF** categorises educators into three stages: Exploring, Adopting, and Leading, which correspond to varying degrees of confidence and ability in using digital tools.

Knowledge-Centric Models are employed in frameworks like **UNESCO's ICT CFT**, which divides digital competence development into three phases: Acquisition (basic understanding), Deepening (integration into pedagogy), and Creation (innovative use for systemic change). These phases focus on the depth and application of knowledge rather than explicit levels of proficiency. The **absence of explicit levels** is seen in **UNICEF's Framework**, which does not define predefined proficiency levels. Instead, it prioritises universal competencies such as knowledge sharing and communication, offering a more flexible and adaptable approach to competency development.

DISCUSSION

The study highlights the centrality of digital competence in modern education, emphasising its multidimensional nature—encompassing technical proficiency, ethical judgement, and pedagogical innovation. The comparative analysis reveals a strong consensus among frameworks on core competencies (e.g., collaboration, resource management, ethical use), yet divergences exist in granularity (e.g., UNESCO's phased approach vs. UNICEF's holistic model) and contextual priorities (e.g., Norway's focus on societal impact vs. Spain's AI integration). The **Norwegian** and **UK frameworks** stand out for their focus on societal impact and employability, respectively. Furthermore, cultural and contextual considerations are essential, as many frameworks assume access to high infrastructure, which may not be feasible in all regions. Frameworks like UNICEF's, with a focus on inclusivity and sustainability, offer a more adaptable approach that can be applied globally. Tiered models, like those in the EU, Spain, and the UK, provide clear, incremental pathways that help educators measure their progress, while frameworks such as UNESCO ICT CFT and UNICEF's EDC offer flexibility, allowing them to be more adaptable to varying educational contexts, or it may limit their utility for standardised teacher training. Similarly, ethical considerations, though implicit in many frameworks, warrant explicit integration to address challenges like data privacy and algorithmic bias. The alignment of frameworks like Norway's with national education policies supports a systematic approach to digital transformation. However, some frameworks may be overwhelming, particularly in resource-limited settings, due to the complexity of their proficiency levels and the lack of standardised assessment tools to track progress. The findings resonate with prior literature (e.g., Ferrari, 2013; Krumsvik, 2012), which stresses the interplay between technical skills and reflective practice. Yet, the study's descriptive focus leaves room for deeper inquiry into how these frameworks translate into classroom outcomes or address digital divides.

CONCLUSION

This study successfully maps the evolving landscape of digital competence frameworks, illustrating their shared emphasis on lifelong learning, ethical engagement, and pedagogical adaptability. By comparing structures, competencies, and proficiency models, it offers a valuable resource for educators and policymakers seeking to align professional development with digital transformation goals. Future research should explore the implementation challenges of these frameworks, particularly in under-resourced contexts, and assess their impact on student outcomes. Additionally, as digital technologies evolve, frameworks must adapt to address emerging trends like AI-driven education and immersive learning environments.

DECLARATIONS

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To the best of my knowledge, the content presented herein is authentic and does not infringe upon any copyright or intellectual property rights. All sources used in this research have been duly acknowledged and cited in accordance with academic standards. Any errors or omissions remain my sole responsibility.

Funding Information

Not Applicable

Availability of Data and Materials

All documents referenced in this study are publicly available on the respective websites. The links to these documents are provided in the reference section for further access.

Declaration of Conflict

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Clinical Trial Number

Not Applicable

Human Ethics and Consent to Participate

Not Applicable

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