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Digital competence and digital technology: a curriculum analysis of Norwegian early childhood teacher education

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ABSTRACT

This paper explores how digital competence and digital technology are addressed in Norwegian early childhood teacher education (ECTE). The aim is to provide a national overview of the ECTE institutions' programme and relevant course plans to identify how the preservice teachers are being prepared for their future professional life as digitally competent early childhood teachers. We have conducted a summative content analysis of national regulations, national guidelines, programme and course plans by drawing on Goodlad et al.'s curriculum theory. The findings demonstrate that digital competence and digital technology are clearly emphasised and addressed at the ideological curriculum level but less so at the formal and perceived levels. Data shows that there is a need to define and operationalise professional digital competence from an ECTE perspective. Furthermore, there is a need to more explicitly describe the learning outcomes in the programme and course plans, focusing on both theoretical and practical aspects.

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KEYWORDS

Early childhood teacher education (ECTE); curriculum analysis; digital competence; preservice teachers; early childhood teachers

Introduction

This paper explores how digital aspects such as digital competence and digital technology are addressed in Norwegian early childhood teacher education (ECTE) by drawing on official curriculum documents. Norwegian ECTE is a 3-year bachelor's degree that qualifies preservice teachers for work in early childhood education and care (ECEC) institutions (kindergartens) with children from birth to six years old, at which age the children start in compulsory school. Our definition of digital technology includes digital tools and devices (such as computers, tablets, interactive screens, cameras, equipment for programming, and other types of digital production) and digital resources and media (such as the digital content used together with the children, both online content and apps or software to be installed) (Undheim, 2022, p. 472).

In several national and international frameworks and policy documents, digital competence is highlighted as a key competence for the twenty-first century (e.g., Erstad et al., 2021; Erstad & Voogt, 2018; European Commission, 2020; Kunnskapsdepartementet, 2008; OECD, 2016; Voogt & Roblin, 2012; Vuorikari et al., 2022). Other competences regarded as central to the twenty-first century include collaboration, communication, social and/or cultural competences, creativity, critical thinking and problem-solving (e.g., Erstad & Voogt, 2018, p. 26); these are often seen in

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relation to digital competence, as new ways of collaboration and communications have arisen in the digital environment in recent decades. In the European *Digital Education Action Plan 2021-2027*, digital literacy is highlighted as essential for life in a digitalised world: “With computers and algorithms mediating many daily activities, it is important to educate people at all ages about the impact of digital technology on well-being and the way technology systems work” (European Commission, 2020, p. 9).

However, being digitally competent in everyday life is different from being digitally competent as a teacher; in addition to superior and critical handling of technology, teachers also need to evaluate technology’s didactic and pedagogical relevance for integration into the learning environment (e.g., Almås et al., 2021; Alvestad & Jernes, 2014; Erstad et al., 2021; Hardersen & Jenssen, 2013; Nagel, 2021). The complexity and breadth of teachers’ knowledge, skills and competences needed to be able to stimulate children’s digital development in today’s society is often referred to as *professional digital competence*¹ (e.g., Kelentrić et al., 2017; Ministry of Education and Research, 2018; Skantz-Åberg et al., 2022). According to Skantz-Åberg et al. (2022, p. 1), “the concept of teachers’ professional digital competence still appears to be ambiguous and elusive”. The *European Framework for the Digital Competence of Educators* (DigCompEdu) highlights six areas, which, according to Redecker (2017, p. 16) “explain educators’ digital pedagogic competence, i.e. the digital competences educators need to foster efficient, inclusive and innovative teaching and learning strategies” (see Table 1). DigCompEdu is directed towards teachers at all levels, from early childhood to higher education (Redecker, 2017).

There have been some Norwegian efforts to describe professional digital competence for early childhood teachers (Alvestad & Jernes, 2014; Hardersen & Jenssen, 2013; Undheim, 2020), but less than in compulsory education. Hardersen and Jenssen (2013, p. 21) highlight teachers’ ability to use digital technology “broadly and in an appropriate manner to achieve the objectives of the framework plan”, for example, to stimulate children’s digital judgement. Furthermore, they emphasise teachers’ knowledge and awareness of digital divides and ethical challenges (Hardersen & Jenssen, 2013). Alvestad and Jernes (2014) emphasise teachers’ knowledge of digital technology in relation to “children’s cultural formation, *bildung*, connected to the content, the strategies (working design) as well as values related to the society of tomorrow” (p. 7). Undheim (2020, p. 71) highlights teachers’ knowledge and the importance of integrating technology, pedagogy, and methods with multiple knowledge areas. According to several national and international studies, there is a need for more research of various aspects concerning digital technology in ECEC and ECTE (Dardanou et al., 2023; Masoumi, 2021; Papavlasopoulou et al., *Forthcoming*). To prepare preservice teachers for their future work as teachers, it is important to devote explicit attention to the theoretical and practical aspects related to technology during their education (Alelaimat et al., 2020; Krumsvik, 2014; Masoumi, 2021; McKenney & Voogt, 2017; Spiteri & Rundgren, 2020; Zipke et al., 2019).

National ECTE regulations and guidelines

In 2012, new *National Curriculum Regulations for Kindergarten Teacher Education* (hereby referred to as the regulations) (Ministry of Education and Research, 2012) were introduced in Norway. At the same time, ECTE was restructured from a focus on separate subjects to a focus on areas of knowledge. The regulations serve as an overarching guide for the *National Guidelines for Early Childhood Teacher Education* (hereby referred to as the guidelines) (UHR Teacher Education, 2018); together, these documents define what is expected and “ensure a nationally coordinated EC teacher education that meets the requirements for educational quality” (UHR Teacher Education, 2018, p. 4).

¹Profesjonsfaglig digital kompetanse in Norwegian

Table 1. The six areas in DigCompEdu (Redecker, 2017, p. 16, 24–25).

Area	Description
1) Professional engagement	Using digital technologies for communication, collaboration and professional development. <ul style="list-style-type: none"> • Organisational communication • Professional collaboration • Reflective practice • Digital continuous professional development
2) Digital resources	Sourcing, creating and sharing digital resources. <ul style="list-style-type: none"> • Selecting digital resources • Creating and modifying digital resources • Managing, protecting and sharing digital resources
3) Teaching and learning	Managing and orchestrating the use of digital technologies in teaching and learning. <ul style="list-style-type: none"> • Teaching • Guidance • Collaborative learning • Self-regulated learning
4) Assessment	Using digital technologies and strategies to enhance assessment. <ul style="list-style-type: none"> • Assessment strategies • Analysing evidence • Feedback and planning
5) Empowering learners	Using digital technologies to enhance inclusion, personalisation and learners' active engagement. <ul style="list-style-type: none"> • Accessibility and inclusion • Differentiation and personalisation • Actively engaging learners
6) Facilitating learners' digital competence	Enabling learners to creatively and responsibly use digital technologies for information, communication, content creation, wellbeing and problem-solving. <ul style="list-style-type: none"> • Information and media literacy • Digital communication and collaboration • Digital content creation • Responsible use • Digital problem solving

In the regulations, several learning outcomes are listed, focusing on knowledge, skills and competences the preservice teachers shall develop and acquire during their education; these are the expected overall outcomes. Central to Norwegian ECTE today are six areas of knowledge: 1) *children's development, play and learning*; 2) *society, religion, beliefs and ethics*; 3) *language, text and mathematics*; 4) *art, culture and creativity*; 5) *nature, health and movement*; and 6) *leadership, cooperation and development*. To prepare preservice teachers for their future work, the professional orientation in the content taught in all these areas of knowledge must be ensured by considering the national regulations and guidelines (Kunnskapsdepartementet, 2012; Ministry of Education and Research, 2012; UHR Teacher Education, 2018; UHR-Lærerutdanning, 2018), the *Kindergarten Act (2005)* and the *Framework Plan for Kindergartens* (the national ECEC curriculum) (Directorate for Education and Training, 2017).

Digital practice in Norwegian ECEC

The first Norwegian framework plan had a technical focus on early childhood (EC) teachers' use of digital tools, aiming to give the children (0- to 6-year-olds) basic experiences of everyday technical tools (Barne- og familiedepartementet, 1995). In the following framework plans, children's experiences with digital tools as a source for play, communication and knowledge were emphasised (Kunnskapsdepartementet, 2006, 2011). At the same time, the white paper *Quality in Kindergarten*

(Kunnskapsdepartementet, 2008) stated that knowing how to use digital technology is an important skill in a modern knowledge society.

In the current framework plan (Directorate for Education and Training, 2017), digital practice is presented as a working method. The framework plan emphasises teachers' and educators' exploration of "the creative and inventive use of digital tools together with the children" and states that "digital practices in kindergarten shall encourage the children to play, be creative and learn" (pp. 44–45). Staff shall exercise "sound digital judgement with regard to searching for information, be conscious of copyright issues, critically analyse sources and safeguard the children's privacy" as well as evaluating "relevance and suitability and participate in the children's media usage" (Directorate for Education and Training, 2017, p. 45). Furthermore, in the learning area *quantities, spaces and shapes*², digital tools are emphasised as tools "to inspire the children's mathematical thinking" (p. 54).

Two national reports (Naper et al., 2021, 2022) show an increasing use of digital technology in Norwegian ECEC since 2018. However, it is mainly within two areas: documenting pedagogical work and communicating with parents (2021, p. 92, 2022, pp. 39–40). There is less use of digital technology in creative activities with children (Naper et al., 2022). The question is, how are the pre-service teachers being prepared to use digital technology during ECTE?

The study's purpose

The purpose of this study is to explore how digital aspects such as digital competence and digital technology are addressed in Norwegian ECTE plans and at the twelve Norwegian institutions that offer full-time ECTE. The aim is to provide a national overview of the ECTE institutions' programme plans and relevant course plans to identify how the preservice teachers are being prepared for their future professional life as digitally competent EC teachers. Similar efforts have been made regarding Norwegian teacher education (grade 1–10) (e.g., Daus et al., 2019; Hjukse et al., 2020; Instefjord & Munthe, 2016; Kofoed et al., 2019; Nagel, 2021; Tømte et al., 2013) but not regarding ECTE. The research question is as follows: *How are digital competence and digital technology addressed at the ideological, formal and perceived curriculum levels in Norwegian ECTE?* We use Goodlad et al.'s (1979) curriculum theory as the theoretical framework.

Curriculum theory

Goodlad et al.'s (1979) curriculum theory consists of five levels. At the highest level is the ideological curriculum, which emerges from ideological debates and discussions in society by drawing on a combination of conventional wisdom and funded knowledge. The ideological curriculum is the basic idea that underlies the formal curriculum with more specific content and working methods. The formal curriculum is the official curriculum, in which the society's interests are embedded (Goodlad et al., 1979), such as the regulations (Kunnskapsdepartementet, 2012; Ministry of Education and Research, 2012) and the guidelines (UHR Teacher Education, 2018; UHR-Lærertutdanning, 2018). At the formal curriculum level, there are also the institutions' programme plans, which shall provide information on the content of the education, in line with and by drawing upon national regulations and guidelines. However, "the institutions' plans should not be an exact replica of the guidelines; they should exploit the scope for interpretation that the guidelines afford for innovation and institutional adaptation" (UHR Teacher Education, 2018, p. 4).

²The learning areas in the framework plan reflect topics of interest and intrinsic value to children of kindergarten age and shall help promote well-being, all-round development and good health (Directorate for Education and Training, 2017, p. 47). The seven learning areas are: 1) communication, language and text; 2) body, movement, food and health; 3) art, culture and creativity; 4) nature, environment and technology; 5) quantities, spaces and shapes; 6) ethics, religion and philosophy; 7) local community and society.

Table 2. Overview of the included documents.

Curriculum level	Included documents
Ideological	<ul style="list-style-type: none"> • <i>Kompetanse for framtidens barnehage: Revidert strategi for kompetanse og rekruttering 2018–2022</i> [Competence for the kindergarten of the future: Revised strategy for competence and recruitment 2018–2022] (Kunnskapsdepartementet, 2017) • <i>Barnehager mot 2030: Strategi for barnehagekvalitet 2021–2030</i> [Kindergartens towards 2030: Strategy for kindergarten quality 2021–2030] (Kunnskapsdepartementet, 2021) • <i>Teacher Education 2025: National Strategy for Quality and Cooperation in Teacher Education</i> (Ministry of Education and Research, 2018)
Formal	<ul style="list-style-type: none"> • <i>National Curriculum Regulations for Kindergarten Teacher Education</i> (Ministry of Education and Research, 2012) • <i>Merknader til nasjonal forskrift om rammeplan for barnehagelærerutdanning</i> [Comments on the national regulations on the framework plan for kindergarten teacher education] (Kunnskapsdepartementet, 2012) • <i>National Guidelines for Early Childhood Teacher Education</i> (UHR Teacher Education, 2018) • <i>Felleskapittel - Nasjonale retningslinjer for lærerutdanningane</i> [Common chapter - National guidelines for teacher education] (UHR-Lærerutdanning, 2018) • Programme plans from the twelve Norwegian ECTE institutions
Perceived	<ul style="list-style-type: none"> • Course plans from two compulsory areas of knowledge (BULL and STM), practice placements and relevant extension courses

At the third curriculum level, we find the perceived curriculum, which Goodlad et al. (1979, p. 61) describe as the “curricula of the mind”. By drawing on the formal curriculum, the ECTE teachers create course plans and learning outcomes. Both ideological, disciplinary and personal factors come into play and influence assessments of how learning outcomes are defined and operationalised (Kunnskapsdepartementet, 2016; Solbrekke & Karseth, 2016). However, it is important to ensure that the course’s content and learning outcomes correspond with the overarching learning outcomes in the programme plan. Course plans and learning outcomes formalise what knowledge, skills and competences the preservice teachers are expected to know at the end of their education, but analyses of learning outcomes show that they tend to be either too general/overall or too local (Solbrekke & Karseth, 2016, pp. 65–66).

The operational curriculum is the actual realisation of the curriculum, which the teachers focus on in their lessons, while the experienced curriculum is how the preservice teachers experience the curriculum (Goodlad et al., 1979). The challenge is to minimise the gap between the ideological ideas and what the preservice teachers experience during the lessons (Goodlad et al., 1979; Gundem, 1990).

In this paper, we draw on official documents; consequently, we will only focus on the ideological, formal and perceived curriculum levels and not the operational and experienced levels.

Methods

The empirical material in this study consists of policy documents, national curriculum regulations, national guidelines, programme plans and course plans from the twelve Norwegian ECTE institutions that offer full-time ECTE at the bachelor’s level (see Table 2). We have included course plans from two compulsory areas of knowledge, namely, *children’s development, play and learning* (BULL³) and *language, text and mathematics* (STM⁴), practice placements and relevant extension courses (Table 3).

BULL is based on Norwegian ECEC’s core values and pedagogic topics. This area of knowledge will contribute to the preservice teachers’ “professional insight that is necessary for

³*Barns utvikling, lek og læring* in Norwegian

⁴*Språk, tekst og matematikk* in Norwegian

Table 3. Overview of the included institutions and courses.

Abbr.	Institution	Course plans	Course codes
DMMH	Queen Maud University College (Dronning Mauds Minne Høgskole)	Children's development, play and learning 1 and 2 Language, text and mathematics 1 and 2 Practice placements	BFBUL1003 BFBUL2003 BFSTM1043 BHSTM2043 BFPRA100 BFPRA200/210 BFPRA300
HINN	Inland Norway University of Applied Sciences (Høgskolen i Innlandet)	Children's development, play and learning 1 and 2 Language, text and mathematics Practice placements Opportunity spaces in nature, movements and mathematics	2BBULLC-1 2BBULLC-2 2BSTMC-1 2BPRAC-1/2/3 2BFLRBC-1
HiØ	Østfold University College (Høgskolen i Østfold)	Children's development, play and learning 1 and 2 Language, text and mathematics	LBLHBUL116 LBLHBUL219 LBLHSTM20
HVL	Western Norway University of Applied Sciences (Høgskolen på Vestlandet)	Children's development, play and learning Language, text and mathematics Literacy, exploration and play Aesthetic and outdoor education	BULL101 STM101 LUL301 AOE301
HVO	Volda University College (Høgskolen i Volda)	Children's development, play and learning Language, text and mathematics Practice placements	BLUBULL BLUSTM BLUPRA1/2/3
NLA	NLA University College (NLA Høgskolen)	Children's development, play and learning Language, text and mathematics Children, media and beliefs	BLK01 BLK02 BLFORM
NORD	Nord University (Nord Universitet)	Children's development, play and learning Language, text and mathematics Practice placements	BLU1001 BLU1004 PRA1027/1028 PRA2012/2013/ 2014 PRA2015/2016
OSLOMET	Oslo Metropolitan University (Storbyuniversitetet)	Children's development, play and learning Language, text and mathematics Practice placements	BLH1100 BLH2100 BLHP1ÅR BLHP2000/3000 BLH2300
UiA	University of Agder (Universitetet i Agder)	Children's development, play and learning Language, text and mathematics Practice placements	BUL100-1 STM100-1 PRA031/032/033 PRA034/035/036
UiS	University of Stavanger (Universitetet i Stavanger)	Children's development, play and learning 1 and 2 Language, text and mathematics Practice placements	BBL101 BBL102 BBL210 BBLPR1/2/3
UiT	University of Tromsø - The Arctic University of Norway (Universitetet i Tromsø)	Children's development, play and learning Language, text and mathematics Professional digital competence Language and communication	BLU-1004 BLU-1213 BLU-2013 BLU-1210
USN	University of South-Eastern Norway (Universitetet i Sørøst-Norge)	Children's development, play and learning 1 and 2 Language, text and mathematics	BLBUL1 BLBUL2 BLSTM

pedagogic work in play, learning, care and formative development in a diverse society” (UHR Teacher Education, 2018, p. 12) in a pedagogic context in which digital practice is highlighted (Directorate for Education and Training, 2017). The mathematical part of the knowledge area STM is essential due to the framework plans’ focus on digital tools in the learning area *quantities, spaces and shapes* (Directorate for Education and Training, 2017). Extension courses differ in content and broadness, and we have included those that seemed relevant (Table 3). All programme and course plans were collected from the ECET institutions’ websites in December 2021 and applied to 2021–2022.

Curriculum analysis

To answer the research question and explore how digital competence and digital technology are addressed at the ideological, formal and perceived curriculum levels in Norwegian ECTE, we conducted a summative content analysis of the included documents (Fauskanger & Mosvold, 2014; Hsieh & Shannon, 2005).

First, we searched for the word “digital*” in the documents to identify the digital aspects and explore the manifest use of the word (Fauskanger & Mosvold, 2014, pp. 130–131; Hsieh & Shannon, 2005, p. 1283). Quotes from the search were added to an Excel file and systematically organised with respect to their appearance in the examined documents into the following headings: *Content*; *Learning outcomes*; and *Working and teaching methods*. Second, all included documents were thoroughly read to explore the latent use of “digital*”; we were interested in the “underlying meaning” of the word and how it was used in the context, in line with Fauskanger and Mosvold (2014, p. 131) and Hsieh and Shannon (2005, p. 1284). Third, we looked for patterns across the documents.

Ethical considerations

Ethical approval was not required because the documents were collected from open websites. All institutions are anonymised in the analysis; the letters used in Figures 1–3 do not correspond with the order of the institutions in Table 3.

Results

Ideological curriculum level – national policy documents

In a recent national strategy concerning quality in Norwegian ECEC, *Competence for the Kindergarten of the Future* (Kunnskapsdepartementet, 2017, p. 17), digital practice was highlighted as a central area for professional development in ECEC institutions, as well as mathematics and science (“realfag”). In the current ECEC strategy, *Kindergartens Towards 2030* (Kunnskapsdepartementet, 2021), the word “digital*” only occurs once, when describing a digital tool for assessing quality in ECEC. However, the importance of looking forward and further developing ECEC in line with society in general, is emphasised (Kunnskapsdepartementet, 2021, p. 8), reflecting the focus of ECEC institutions acting as “learning organisations” (Kunnskapsdepartementet, 2017, p. 7).

In *Teacher Education 2025* (Ministry of Education and Research, 2018), a national strategy for quality and cooperation in teacher education, teachers’ knowledge, skills and competences in a digitalised society is described as professional digital competence. The strategy states that there is “a need for more advanced digital skills in the profession to enable teachers to assess and exploit the new working and learning methods offered by digital tools” (Ministry of Education and Research, 2018, p. 11).

Formal curriculum level – national ECTE regulations and guidelines

In the regulations, digital aspects were found in Section 2, *Learning outcomes*; upon completing ECTE, it is expected that the preservice teachers possess “broad knowledge of children’s language development, multilingualism, social, physical and creative development and of their early digital, reading, writing and numeracy skills” (Ministry of Education and Research, 2012, Section 2, p. 2). Furthermore, it is expected that preservice teachers have “a capacity for change and development” and are “able to lead educational development processes and contribute to new thinking and innovation processes for tomorrow’s kindergarten” (Ministry of Education and Research, 2012, Section 2, p. 4).

In the guidelines (UHR Teacher Education, 2018), six overarching themes are listed, one of them being “Professional digital competence, including digital judgement” (p. 6), although the theme is not described or defined. However, in Section 4.3, *Working methods and assessment*, it is stated that the education shall provide the preservice teachers with various forms of communication, including digital tools, and help the preservice teachers to enhance their professional digital competence (p. 7). Furthermore, it is stated that practical, didactic and theoretical perspectives are to be included in ECTE through various assignments to “achieve a holistic, coherent and relevant education” (UHR Teacher Education, 2018, p. 7). The professional orientation of the content is also emphasised.

Digital aspects are also mentioned in the guidelines’ description of several of the knowledge areas. STM focuses on preservice teachers’ knowledge of media cultures and their ability to “demonstrate professional digital competence” (p. 16), but without specifying what the term professional digital competence contains. The *society, religion, beliefs and ethics* knowledge area focuses on promoting preservice teachers’ “ethical awareness and occupational competence with regard to digital challenges, the environment and sustainable development” (p. 15), while the area of *art, culture and creativity* emphasises technology as an aesthetic tool in relation to music, drama and art and focuses on preservice teachers’ ability to “stimulate children to explore, play, learn and create through digital forms of expression” (p. 18). In BULL, digital aspects are not explicitly mentioned. However, there are three learning outcomes that we interpret in relation to being digitally competent: having “knowledge of relevant theories and research on children’s development, play, learning and formative development, and of how these are linked”; being able to “support children’s curiosity and creative expression and contribute to children’s well-being and joy in a safe yet challenging play and learning environment”; and being able to “demonstrate a beginner’s level of professional judgement” (UHR Teacher Education, 2018, pp. 12–13).

Formal curriculum level – the institutions’ programme plans

The word “digital*” is found at least once in all institutions’ programme plans (Figure 1). Professional digital competence and digital judgement are highlighted by five of the twelve institutions as a central theme when describing the content of the study, in line with the national guidelines (UHR Teacher Education, 2018). However, only one institution describes the term professional digital competence further (Excerpt 1).

Professional digital competence is an integral part of education that contains practical skills and theoretical perspectives. Professional digital competence is a competence required by EC teachers, for example, to be able to acquire, process and produce information and communicate digitally. Perspectives on digital development as well as the significance and function of digital media in today’s society, including ethical issues related to participation in a digital and democratic society, will also be emphasised during the BA programme. Furthermore, the university shall contribute to the preservice teachers’ ability to critically assess how a digital society influences pedagogical work in ECEC, as well as to exercise digital and critical pedagogical judgement regarding children’s digital learning processes.

Excerpt 1: Description of professional digital competence in institution A’s programme plan, in the content section (translated by the authors)

To summarise, two aspects are central in Excerpt 1: i) what competence the preservice teachers need as future EC teachers and ii) how the institution will prepare the preservice teachers to accomplish this competence.

In the content section, three of the ECTE institutions focus on how they will help preservice teachers develop the digital competence they need as future EC teachers. These institutions focus on being able to obtain and handle information, use digital resources creatively and communicate and interact with other people in digital environments. Being able to use digital resources in a practical and justifiable way to solve practical tasks, being able to use digital tools and digital media creatively

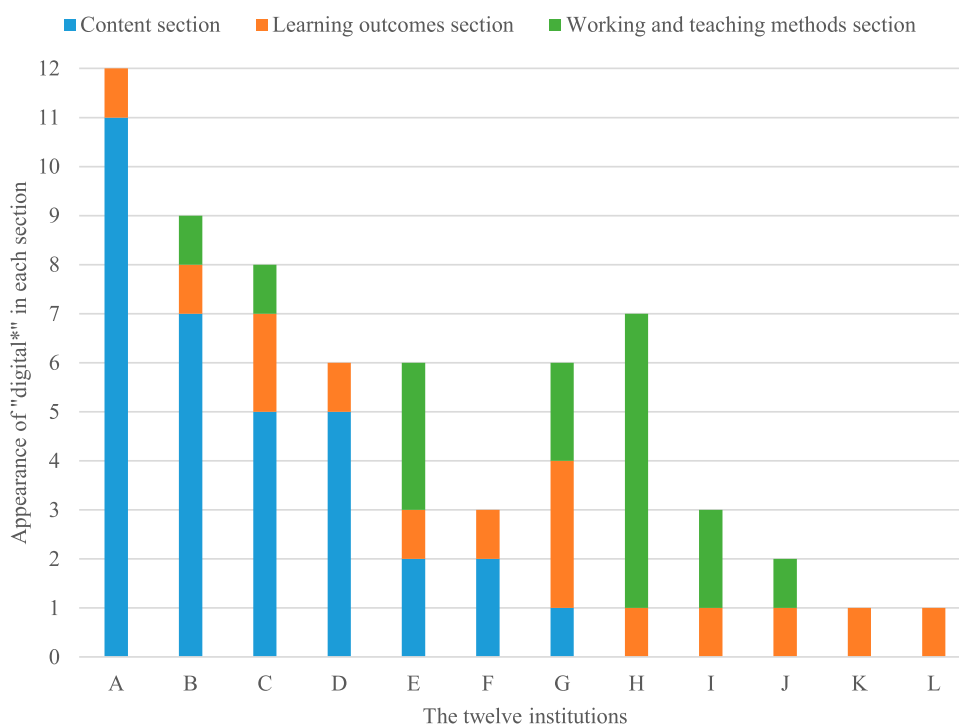


Figure 1. The number of times “digital*” is found in the twelve institutions’ programme plans.

and reflectively, and developing digital judgement by acquiring knowledge and good strategies for online use are also emphasised. Furthermore, EC teachers’ digital competence is described as using digital tools for documentation, communication and as a pedagogical tool.

At all institutions, there is at least one learning outcome in the programme plan that explicitly emphasises knowledge of digital aspects, by focusing on the preservice teachers’ broad knowledge of kindergarten children’s early digital and mathematical skills (Figure 1). Furthermore, all institutions have included one learning outcome that focuses on the preservice teachers’ contribution to new thinking and innovation processes for tomorrow’s ECEC institutions. However, at all institutions these two learning outcomes are the same as in the national regulations (Ministry of Education and Research, 2012, Section 2, p. 2 and 4). One institution also highlights professional digital competence as a skill to be developed.

Digital aspects are also mentioned by several institutions when describing the working and teaching methods, with a focus on giving the preservice teachers experiences with various digital tools to promote their professional digital competence (Figure 1). One institution also highlights that preservice teachers will experience how creativity, thinking and innovation can be connected to competence development in ECEC through various working methods during the bachelor’s programme.

Perceived curriculum level – the institutions’ course plans

In the knowledge area BULL, “digital*” is found in eight of the course plans (Figure 2). “Digital*” is mentioned in the content section at three institutions; one of these connects digital judgement to professional digital competence, in line with the national guidelines (UHR Teacher Education, 2018). At four institutions, digital aspects are addressed in the learning outcomes; two focus on the preservice teachers’ knowledge of or skills in exploring pedagogical use of digital technology, one institution

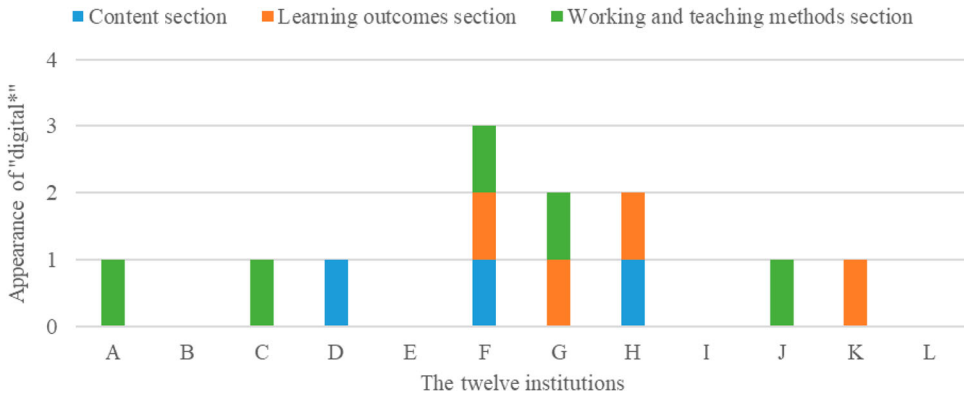


Figure 2. The number of times “digital*” is found in the BULL course plans.

emphasises the preservice teachers’ knowledge of ethics and digital judgement related to pedagogical work, while another institution focuses on developing professional digital competence. Five institutions mention digital aspects in the section of working and teaching methods, but only two describe how they will help the preservice teachers develop their digital competence.

In the knowledge area STM, “digital*” is found in ten of the course plans (Figure 3); two institutions highlight digital aspects in the content section, but all address digital aspects in the learning outcomes. Nine of them emphasise the use or mastery of digital tools in their learning outcomes; one institution, for example, highlights the knowledge of relevant digital tools to use together with children to foster their mathematical development. Seven institutions highlight the preservice teachers’ understanding of mathematics as a tool for exploration and problem solving, but no explicit connection between mathematical concepts or problem solving and digital tools is found. At four institutions, professional digital competence is mentioned as a competence the preservice teachers possess upon completing the course.

At most institutions, the description of practice placements is included in the programme plan, but some institutions have separate course plans for practice placements (see Table 3). Only one institution includes “digital*” in its description of practice placements by emphasising the preservice teachers’ knowledge of the ECEC core values and what this means in a diverse and digital society, including being able to use digital tools for communication when appropriate.

Three of the included extension courses use the word “digital*” in their learning outcomes, related to the preservice teachers’ use of digital tools. Only one institution specifies and goes deeper into the digital concept in their course plan (Excerpt 2):

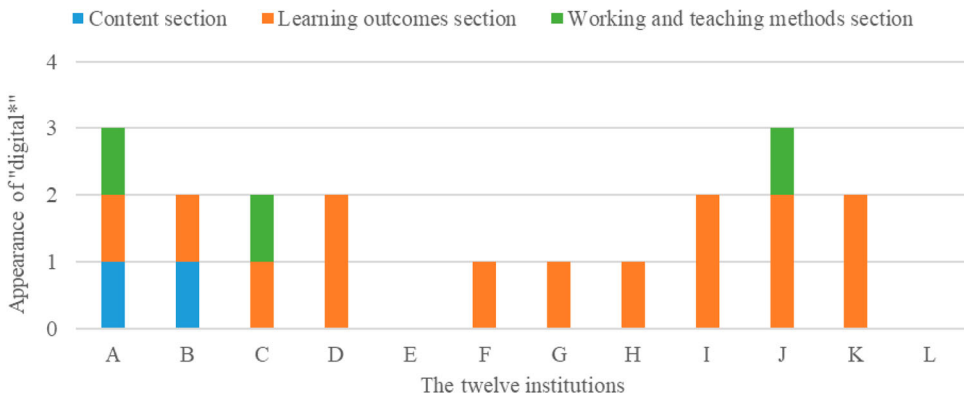


Figure 3. The number of times “digital*” is found in the STM course plans.

The course combines theoretical and practical knowledge and skills about the pedagogical use of digital tools and children's digital everyday life in ECEC. (...) How the EC teachers use digital tools in their pedagogical work are central parts of the course and will be included in play, exploration and learning, as well as the documentation work in ECEC. Professional digital competence and digital judgement are concepts that will be placed into a professional context. The course focuses on the EC teachers' role in ECEC and their responsibility to provide children with varied and adapted challenges related to activities using digital technology.

Excerpt 2: Description of the digital concept in an extension course plan (translated by the authors)

The description of the institution's working and teaching methods in Excerpt 2 reveals practical assignments for the preservice teachers to gain digital competence, including digital judgement.

Discussion

The purpose of this paper is to explore how digital aspects such as digital competence and digital technology are addressed in the Norwegian ECTE curriculum at the ideological, formal and perceived curriculum levels (Goodlad et al., 1979).

At the ideological level, by drawing on central Norwegian policy papers (Kunnskapsdepartementet, 2017, 2021; Ministry of Education and Research, 2018) (Table 2), we consider digital competence to be an overarching and central competence in contemporary society at all educational levels from ECEC to higher education.

At the formal level, our analysis of the curriculum documents shows that all institutions share the idea that digital competence is a required competence for future teachers, in line with national policy documents (Directorate for Education and Training, 2017; Kunnskapsdepartementet, 2017, 2021; Ministry of Education and Research, 2018) and the European DigCompEdu (Redecker, 2017). In the regulations, it is expected that preservice teachers, upon completing ECTE, possess a broad knowledge of children's "early digital, reading, writing and numeracy skills" (Ministry of Education and Research, 2012, Section 2, p. 2). The analysis shows that most institutions focus on EC teachers' knowledge of children's development of digital skills, by drawing on the regulations (Ministry of Education and Research, 2012). Furthermore, most institutions highlight professional digital competence as an overarching theme, in accordance with the guidelines (UHR Teacher Education, 2018). However, the analysis shows that the word "digital*" is mainly used as an overall description when referring to professional digital competence, digital judgement and digital tools. Only three institutions focus on the preservice teachers' use of digital tools creatively, but without specifying how and in which context. Only one institution describes what they mean by professional digital competence. Most institutions emphasise EC teachers' use of digital technology for documentation and communication, and as a pedagogical tool, which can be interpreted in line with Areas 1–3 in DigCompEdu (Redecker, 2017).

At the perceived curriculum level, by exploring the course plans, we found that most institutions highlight the use and mastery of digital tools in their learning outcomes, but very broadly. The word "digital*" mostly appears in relation to something, for example, having knowledge of relevant digital tools to use together with children to foster their mathematical development (in STM). This relates to some extent to Areas 2 and 3 in DigCompEdu (Redecker, 2017) (see Table 1). It seems that the framing of "digital*" in the course plans is mostly user-oriented and less focused on promoting a deeper understanding and awareness. A similar finding appears in another study of preservice teachers' professional digital competence development (Almås et al., 2021); in this study, the researchers found that the preservice teachers had experienced a wide variety of basic uses of digital tools as well as a range of didactical digital activities during their teacher education (pp. 78–79). However, the researchers also found that the preservice teachers had less experience with issues related to digitalisation, reflective perspectives on digital technology and critical considerations (Almås et al., 2021, p. 82). From our perspective, the focus on digital competence and skills in the regulations (Ministry of Education and Research, 2012) include more than using digital tools for pedagogical or communicative work, and need to be seen in line with Areas 5 and 6 in DigCompEdu (Redecker, 2017). Only one institution mentions "digital*" in relation to practice placements;

however, from our perspective, practice placements should also be interpreted as a valuable context for preservice teachers to experience and try different digital tools together with children and discuss various aspects related to a digital society with EC teachers. During practice placements, preservice teachers can watch and learn from EC teachers' various didactical digital activities with the children and experience similar activities themselves (e.g., Alelaimat et al., 2020; Krumsvik, 2014; Masoumi, 2021). According to several researchers, it is important to devote explicit attention to both theoretical and practical aspects related to technology during teacher education (Alelaimat et al., 2020; Krumsvik, 2014; Masoumi, 2021; McKenney & Voogt, 2017; Spiteri & Rundgren, 2020; Zipke et al., 2019). Professional digital competence is emphasised in several of the course plans (Table 3), but the concept is not described or explained. In one of the extension courses, for example, it is stated that "professional digital competence and digital judgement are concepts that will be placed into a professional context" (translated by the authors); but what does this mean and how is it done? Consequently, we find it hard to understand, by exploring the course plans, how institutions prepare and help preservice teachers develop the expected learning outcomes, as described in the regulations (Ministry of Education and Research, 2012).

From our perspective, the analysis clearly demonstrates that there is a need to operationalise professional digital competence from an ECTE perspective. Even though there have been some efforts in operationalising the concept (e.g., Alvestad & Jernes, 2014; Hardersen & Jenssen, 2013; Redecker, 2017), the results of this study confirm that there is a need for further conceptualising and defining, as also emphasised by several researchers (e.g., Almås et al., 2021; Dardanou et al., 2023; Erstad et al., 2021; Masoumi, 2021; Skantz-Åberg et al., 2022).

The analysis also demonstrates a need to define the learning outcomes more precisely, as highlighted in previous studies (Solbrekke & Karseth, 2016; Tømte et al., 2013). Currently, several of the learning outcomes in the programme and course plans appear to be more or less exact replicas of the guidelines, without utilising the room for interpretation that the guidelines provide for innovation and institutional adaptation. By reading the curriculum documents with a digital focus, we see that digital aspects are integrated into many learning outcomes even though they might not be stated explicitly, for example, having "knowledge of relevant theories and research on children's development, play, learning and formative development, and of how these are linked" and being able to "support children's curiosity and creative expression, and contribute to children's well-being and joy in a safe yet challenging play and learning environment" (UHR Teacher Education, 2018, pp. 12–13). However, by reading the same curriculum documents with another focus, these links to the digital might not be seen. With the current regulations and guidelines, personal factors may, to a large extent, influence assessments of how learning outcomes are defined and operationalised in Norwegian ECTE. A similar factor was also highlighted by Tømte et al. (2013, p. 39), who concluded that when digital aspects are mostly left to teachers with a special interest in the digital, there is a risk that the digital focus will be fragmented and too dependent on these teachers.

Conclusion

In this paper, we provide a national overview of how digital competence and digital technology are addressed at the ideological, formal and perceived curriculum levels in Norwegian ECTE. The aim of this paper is to identify how preservice teachers in Norway are being prepared for their future professional lives as digitally competent EC teachers. Although only Norwegian curriculum documents are included, we believe the results are relevant internationally due to the increased focus on digital technology in today's society (European Commission, 2020; OECD, 2016).

Through a summative content analysis of the national regulations and guidelines, as well as the programme and course plans from twelve Norwegian ECTE institutions (Table 3), we have highlighted some patterns. By drawing on official documents, we can provide a description and analysis of how digital competence and digital technology are addressed in ECTE, but we cannot say

anything about how it is done or how it is experienced. To learn more and go deeper into how the documents are operationalised by the teachers at the ECTE institutions and how the content is experienced by the preservice teachers, other research methods are needed.

From our perspective, being a teacher in ECTE or ECEC today includes being a professional, digitally competent teacher. By drawing on the description of professional digital competence in Excerpt 1, previous research (e.g., Almås et al., 2021; Alvestad & Jernes, 2014; Nagel, 2021) and DigCompEdu (Redecker, 2017), we want to highlight several central aspects. First of all, professional digital competence includes reflection and didactic judgement of how, why and when to use the technology (Alvestad & Jernes, 2014) as well as an awareness and deeper understanding of implications of digital technology in society (Almås et al., 2021; Nagel, 2021). Furthermore, professional digital competence includes critical pedagogical judgement regarding children's digital development and learning processes and an awareness of ethical issues related to participation in a digital and democratic society (Hardersen & Jenssen, 2013; Kelentrić et al., 2017; Redecker, 2017).

In line with other researchers in the field (e.g., Alelaimat et al., 2020; Almås et al., 2021) we emphasise the importance of including both theoretical and practical aspects of digital competence in the ECTE curriculum. Practical aspects could be coding or programming, creating animation movies, or evaluating digital picture book apps, integrated into didactical digital activities and experiences; it is not just about the tools. By reflecting on theory and practice together with the preservice teachers during lessons based on relevant didactical examples of how, why and when to use technology, the preservice teachers will be more prepared for what they will experience as future teachers (Alelaimat et al., 2020; Almås et al., 2021). Hopefully, this will help them to make the connections between theory, research and practice, in line with the ECTE regulations and guidelines and be well prepared as digitally competent EC teachers.

The findings in this paper demonstrate that digital competence and digital technology are clearly emphasised and addressed at the ideological curriculum level but less at the formal and perceived curriculum levels. From our perspective, there is a need to define and operationalise professional digital competence from an ECTE perspective. Furthermore, there is a need to more explicitly describe the learning outcomes in the programme and course plans, focusing on both theoretical and practical aspects.

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