Professional Digital Competence Framework for Teachers

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SENTER FOR IKT I UTDANNINGEN

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Introduction

About the teacher's professional digital competence

Technology affects every aspect of our everyday lives and has changed the way we learn, communicate, entertain ourselves, locate information, and acquire knowledge. These changes are, and will continue to become, increasingly apparent at every level of the education system. This process is creating new challenges for teachers' working methods in pedagogical, didactic and administrative contexts, development of pupils' digital bildung, and the development of their specialised knowledge and basic skills. Today, it is more important than ever that children and young people are not merely passive consumers of products, services and information but also critical users and active producers of content themselves. The role of teaching includes fostering pupils who are capable of identifying credible information, quoting sources, protecting their intellectual property, applying ethical values and attitudes in communications and interaction, producing their own digital resources, and developing a reflective relationship in relation to their own and others' actions, cultural differences, values and rights.

The role of the teacher is key in this context. In order to be capable of developing pupils' basic skills and specialised knowledge, teachers must develop their own professional digital competence during their initial teacher education, and later, through continuing professional education and development, during their teaching career. The Professional Digital Competence Framework for Teachers has two aims: one centres on professional development, the other around the actual practice of the profession.

A number of national steering and reference documents stipulate clear expectations concerning teachers and teacher education in this area. In 2012, the Norwegian Directorate for Education and Training revised its *Basic Skills Framework*, which defines the five basic skills, including digital skills. These provided a basis for the curricula. The curricula require that teachers utilise digital tools in their teaching and help foster pupils' digital skills in all subjects. Since all pupils should be given an opportunity to develop basic skills during their primary and secondary education, students who start teacher education must also have basic digital skills, so they can search for and process information, produce and communicate online, as well as exercise digital judgement. Moreover, national regulations and the guidelines for teacher education programmes require that student teachers develop the competence necessary to integrate digital tools into their future pedagogical and administrative work. If the teachers of the future are to be capable of developing pupils'

digital competence, in line with the stipulated obligatory guidelines and requirements, professional digital competence must be regarded as an integral part of teacher competence and the teaching profession, and emphasised in teacher education.

The Norwegian Centre for ICT in Education introduced the concept of "professional digital competence" in 2012, in connection with suggestions for the new framework for teacher education. The centre viewed this as important, in order to highlight the key role the teaching profession plays in realising digitalisation in schools, and the development of digitally competent pupils. The concept is now commonly used in Norway, in both research environments and official steering documents. Various overarching descriptions of the concept have been launched since then. When the centre first introduced the concept, it was with the intention that it should indicate the complexity and breadth of knowledge, skills, and competencies in teachers' professional practice that are associated with understanding the opportunities and challenges in today's digital society. The centre hopes that this framework will give substance and meaning to the concept of *teachers' professional digital competence*, and thereby establish a basis for competence development and improve the quality of this in the teaching profession.

About the framework

The Professional Digital Competence Framework for Teachers is a guidance document that policy developers, heads of department, teacher educators, teachers, student teachers and others can use as a reference in their work on improving the quality of teacher education and systematic continuing professional development of teachers. The hope is that this document will establish a common conceptual framework and frame of reference for what teachers' professional competence entails.

The framework can be utilised in:

1) *Developing common national frames and directions for teacher education* through the preparation and further development of framework plans and guidelines for teacher education.
2) *Planning and implementing initial and continuing teacher education* through the preparation of local programme plans, and the provision of continuing professional development.
3) *Evaluating and following up on teachers' professional digital competence* through the further development of digital forms of assessment and self-evaluation tools for teachers, as well as surveys of the status of digitalisation in the teaching profession and teacher education.

The framework is based on national regulations, guidelines for teacher education programmes, the national curriculum, the Basic Skills Framework, and the National Qualifications Framework. The framework takes, as its starting point, the competence areas for the teaching profession as defined in the Report to the Storting No. 11 (2008-2009) *The Teacher – the role and the education*, and is therefore based on an overall approach, in which extensive and complex teacher competence is viewed from a digital perspective. The framework consists of seven competence areas, which contain descriptions of knowledge, skills and competence.

Figure 1. Visualisation of the Professional Digital Competence Framework for Teachers.

All of the areas of competence are equally important, but it is the sum of the competence areas that makes up a professional, digitally competent teacher.

Teachers' professional digital competence is dynamic and complex, and influenced by developments in society. Therefore, this framework will be updated regularly, in line with the influence digital developments have on the teaching profession and education system in general.

Professional digital competence framework for teachers

Subjects and basic skills

A professional, digitally competent teacher understands how digital developments are changing and expanding the content of subjects. The teacher understands how the integration of digital resources into learning processes can help to achieve competence aims in a subject, and to address the five basic skills. As a prerequisite for this, the teacher needs to develop their own digital skills. At the same time, the teacher needs to understand what pupils' digital skills entail, and how they can be fostered in the subjects.

KNOWLEDGE

The teacher:

- understands how digital developments are expanding and changing the subject's contents, conceptual framework, forms of assessment, and working methods
- understands how digital developments are creating a need for critical assessment, organisation and increased opportunities for access to and sharing of professional knowledge
- understands how the development of reading, writing, numeracy and oral skills in subjects and across subjects is changing in a digital world

SKILLS

The teacher:

- can make use of digital technology, teaching materials, and learning resources to achieve the competence aims in the subject, and ensure academic progression
- can utilise digital teaching materials and digital learning resources to support the development of all five basic skills in and across subjects

COMPETENCE

The teacher:

- can utilise and further develop their own digital skills
- can facilitate the development of pupils' digital skills as a tool for learning
- can facilitate pupils' learning in and across subjects, based on the interplay between academic content, competence aims, digital technology, digital teaching materials and digital learning resources

School in society

A professional, digitally competent teacher is familiar with perspectives on digital developments and the importance and function of digital media in today's society. The teacher understands their own role, and the role of schools, in bridging the digital divide, and is able to help all children and young people orient themselves and be active participants and contributors in a global, digital and democratic society. The teacher contributes to development of pupils' digital bildung and ensures that they can participate in tomorrow's labour market.

KNOWLEDGE

The teacher:

- has an insight into how digital developments influence the world and society
- understands the influence digital developments have on the distinctive character of schools and the teaching profession, the school's objectives, its core values, legal basis, current curricula and the various rights of pupils
- understands the influence of digital developments on children's and young people's childhood environment, and child and youth culture, development and identity
- understands how access to digital resources can create or diminish barriers, and has insight into how pupils' cultural, social and economic conditions are of relevance to how technology is used for learning
- understands the basic principles of algorithmic thinking, and its relevance for digital technology and digitalisation in society

SKILLS

The teacher:

- can guide pupils in their active participation in digital media, and help ensure that they develop a reflective relationship to digital arenas
- can utilise digital technology, digital teaching materials, and digital learning resources to create frames for developing the pupils' creativity, innovation, problem-solving skills, algorithmic thinking, and entrepreneurship that they need in a globalised society, and a constantly changing labour market

COMPETENCE

The teacher:

- can contribute to pupils' understanding of how digital arenas can provide opportunities for participation in democratic and cultural processes
- can contribute to strengthening the international dimensions of the school's work, by taking advantage of the opportunities digital arenas provide for learning and interaction, in a multicultural and globalised society

Ethics

A professional, digitally competent teacher is familiar with the schools' core values in relation to digitalisation in society. The teacher has an insight into the legislation and ethical concerns, as well as development of pupils' digital bildung associated with participation, in a digital and democratic society. The teacher contributes to developing pupils' digital judgement, understanding and ability to act in line with these.

KNOWLEDGE

The teacher:

- is familiar with the law, rules and guidelines concerning intellectual property rights, and how to handle the personal data of pupils, guardians and colleagues
- is familiar with the signs of digital bullying and harassment, and understands their obligations and options for action

SKILLS

The teacher:

- can apply and teach the rules on intellectual property, privacy, data security, source criticism, and the correct use of sources
- can teach and personally exercise good judgement in a digital environment, based on the school's core ethical values
- can contribute to developing pupils' awareness of how digital developments can influence health and the environment
- can identify digital bullying, harassment, and adverse incidents, work preventively in the classroom, and deal with problems in collaboration with pupils, guardians, the school and other relevant bodies

COMPETENCE

The teacher:

- can develop and administer their own digital identity, is conscious of their conduct in digital arenas, and the consequences this has for their professional identity
- can contribute to the pupils' development of digital judgement, and awareness of their responsibilities and right to participate
- can guide the pupils in the development of their digital identity, and create frames for responsible interaction in a digital environment
- initiates ethical reflection in a professional community, and takes part in positive interaction and a critical, constructive, sharing culture in digital arenas

Pedagogy and subject didactics

A professional, digitally competent teacher possesses pedagogical knowledge, as well as knowledge of subject didactics relevant to the practice of their profession in a digital environment. Based on this, the teacher integrates digital resources into their planning, organisation, implementation and evaluation of the teaching in order to foster pupils' learning and development.

KNOWLEDGE

The teacher:

- understands the correlation between aims, content, teaching methods, assessment, and the individual pupil's preconditions for learning and development in a digital environment
- has a broad repertoire of working methods in a digital environment, with digital teaching materials and digital learning resources

SKILLS

The teacher:

- can locate, critically evaluate, choose, and integrate digital teaching materials and digital learning resources based on pedagogical, subject didactic, and professional criteria, and adapt their use to the subject's content and methods
- can apply their professional knowledge, and knowledge about learning processes, to design and develop their own digital teaching materials and learning trajectory
- can combine different didactic methods with digital technology, digital teaching materials, and digital learning resources in a creative and innovative manner, to produce varied and adapted learning activities

COMPETENCE

The teacher:

- can plan, implement, and reflect on teaching in a digital environment, alone and in collaboration with others, based on steering documents, research, and experience-based knowledge
- can foster the individual pupil's desire to learn, motivation, and faith in their own capacity to learn, create, interact, and share in a digital environment

Leadership of learning processes

A professional, digitally competent teacher possesses the competence to guide learning work in a digital environment. This entails understanding and managing how this environment is constantly changing, and challenging the role of the teacher. The teacher makes use of the opportunities inherent in digital resources in order to develop a constructive and inclusive learning environment, and to adapt the teaching to both diverse groups of pupils, and pupils' individual needs. The teacher uses diverse forms of assessment of pupils' learning in a digital environment, in ways that contribute to fostering their desire to learn, learning strategies and learning competence.

KNOWLEDGE

The teacher:

- understands how a digital environment is of relevance in the management of learning processes, which leads to requirements for organisation, clarity and choice of teaching methods
- understands how digital technology, digital teaching materials, and digital learning resources can help to motivate and support the pupils' learning processes

SKILLS

The teacher:

- can facilitate teaching and learning in a digital environment that can result in academic, creative, and social learning processes in an inclusive learning environment
- can assess individual learning needs, and make use of the opportunities that digital technology, digital teaching materials, and digital learning resources provide for adapted teaching and special education
- can foster a desire to learn, by clarifying learning objectives and using diverse forms of feedback and assessment, for learning in a digital environment

COMPETENCE

The teacher:

- can lead and organise teaching in a digital environment that is characterised by frequent transitions, and adaptive and parallel learning activities at different levels
- can develop good relationships in a digital environment, in order to create a constructive and inclusive learning environment, that fosters interaction, engagement, and a motivation to learn
- can contribute to pupils participating in innovation processes, and thinking in new way through the use of digital technology, digital teaching materials, and digital learning resources
- can adapt their teaching role to different activities, and switch between the role of tutor, guide, participant and intermediary in a digital environment

Interaction and communication

A professional, digitally competent teacher uses digital communication channels for information, collaboration, and knowledge sharing with various stakeholders in a way that builds trust, and contributes to participation and interaction.

KNOWLEDGE

The teacher:

- has an insight into technical opportunities for digital interaction, and for developing pupils' sharing culture
- has an insight into how interaction in a digital environment expands the space for communication, as well as challenging and changing traditional relationships with the teacher

SKILLS

The teacher:

- can facilitate a good learning environment, and guide pupils in their development of good relationships with others in digital arenas
- can use different digital arenas to support interaction, and develop good relationships with pupils, guardians, colleagues, management, and other relevant stakeholders

COMPETENCE

The teacher:

- can critically discuss digital technology, digital teaching materials, and digital learning resources in a professional community, with an intention to developing subjects, teaching and the culture of the school
- can foster pupils' communication and interaction skills
- can participate in digital arenas, and use professional networks for their own learning and development, and for sharing knowledge with colleagues

Change and development

A professional, digitally competent teacher is aware that the development of digital competence is a lifelong, dynamic, situational and flexible process. The teacher improves their competence, and adapts their own practices, based on research and development. This also means that the teacher must be capable of driving their own development work, and contributing to a shared culture around learning, in a digital environment.

KNOWLEDGE

The teacher:

- is familiar with relevant research about, and methods for, integrating digital technology, digital teaching materials, and digital learning resources into teaching
- stays up-to-date on national steering documents and international guidelines, linked to learning and teaching in a digital environment

SKILLS

The teacher:

- can contribute to the modification and development of local curricula, in line with new knowledge about teaching and learning in a digital environment
- can reflect on the importance of digital working methods, forms of assessment, teaching materials, learning resources and forms of expression for their professional practice

COMPETENCE

The teacher:

- can transfer existing competencies to new digital environments, technologies and situations
- can contribute to the development of local steering documents, associated with teaching in a digital environment
- can independently develop their own professional digital competence further, and contribute to the development of pupils, schools, colleagues and teaching professions, in line with digital changes in society

Appendices

APPENDIX 1

Glossary

Adaptive learning is learning and teaching, in which digital resources are adapted on an ongoing basis, with the aid of algorithms to each pupil's measured level of skill and development (source: Norwegian Centre for ICT in Education).

Algorithmic thinking entails breaking down large, complex problems into smaller, more manageable parts. This includes organising and analysing data in a logical manner, and creating approaches (algorithms) for using computers to solve complex problems. It also involves creating abstracts and models of the real world, and generalising solutions so they can be used to solve similar problems. Algorithmic thinking is usually associated with programming, but can also be used as a method in many other contexts and subjects (source: Sevik et al., 2016).

Basic skills. Oral skills, reading, writing, digital skills and numeracy were defined in the Knowledge Promotion Reform of 2006, as basic to learning in school, work and social life. These skills are basic in the sense that they are fundamental to learning in all subjects, as well as prerequisites for the pupil to show his/her competence and qualifications. From the 2006 reform, all subject-specific curricula describe how the five basic skills contribute to developing the pupils' competence and qualifications, and how these skills are integrated into the subject. Each subject curriculum integrates competence aims, basic skills, and subject content. The skills are consequently expressed in different manners, and to a varying degree in the different curricula, depending on the relevance of different skills aspects for the subject in question. (source: Norwegian Directorate for Education and Training)

Competence means acquiring and using knowledge and skills to master challenges and solve tasks in familiar and unfamiliar contexts and situations. Competence entails understanding, and the capacity for reflection and critical thinking (source: Report to the Storting No. 28 (2015-2016).

Competence aims are aims defined in the curriculum for pupils' learning, which were introduced with the Knowledge Promotion Reform (Kunnskapsløftet) in 2006, and described in the Norwegian Regulations for the Education Act (section 3-1). Competence aims are formulated with the idea in mind that pupils require various competencies for their current and future education, occupation, social life and on a personal level. Competence aims can also be viewed as being part of more overarching goals for teaching, as they are described in the General Part, the 'Principles for Teaching' and 'Purpose of the Subject' sections of subject curricula (source: Norwegian Directorate for Education and Training).

Digital arena is a web-based forum that permits interaction between two or more stakeholders. Websites used for the exchange of ideas and experience, web forums, and social network services can in this context be regarded as digital arenas (source: Norwegian Centre for ICT in Education).

Digital bildung is a term closely related to the German notion of *Bildung* and tradition of self-cultivation, and as such is often used as an English translation for the Nordic concept of *digital dannelse*. Digital bildung refers to the integrated development of the individual as a whole person, maturing in a digital culture. It therefore entails actively developing a person's social, cultural, and practical competence in interaction with the digital environment, and being able to link their own digital experiences to the world around them. It also entails a personal maturity, that enables each individual to act in line with social expectations and ethical norms in a digital culture, as well as to reflect critically, and make well-considered and independent decisions (source: Norwegian Centre for ICT in Education).

Digital competence can be broadly defined as the confident, critical, and creative use of ICT to achieve goals related to work, employability, learning, leisure, inclusion and/or participation in society. Digital competence is a transversal key competence which enables the acquisition of other key competencies. It is related to many of the so-called '21st Century skills', which should be acquired by all citizens, to ensure their active participation in society and the economy (source: Ferrari, 2012).

Digital developments encompass processes of change in society, due to digitalisation and technological developments, such as access to, and dissemination of, information through social media, the digitalisation of work processes and services, and so on (source: Norwegian Centre for ICT in Education).

Digital divide refers to cultural, social and economic differences, that change or increase as a consequence of different individuals, or groups in society, having differing access to digital resources. Digital divide also refers to differences between those who take advantage of and use technology to acquire new knowledge or develop specific competencies, and those who do not have this competence (source: Norwegian Centre for ICT in Education).

Digital environment consists of digital infrastructure and technology-rich spaces, as well as web-based services and virtual forums in which we can form social relationships, communicate, collaborate, exchange information, or entertain ourselves (source: Norwegian Centre for ICT in Education).

Digital identity refers to the ways in which identity is created and perceived online. This includes unique, descriptive data, as well as personal information, and the relationships we forge with others. Our digital identity consists of representations of ourselves through account names, screen names, avatars, and display names, as well as web design, photographs and personal information linked to us and available online. In addition to this, we create and develop our own digital identity through our online activities. Friends, favourites, followers, those we follow, and what we share, like, comment on and say in digital arenas, contribute to creation of our digital identity (source: Norwegian Centre for ICT in Education).

Digitalisation means the rationalisation of work processes with the aid of digital technology. Typical examples include the digitalisation of the music industry, and the use of learning platforms for administering users and organising e-learning content in education systems (source: Norwegian Centre for ICT in Education).

Digital judgement is one of the four areas of digital skills mentioned in the Knowledge Promotion Reform (education reform from 2006 that introduced certain changes in substance, structure and organisation, from the first grade in the 10-year compulsory school system, to the last grade in upper secondary education and training). Digital judgement entails being able to use digital tools, media and resources in a responsible manner, being aware of rules for protecting privacy, and ethical use of the Internet. Digital judgement is about attitudes and actions, based on knowledge and information. The concept thus encompasses legal, technological and social aspects, to address intellectual property, privacy and interpersonal relationships in digital media (sources: Norwegian Directorate for Education and Training, 2012; Engen, Giæver & Mifsud, 2017; Dubestemmer.no, Norwegian Directorate for Education and Training).

Digital learning resources are a type of information content that was not primarily developed for use in schools, but which can facilitate learning if the teacher integrates it into teaching in a didactic and appropriate manner. Typical examples include games, music, films, radio programmes in podcast format, web-based publishing media (newspapers, magazines, and news portals), reference works with links to specific knowledge domains (web-based dictionaries, and encyclopaedias), and so on. (see also digital resources) (based on Gilje et al., 2016).

Digital media are web-based communication channels, services and platforms that are used in the dissemination of content, entertainment, information or advertising. Technological solutions, software, design processes, advert distribution, digitalisation and journalism are important elements in the development of digital media. What characterises digital media is that they are web-based, and designed to meet different needs. Typical examples include web-based traditional media such as newspapers, magazines, TV and radio, as well as new forms such as blogs, social media, e-books, internet solutions, web pages, and services for games, music or videos (source: Norwegian Centre for ICT in Education).

Digital resources are digital materials that can be used in teaching. In this framework, 'digital resources' is used as an umbrella term that encompasses digital technology, digital learning resources, and digital teaching materials (source: Norwegian Centre for ICT in Education).

Digital skills are included as one of the five basic skills in the Knowledge Promotion Reform (Kunnskapsløftet). Digital skills involve being able to use digital tools, media and resources efficiently and responsibly, to solve practical tasks, find and process information, design digital products and communicate content. Digital skills also include developing digital judgement by acquiring knowledge and good strategies for the use of the Internet. (source: Norwegian Directorate for Education and Training, 2012).

Digital teaching materials represent a combination of digital tools, services and content specifically developed for use in schools and subjects. Typical examples include: publishers' textbooks in digital format, websites associated with textbooks, animation, films, and learning games created for educational purposes. They are used in combination with various digital technologies. Another category of teaching materials is those developed by teachers themselves; for example, presentations or websites linked to academic content (see also digital resources) (based on Gilje et al., 2016).

Digital technology represents products or services that are used in the communication, transmission, broadcasting, collection, organisation, production, storage, administration and protection of information and digital content. Typical examples include: PCs, tablets, operating systems, interactive boards, learning management systems, software for programming, text and image processing, cloud services, services for secure identification, services for streaming video content or audio, and so on. (see also digital resources) (based on Redecker et al., 2017).

Learning objectives are developed by teachers based on the competence aims of the curriculum, to familiarise pupils with what the aims of the teaching are, and what is deemed important in assessments of competence. The competence aims are different and of varying complexity, and the manner in which teachers have to work with competence aims in their teaching must be adapted to where pupils are in their learning. Schools or teachers must assess when, and whether it is appropriate, to develop learning objectives, criteria and indicators (source: Norwegian Directorate for Education and Training).

APPENDIX 2

Methodology

The framework builds on a thorough analysis of national guidelines, as well as a series of international frameworks and evaluation tools for digital competence. The competencies identified and defined in this framework accord with the national guidelines for teacher education programmes, the national curriculum and the National Qualifications Framework. Therefore, digital competence is an inseparable part of the teachers' professional practice, since it is integrated into the pedagogical and administrative work that encompasses, for example, planning and carrying out teaching in a digital environment, assessing pupils with the aid of digital tools, communication and cooperation with parents and colleagues online, and so on. Teachers' professional digital competence is thereby understood as being an integral part of teachers' overall professional competence.

In January 2016, the Norwegian Centre for ICT in Education established an internal working group that worked on the development of the framework. The working group comprised of professionals with knowledge about, and broad experience in, developing similar frameworks, policy documents and research reports concerning teachers' professional digital competence, as well as expert knowledge in specific subject areas, such as digital judgement, safety and privacy, etc. The sequence below illustrates the project's phases:

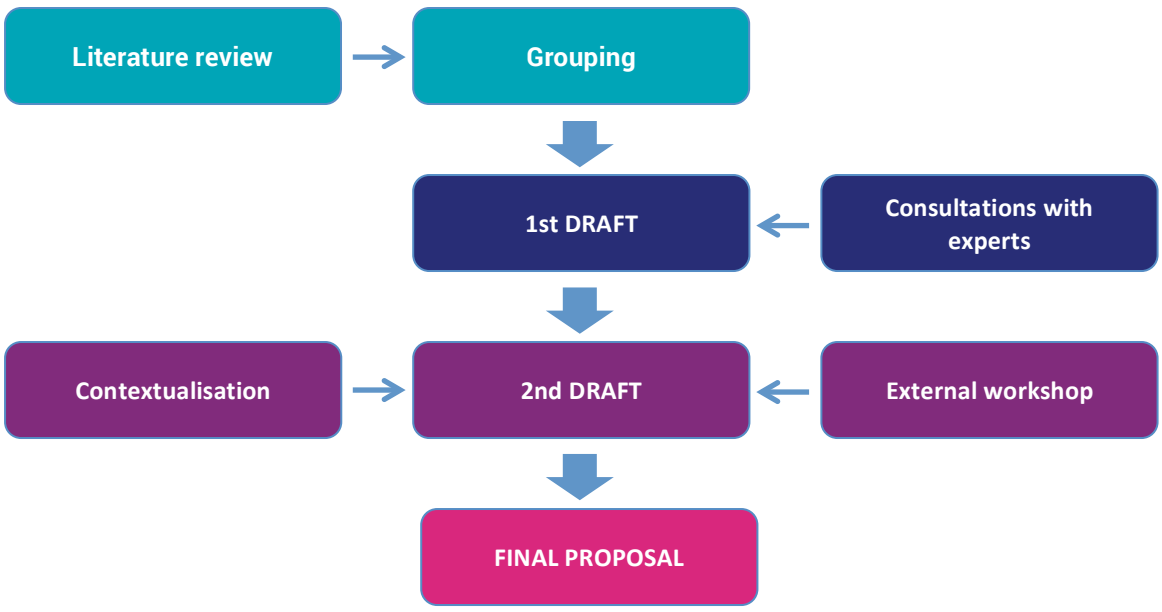

Figure 2. Phases in the development of the Professional Digital Competence Framework for Teachers.

The process started with a literature review. The literature review covered a broad spectrum of materials, such as national policy documents and digital status reports, national and international journal articles, books, and chapters of books, conference contributions and presentations, websites, wikis, and blogs about teachers' digital competence.

The most important goals for the literature review were: to develop a conceptualisation of the term 'professional digital competence', which includes definitions, models and key elements; and to develop an overview of various national and international instruments, that define and describe teachers' digital competence, or digital competence in general.

The literature review identified relevant national steering documents, and a number of national and international frameworks and evaluation tools for digital competence, with different target groups and geographical scopes. From these, forty-one frameworks, evaluation tools, and steering documents were selected for a meta-analysis. The selection criteria were: steering documents, frameworks or evaluation tools aimed at either all citizens or directly at teachers, developed by national authorities or international organisations, and nothing older than 2006. The purpose of the meta-analysis was to compile and compare these instruments, identify overlaps, or any gaps, in thematic areas, gain an insight into objectives, approaches, methodology, and implementation strategies, learn from others' experience, and extract best practice that could be adapted to a Norwegian context. The result of the meta-analysis is presented in the overview in Appendix 3 of the web-based version of the framework on iktsenteret.no.

The selection and classification of steering documents, frameworks and evaluation tools presented in the overview were based on UNESCO's definition of stakeholders on an individual or micro level, one of the three groups of stakeholders identified in the MIL Assessment Framework (UNESCO, 2013). In UNESCO's framework, the individual level/micro level includes all citizens, but with a primary focus on teachers, which UNESCO views as key stakeholders in the development of a knowledge society. The teacher, like all other citizens, develops their digital skills, but also their professional digital competence, in order to foster digitally competent pupils, who are active and responsible participants in a digitalised society. Therefore, the Professional Digital Competence Framework for Teachers should be viewed in connection with, and as an extension of, the Basic Skills Framework (Norwegian Directorate for Education and Training, 2012). It therefore does not discuss the basic digital skills that all citizens should develop in primary and lower secondary education; rather it discusses the teacher's competence to foster basic skills in their pupils.

The overview provides information about the structure, the geographical scope, the education sector, and the target group of each steering document, framework or evaluation

tool that was examined, as well as a link to the relevant framework's/evaluation tool's website. The overview also contains notes on the document's purpose, policy relevance, background, and any steering documents, frameworks or evaluation tools that were used in the development of the document.

A large number of these other national, and international, frameworks and evaluation tools were identified from two earlier synthesis reports, produced by Ferrari (2012) and McGill & Beetham (2015).

In the next phase, elements from all of the frameworks and evaluation tools were grouped in a construct that formed the basis for the first draft of the framework. The process started with listing all of the elements in all of the instruments. Elements that were similar were identified and grouped together. Some instruments contain progression levels, and these have been preserved. That means this groundwork can be used later in, for example, the development of evaluation tools for teachers' professional digital competence.

Based on the overview and grouping of elements, a first draft was developed that defined the boundaries and content of a Norwegian professional digital competence framework for teachers. The draft was circulated for internal comments and then, based on the contributions received, work started on adapting to, and placing the framework in, a national context. The contextualisation was based on national steering documents for the teaching profession, i.e. the Report to the Storting No. 11 (2008–2009) *The Teacher – the role and the education*, national regulations and the guidelines for teacher education programmes, the national curriculum for primary and secondary education, and the National Qualifications Framework. Therefore, elements from the first draft framework were reformulated in order to harmonise them with the competence aims from these national documents, and were grouped into knowledge, skills and competence.
The framework therefore consists of two dimensions:

Figure 3. Matrix for the Professional Digital Competence Framework for Teachers.

Dimension 1 represents seven competence areas in teachers' professional digital competence, and contains a general description of each area.

Dimension 2 contains competence aims subdivided into knowledge, skills and competence within each of the areas.

The second draft was circulated for consultation to all teacher education institutions in Norway, as well as relevant research and policy environments. The Norwegian Centre for ICT in Education also organised a professional workshop, in which around thirty representatives from eleven teacher education programmes[1], as well as the Nordic Institute for Studies in Innovation, Research and Education (NIFU) and ProTed, got the opportunity to provide input on the content, conceptual framework and purpose of the framework. The input from this phase was used to complete the framework.

Another important element in this phase was the development of a glossary, containing explanations of terms used in the framework. The glossary clarifies how each of the terms are used in the framework, and also helps establish a uniform conceptual framework for teachers' professional digital competence. The glossary can be found in Appendix 1.

[1] The participants were: Bergen University College (HiB), Oslo and Akershus University College of Applied Sciences (HiOA), Sogn og Fjordane University College (HiSF), the University College of Southeast Norway (HiSN), the Nord University (NORD), the Norwegian University of Science and Technology (NTNU), the University of Agder (UiA), the University of Bergen (UiB), the University of Oslo (UiO), the University of Stavanger (UiS) and the Arctic University of Norway (UiT).

Appendix 3

Meta-analysis of national and international digital competence frameworks

Overarching frameworks and evaluation tools

International frameworks and evaluation tools

TITLE	TYPE	STRUCTURE	YEAR	GEOGRAPHICAL SCOPE	EDUCATION SECTOR	DEVELOPER	TARGET GROUP
DIGITAL TRANSFORMATION: A FRAMEWORK FOR ICT LITERACY	Framework for competence testing	Five components of ICT proficiency: 1) Access; 2) Manage; 3) Integrate; 4) Evaluate; 5) Create.	2007	International	Adult education, Lifelong learning, Vocational training	International Literacy Panel of the Educational Testing Service (ETS)	Adults

Link: http://www.ets.org/Media/Tests/Information_and_Communication_Technology_Literacy/ictreport.pdf

Notes: Digital Transformation: A Framework for ICT Literacy establishes a basis for designing diagnostic tools for testing digital competence. The framework contains a broad overview of five components for mastering ICT based on previous definitions of ICT literacy. The components are not described in detail, but the report does contain a detailed explanation of the methodology used in the development of the framework, and definitions of the conceptual framework that has been used, concrete proposals for policy measures, as well as concrete examples for the development of the digital competence test.

21st CENTURY LEARNING DESIGN	Framework	Six rubrics: 1) Collaboration;	2012	International	Primary and lower	ITL Research and Partners in Learning	Pupils

	2) Knowledge construction; 3) Self-regulation; 4) Real-world problem-solving and innovation; 5) The use of ICT for learning (use ICT to learn or practise basic skills, knowledge construction, creating ICT products); 6) Skilled communication. Goal levels 1-4 (5)	secondary school; Upper secondary school	Programme

Link: http://www.itlresearch.com/itl-leap21

Notes: 21st Century Learning Design is a global, professional development programme, involving innovative pedagogical practice, that develops the skills pupils need for the 21st century. The programme is based on how Innovative Teaching and Learning (ITL) Research researches innovative teaching practices, and is globally sponsored by the Partners in Learning Programme. It consists of two guides for teachers: 21CLD Learning Activity Rubrics, which contains teaching activities, and 21CLD Student Work Rubrics, which shows what pupils produce as they complete the teaching activities. Both are based on six rubrics or dimensions that represent skills that pupils ought to develop. Both guides consist of an overview of definitions of key terms and related examples, rubrics for helping the teacher assign each learning activity a number from 1-4 or 5, depending on how well they provide opportunities to foster a given skill, or how well pupils' work demonstrates good proficiency, and a flow chart that shows how the teacher chooses the best number in each case. The guides are written at a general level, so they can be implemented in all subjects. The framework is a sort of vision for the future, i.e. what pupils should be able to do.

INTERNATIONAL COMPUTER AND INFORMATION LITERACY STUDY: ASSESSMENT FRAMEWORK	Framework for skills attainment test	Two strands: 1) Collecting and managing information; 2) Producing and exchanging information.	2013	International	Primary and lower secondary school	International Association for the Evaluation of Educational Achievement (IEA)	Pupils

Link: http://www.iea.nl/fileadmin/user_upload/Publications/Electronic_versions/ICILS_2013_Framework.pdf

Notes: The purpose of the International Computer and Information Literacy Study: Assessment Framework (ICILS Assessment Framework) was to investigate the ways in which young people, in a number of countries, develop the digital competence necessary to take part in the digital society. To achieve this goal, the study assessed pupils' performance via an authentic data-based skills attainment test. The framework's concept consists of two strands, which are further subdivided into several aspects. The aspects encompass a set of knowledge, skills and understandings of ICT and digital competence from previous definitions summarised in Ferrari (2012). The entire concept involves a fairly narrow approach to digital competence, with a focus on only two information competence areas; however the aspects are nonetheless described in quite a detailed fashion. The framework also contains an overview of the term 'digital competence', the contextual framework, and a detailed description of assessment design, in which the test design and instrument are explained, as well as concrete examples of tasks from the survey.

DIGCOMP	Framework and self-evaluation tool	Five competence areas: 1) Information; 2) Communication; 3) Content creation; 4) Safety;	2013	Europe	Broad	Joint Research Centre–European Commission (JRC–EC)	Adults

	5) Problem solving. Three proficiency levels: A-Foundation; B-Intermediate; C-Advanced.
Link:	http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=6359
Notes:	The full title of the report is DIGICOMP: A Framework for Developing and Understanding Digital Competence in Europe. It presents a detailed framework for the development of digital competence for all European citizens, and is intended to be used in policy development. The framework has several dimensions – Dimension 1: five competence areas; Dimension 2: between three and six competencies relevant to each area; Dimension 3: three skill levels set for each competence; Dimension 4: examples of knowledge, skills and attitudes that apply to each competence (the examples are not differentiated between by skill level); and Dimension 5: examples of the use of the competence for different purposes. The report also contains a self-evaluation tool for surveying levels of digital competence. What is missing are basic operative skills when it comes to using digital tools, but their argument is that these are integrated into all competence areas. The framework is based on: Digital Competence: Identification and European-wide validation of its key components for all levels of learners (DIGCOMP); Ferrari, Anusca (2012) Digital Competence in Practice: An Analysis of Frameworks, JRC Technical Report for the European Commission Report EUR 25351EN; Digital Agenda for Europe; eCompetence Framework for ICT Professionals (eCF); Common European Framework of Reference for Languages (CEFR) and European Qualification Framework (EQF) Based on DigComp, EK DigCompTeach developed a project dedicated to developing open digital learning resources in the form of an MOOC for training teachers in digital competence, and assessing their knowledge at the end of the course. In the pilot phase, teachers receive training in DigComp's five competence areas (information, communication, content production, online safety and problem solving) that are represented as five modules. The modules provide training in how teachers can integrate more general digital

	competence into pedagogical and subject didactic digital competencies.						
GLOBAL MEDIA AND INFORMATION LITERACY ASSESSMENT FRAMEWORK	Framework Self-evaluation tool	Three components: 1) Access; 2) Evaluation; 3) Creation. Three levels: 1) Basic level; 2) Intermediate level; 3) Advanced level.	2013	International	Broad	United Nations Educational, Scientific and Cultural Organization (UNESCO)	The State; All citizens (Teachers; Teacher education institutions)

Link: http://unesdoc.unesco.org/images/0022/002246/224655e.pdf

Notes: The Media and Information Literacy framework collates information literacy, media literacy, information and communication technology (ICT) and digital literacy into a new literacy construct. The framework helps to foster critical thinking and problem solving, as well as increase collaboration and participation. It is defined as a set of competencies in which citizens can access, retrieve, understand, evaluate, use, create and share information and media content in all formats, with the aid of various tools in a critical, ethical and efficient way, in order to participate and get involved in personal, professional and social activities. The framework takes a two-tiered approach: the first tier is country readiness – which provides information about a country's degree of media and information literacy; the second tier is competence aimed at all citizens, but especially practising teachers and student teachers. Most relevant for our framework is Technical Annex E-MIL Competency Matrix (Tier Two) in which concrete competencies are described, and can be used by teachers for self-evaluation. Pedagogical and subject didactic competencies are not particularly apparent in the framework.

EUROPEAN e-COMPETENCE FRAMEWORK 3.0	Framework	Five e-Competence areas: 1) Plan; 2) Build; 3) Run; 4) Enable; 5) Manage. Five proficiency levels: e-1 – e-5	2014	Europe	Broad	European Committee for Standardisation (CEN)	Adults

Link: http://www.ecompetences.eu

Notes: The European e-Competence Framework was developed through collaboration between experts and stakeholders from different countries at the CEN Workshop on ICT Skills. The framework forms part of the EU's Strategy for e-Skills in the 21st Century, which is supported by the European Commission and the Council of the European Union. This provides a common language for describing a total of forty competencies in the five competence areas, including skills and knowledge for ICT professionals, occupations and organisations at five skill levels, and is designed to meet the needs of enterprises and other organisations in the public and private sectors. The framework does not cover teachers' ICT competence, but can, to some extent, be compared with 'ICT trainer', which covers two competencies: Education and Training Provision and Personnel Development.

EUROPASS DIGITAL COMPETENCE	Self-evaluation form	Five digital competences: 1) Information processing; 2) Communication; 3) Content creation; 4) Safety; 5) Problem solving.	2015	Europe	Broad	European Centre for the Development of Vocational Training	Adults

		Three types of users: 1) Basic user; 2) Independent user; 3) Proficient user.					

Link: https://europass.cedefop.europa.eu/sites/default/files/dc-en.pdf

Notes: The European Skills Passport (Europass) is a digital portfolio, consisting of documents containing information about someone's skills and competencies. Its purpose is to help European citizens effectively convey their skills and qualifications when looking for a job or training, help employers understand their employees' skills and qualifications, and help education and training authorities define and convey curriculum content. Digital competence is a self-evaluation form that is included in Europass. The self-evaluation form employs fairly general language in its descriptions of mastery levels, and contains no examples that concretise competencies.

ISTE STANDARDS FOR STUDENTS	Framework and self-evaluation form	Seven standards: 1) Empowered Learner; 2) Digital citizen; 3) Knowledge Constructor; 4) Innovative Designer;	2016	International	Primary and lower secondary school; Upper secondary school	International Society for Technology in Education (ISTE)	Pupils

	5) Computational thinker; 6) Creative communicator; 7) Global Collaborator.

Link: http://www.iste.org/docs/Standards-Resources/iste-standards_students-2016_one-sheet_final.pdf?sfvrsn=0.23432948779836327

Notes: ISTE's standards for pupils define skills pupils need to develop, to function in a digital society. The standards were designed to be used by teachers across subjects, and both pupils and teachers are responsible for acquiring the basic technological skills necessary to practise these standards. The framework consists of seven standards that contain indicators of goal attainment in the form of concrete skills. These are a combination of technological and pedagogical knowledge and skills that the teacher uses to teach in the subject. The framework is short and general, but nonetheless comprehensive and clear; there is no progression beyond the levels. It is based on the USA's National Educational Technology Standards (NETS), which have been in use since 2000, as well as older ISTE frameworks for pupils from 1998, which employed a 'learning to use technology' approach, and 2007, which employed a 'using technology to learn' approach. The most recent, from 2016, is described as 'transformative learning with technology'. The framework also contains a glossary, in which the terms used are explained, and practical examples are provided. There is also a report, Redefining Llearning in a Technology-driven World, from 2016, which contains a self-evaluation form that teachers can use to evaluate pupils' competence.

Norwegian steering documents, frameworks and evaluation tools

TITLE	TYPE	STRUCTURE	YEAR	GEOGRAPHICAL	EDUCATION SECTOR	DEVELOPER	TARGET GROUP

				SCOPE			
CURRICULA	Steering document	Competence aims by year	2006	Norway	Primary and lower secondary school; Upper secondary school	Norwegian Directorate for Education and Training; Norwegian Ministry of Education and Research	Pupils

Link: http://www.udir.no/laring-og-trivsel/finn-lareplan/

Notes: Curricula contain: their purpose, main areas/structure, competence aims by year, basic skills, and provisions for final assessments. Most of the curricula from 2006 were revised in 2013, or later. Each curriculum for a subject describes how the basic skills (including digital skills) are prerequisites for developing subject competence. The skills are integrated into the competence aims in order to ensure the pupils' basic skills continuously develop during their entire thirteen years of primary and lower secondary education. However, it should be mentioned that they may look different and be expressed differently in different curricula for subjects, and this is especially true in the case of digital skills. Formulations such as 'use of digital tools', 'digital forms of expression', 'digital media', 'digital forms of communication', and 'digital contexts' are used in the competence aims in different subjects.

BASIC SKILLS FRAMEWORK	Framework	Four skill areas in digital skills: 1) Acquire and consider; 2) Produce and process; 3) Communicate; 4) Digital judgement. Five progression levels: 1-5	2012	Norway	Primary and lower secondary school; Upper secondary school	Norwegian Directorate for Education and Training; Norwegian Ministry of Education and Research	Pupils

Link: http://www.udir.no/Lareplaner/Forsok-og-pagaende-arbeid/Lareplangrupper/Rammeverk-for-grunnleggende-ferdigheter/

Notes: The purpose of the Basic Skills Framework is to define five basic skills, and describe the progression in each of them at five levels. The framework is intended to be an essential document when revising curricula for schools. Digital skills are included as one of the five basic skills that pupils ought to acquire across subjects. Digital judgement is both an independent interdisciplinary skill area, and is also included in the other three digital skill areas. The framework is missing skill areas, such as problem solving and cooperation, which are found in other national and international frameworks.

LEARNING OUTCOMES IN	Framework and	Three areas:	2013	Norway	Adult education	Skills Norway; Norwegian	Adults; Pupils in

DIGITAL SKILLS	self-evaluation tool, test	1) Use of ICT systems; 2) Locating and exchanging digital information; 3) Production and presentation of digital information. Three levels: Levels 1/2; Level 3; Level 4.	Ministry of Education and Research	secondary school

Link: http://www.vox.no/contentassets/1b6e2c7cb20e4609997b1f28f6f7df39/laringsmal-som-pdf/laringsmal_digitale_ferdigheter.pdf

Notes: The learning outcomes are examples of local curricula for basic skills for adults. They are based on the curricula in the Knowledge Promotion Reform (Kunnskapsløftet) and the Norwegian Directorate for Education and Training's Basic Skills Framework. Examples of local curricula for digital skills, as basic skills, have been developed with a view to adult education, but may also be suitable for some pupils at lower or upper secondary school levels. The learning outcomes in digital skills are divided into three areas, and three levels, based on the Basic Skills Framework. The levels describe progression in using digital skills, as tools for various situations. A series of resources are linked to the framework: the guidance on learning outcomes in basic skills for adults shows how, based on the learning outcomes, one can plan and facilitate training in basic skills (including digital skills) for adults. The guidance consists of concrete teaching plans for each level. The digital test analyses strengths and weaknesses in the user's digital skills. Course arrangers can use these to map training needs. The testing takes place online, and can be taken individually, or in groups. The IT Barometer is a self-evaluation tool, for those wondering how good their computer skills are. Course arrangers can use it to indicate training needs and levels. There are also teaching materials that consist of web-based courses, games and quizzes, as well as methods and examples for use in practice. Since the framework is based on the Basic Skills Framework, it is missing areas, such as problem solving and cooperation. Digital judgement is not a separate area, rather it is integrated into the other three areas in the form of source evaluation, privacy, safety and intellectual property rights.

Other national frameworks and evaluation tools

TITLE	TYPE	STRUCTURE	YEAR	GEOGRAPHICAL SCOPE	EDUCATION SECTOR	DEVELOPER	TARGET GROUP
ICT FRAMEWORK: A STRUCTURED APPROACH TO ICT IN CURRICULUM AND ASSESSMENT	Framework	Four areas (objectives): 1) Creating, communicating and collaborating; 2) Developing foundational knowledge, skills and concepts; 3) Thinking critically and creatively; 4) Understanding the social and personal impact of ICT. Three levels of achievement (learning opportunities) Levels 1-3	2007	Ireland	Primary and lower secondary school; Upper secondary school	National Council for Curriculum and Assessment (NCCA)	Pupils

Link: http://www.ncca.ie/uploadedfiles/publications/ict revised framework.pdf

Notes: ICT Framework: A structured approach to ICT in Curriculum and Assessment from 2007 is an updated version of an earlier framework from 2004. The framework is based on an initiative for developing schools (SBDI), and contains four areas, with fifteen concrete descriptors, subdivided into three levels, that function as guides for teachers on integrating ICT into teaching and assessments across subjects. 'Learning opportunities' contains concrete examples of descriptions of mastery levels that are not as relevant as they were in 2007, but do provide a better understanding of skills.

THE SCONUL	Framework	7 pillars:	2011	UK	Higher education	The Society of College,	Students;

SEVEN PILLARS OF INFORMATION LITERACY		1) Identify; 2) Scope; 3) Plan; 4) Gather; 5) Evaluate; 6) Manage; 7) Present.				National and University Libraries (SCONUL)	Teachers; Librarians

Link: http://www.sconul.ac.uk/sites/default/files/documents/coremodel.pdf

Notes: SCONUL Seven Pillars of Information Literacy defines core skills and competencies (abilities), and attitudes and conduct (understanding), in the development of information competence in higher education in general, and not necessarily associated only with information in digital format. It is a circular model, showing that information competency is not a linear process; a person can develop within multiple columns at the same time, independently of each other, although in practice these are often closely linked. The model is based on 'Information skills in higher education: a SCONUL position paper' published by the SCONUL Working Group on Information Literacy in 1999. There are no progression levels in the model, and it can be read through different lenses, representing different target groups. The model was used in the development of JISC's Developing Digital Literacy programme, for mapping institutions of higher education's resources for developing digital competence (Mapping Resources to Competencies: a quick guide to the JISC Developing Digital Literacies Resources). The model is narrow, and focuses solely on information processing. It does not cover other areas of information competence as part of digital competence, such as digital production.

digi.komp	Framework	Four areas:	2013	Austria	Primary and lower	Federal Ministry of	Pupils

		1)Information technology, people and society; 2) IT systems; 3) Applied computer science; 4) Conceptual work.			secondary school; Upper secondary school	Education; Onlinecampus Virtuelle PH;	

Link: http://digikomp.at/praxis/portale/digitale-kompetenzen/die-initiative/digikomp-unverzichtbar.html

Notes: digi.komp (Digitale Kompetenzen Informatische Bildung) is an initiative that aims to help foster pupils' digital competence, and is incorporated into curricula, teaching principles, and education programmes at a national level. The digi.komp initiative include a number of frameworks for pupils at different levels, as well as a framework for teachers' digital competence. Each framework comes with examples of skills development courses and self-evaluation tools. Together, the different frameworks represent progression levels on level 4, level 8, level 9 and level 12.

TECHNOLOGIES	Framework	Six organisers:	2014	Scotland	Kindergarten; Primary	Education Scotland	Pupils

PROGRESSION FRAMEWORK	1) Technological developments; 2) ICT; 3) Business; 4) Computing science; 5) Food and textiles; 6) Craft, design, engineering and graphics. Five levels: 1) Early level; 2) First level; 3) Second level; 4) Third level; 5) Fourth level.	and lower secondary school; Upper secondary school

Link: http://www.educationscotland.gov.uk/learningandteaching/assessment/progressandachievement/significantaspectsoflearning/curriculum/technologies/progress.asp

Notes: The Technologies Progression Framework is based on the paper, Technologies Principles and Practice. It describes a number of areas that overlap with the Norwegian Basis Skills Framework. There are also other areas, such as food production, technology in industry, and materials and production. The framework spans many fields, not just ICT, but in all other types of technology. The areas are not defined in themselves, rather they are described through progression levels. The framework is also constructed around three important aspects of learning: 1. locating, discussing and organising information about technology; 2. understanding how technological products function and how they affect people; and 3. the planning and organisation of technological activities.

DEVELOPING DIGITAL LITERACIES	Framework and self-evaluation tool	Seven elements: 1) Media literacy; 2) Communication and collaboration; 3) Career & identity management; 4) ICT literacy; 5) Learning skills; 6) Digital Learning; 7) Information literacy.	2014	UK	Higher education	Joint Information Systems Committee (JISC)	Students

Link: https://www.jisc.ac.uk/guides/developing-digital-literacies

Notes: The JISC: Developing Digital Literacies framework looks beyond IT skills to describe a set of digital behaviours, practices and identities in a specific organisational context, such as a university, university college, department, subject area, professional environment, and so on. The framework is based on Beetham & Sharpe's (2010) framework, which describes digital literacy as a development process from access and functional skills, to higher levels with capabilities and identity. The JISC Developing Digital Literacies Programme offers resources for

		developing perspectives for institutions (vision and leadership, strategy and policy, support and development, digital environment, and culture and change) and resources for developing digital competencies in practice (changing curricula and resources for students, staff and researchers). Its website also contains an overview of other organisations' frameworks. The JISC Developing Digital Literacies framework has been implemented in a number of universities and university colleges in the UK, in the form of individual adaptations developed by the institutions themselves. Resources for students are based on research into practical challenges and conceptual problems associated with the use of technology in studies, as well as the students' development of their academic and scientific identity. The resources package includes a number of self-evaluation tools for students, that were developed either as part of the programme, or externally. The framework was updated in 2015, and contains six elements, as well as teachers and researchers, as new target groups in higher education.					
DESIGN PRINCIPLES FOR THE ESSENTIAL DIGITAL LITERACY SKILLS QUALIFICATION	Framework and skills attainment test	Six skill units: 1) Digital Responsibility; 2) Digital Productivity; 3) Digital Information Literacy; 4) Digital Collaboration; 5) Digital Creativity; 6) Digital Learning. Three levels: 1) Entry level 1; 2) Entry level 2; 3) Entry level 3.	2015	Wales	Primary and lower secondary school; Upper secondary school	Welsh Government, Dept for Education and Skills, Qualifications and Regulation Division	Pupils

Link: http://dera.ioe.ac.uk/22223/1/150205-design-principles-for-the-essential-digital-literacy-skills-qualification-en.pdf

Notes: The Digital Literacy Skills Qualification is part of the Essential Skills Wales qualifications, which also include Communication, Application of Number and Employability Skills. Essential Skills Wales was first established in 2010, and introduced Communication, Application of Number and Information, and Communication Technology (ICT) skills. The purpose of the framework is to help pupils develop and demonstrate the digital skills they will need in further education and work. The Digital Literacy Skills Qualification is based on ICT qualifications developed by Agored Cymru, a Welsh registered charity and social enterprise for education and training. The framework defines six 'skill units' and contains a number of interdisciplinary competence aims for each unit. There is also a skills attainment test, which consists of a controlled task, which tests the application of skills, and a structured discussion, which tests knowledge and requires pupils to reflect on and evaluate their own learning. The skills attainment test has three levels, and all of the six units are described in all three levels, both for controlled tasks and for structured discussions. The structured discussion provides a general approach for assessing knowledge and understanding, and is useful in determining not just what a candidate can do and how they perform, but also their analytical abilities.

Frameworks and evaluation tools for teachers

International frameworks and evaluation tools for teachers

TITLE	TYPE	STRUCTURE	YEAR	GEOGRAPHICAL SCOPE	EDUCATION SECTOR	DEVELOPER	TARGET GROUP
TPACK MODEL	Framework	Three primary forms of knowledge: 1) Content (CK); 2) Pedagogy (PK); 3) Technology (TK).	2006	International	Teacher education; Continuing teacher education	No ownership	Teachers

Link: http://www.tpack.org

Notes: Its full title is the Technological Pedagogical Content Knowledge (TPACK) model. The framework is based on three primary forms of knowledge: content, pedagogy and technology. These are used to establish four new knowledge bases that teachers need to teach using technology: pedagogical content knowledge (PCK), technological content knowledge (TCK), technological pedagogical knowledge (TPK), and the intersection of all three circles, technological pedagogical content knowledge (TPACK). The framework does not contain progression beyond two or more levels. It expands on Shulman's notion of pedagogical content knowledge (1986), but no one has ownership of it (a seminal description of TPACK can be found in Mishra & Koehler, 2006). The lack of clear definitions for the various concepts for the TPACK framework, and the difficulty in separating the different domains of the model, has been highlighted in previous research (Angeli & Valanides, 2009; Archambault & Barnett, 2010).

THE eLEARNING COMPETENCY FRAMEWORK FOR TEACHERS AND TRAINERS	Framework and self-evaluation form	Ten competence areas: 1) Preparing the learning event; 2) Running the learning event; 3) Supporting learners; 4) Assessing learner progress; 5) Promoting accessibility for learners; 6) Evaluating learning programmes; 7) Managing the learning environment; 8) Contributing to the learning organisation; 9) Managing own professional development;	2008	International	Continuing teacher education	European Institute for E-Learning (EIfEL)	Teachers

		10) Communicating. Six proficiency levels: 1-6						

Link: http://www.eife-l.org/publications/competencies

Notes: The eLearning Competency Framework for Teachers and Trainers is aimed at teachers and others who work as trainers or lead learning programmes, such as supervisors, mentors, librarians, and so on. The extended version of the framework presents ten e-learning competencies based on knowledge, skills and attitudes associated with ICT in teaching. The descriptions of these competencies are split into two branches: they contain general/generic knowledge needs that are key in all core competence areas, plus extra knowledge needs that are peculiar to the individual areas, and performance criteria that specify expected results for the completed activity (i.e. they provide a detailed description of the performance criteria required to enable evaluation). The framework does not contain mastery levels, instead it provides an implementation guide and self-evaluation form. It takes a clear pedagogical approach to ICT in teaching at a general and overarching level.

ISTE STANDARDS FOR TEACHERS	Framework	Five standards and performance indicators: 1) Facilitate and inspire student learning and creativity; 2) Design and develop digital age learning experiences and assessment; 3) Model digital age work and learning; 4) Promote and model digital	2008	USA International	Continuing teacher education	International Society for Technology in Education (ISTE)	Teachers

		citizenship and responsibility; 5) Engage in professional growth and leadership.					

Link: http://www.iste.org/standards/ISTE-standards/standards-for-teachers

Notes: ISTE's Standards for Teachers is part of an overall focus on ICT in education, through the development of frameworks for pupils, teachers, administrations and ICT teachers. ISTE's Standards for Teachers was first launched in 2008, and defines skills and pedagogical insights that teachers require to teach, work and learn in a digital environment. The framework consists of five standards that contain indicators for goal attainment – these are a combination of technological and pedagogical knowledge and skills that teachers use to teach in a subject. The framework focuses heavily on pedagogy where teaching with technology is oriented towards fostering pupils' higher order thinking skills, such as creativity, pedagogy and cooperation. The framework is short and general; there is no progression beyond the levels. The framework is based on the USA's National Educational Technology Standards (NETS), which have been in use since 2000. Standards for Teachers was revised in 2017, ISTE Standards for Teachers Second Draft, and there is also an implementation guide.

ICT COMPETENCY STANDARDS FOR TEACHERS	Framework	Six aspects of teachers' work: 1) Policy; 2) Curriculum and assessment; 3) Pedagogy; 4) ICT; 5) Organization and administration;	2010	Africa	Teacher education; Continuing teacher education	GESCI	Student teachers; Teachers

		6) Professional development. Four successive stages of teachers' development: 1) Emergent; 2) Technology literacy; 3) Knowledge Deepening; 4) Knowledge Creation.					

Link: http://gescio.gesci.org/assets/files/Knowledge%20Centre/ICTCompStandards.pdf

Notes: ICT Competency Standards for Teachers is a matrix for teachers' professional development, aimed at African countries. The standards are based on the UNESCO ICT Framework for Teachers v.1.0 from 2008, and incorporate aspects of the teacher's profession, as well as levels from this framework. Some differences are apparent at a detailed level. The purpose of the matrix is to guide countries' development of national policies for teachers' continuing professional development. The framework also developed GESCI, an implementation tool, Planning Toolkit for ICT in Teacher Professional Development.

eTQF TEACHER ICT	Framework and self-evaluation tool	Four options: 1) ICT;	2010	Europe	Continuing teacher education	Project funded by the EU Lifelong Learning	Teachers; School

COMPETENCY FRAMEWORK		2) Pedagogy; 3) Curriculum and assessment; 4) Professional development. Four competency levels: 1) Introductory; 2) Basic; 3) Complex; 4) Pervasive.				Programme	owners; Heads of department

Link: http://etqfproject.ning.com/page/etqf-framework-1

Notes: eTQF Teacher ICT Competency Framework is a tool for teachers at all levels, schools, principals, education managers and education authorities, that supports the development of teachers' competence in the use of ICT in education. This programme was developed to give teachers an opportunity to measure their own ICT competence, learn about areas where they require further training or knowledge and, thereafter, share their skills and learn from their colleagues with the aid of the internet. The framework describes competencies within four areas, and shows progression over four levels. The lower levels focus on teachers' own digital competence, while the higher levels integrate this competence into the teaching, and are aimed at fostering pupils' digital competence. Cross competencies such as digital judgement, cooperation, and problem solving are described in all areas, usually on the third and fourth levels of mastery.

UNESCO ICT COMPETENCY FRAMEWORK	Framework	Six aspects of teachers' work: 1) Understanding ICT in education;	2011	International	Teacher education; Continuing	United Nations Educational, Scientific and Cultural	Student teachers; Teachers

FOR TEACHERS 2.0		2) Curriculum and assessment; 3) Pedagogy; 4) ICT; 5) Organization and administration; 6) Teacher professional learning. Three successive stages of teachers' development: 1) Technology Literacy; 2) Knowledge Deepening; 3) Knowledge Creation.			teacher education	Organization (UNESCO)	

Link: http://unesdoc.unesco.org/images/0021/002134/213475e.pdf

Notes: The purpose of the ICT Competency Framework for Teachers is to help countries develop comprehensive national standards and policies for the development of ICT competence for teachers. The framework should be regarded as an important part of an overall 'master plan' for ICT in education. The current version of the framework is an update of the original version published in 2008, and is a result of collaboration between UNESCO and Cisco, Intel, ISTE and Microsoft. The framework underscores that it is not enough for teachers to possess ICT competence and be capable of teaching this to their students. Teachers must also be capable of helping pupils develop competencies such as cooperation, problem solving and creativity through the use of ICT, such that they become active citizens and members of the labour force. It is based on three different approaches to teaching (three subsequent stages of a teacher's development). The first is Technology Literacy: enabling pupils to use ICT to learn more effectively. The second is Knowledge Deepening: enabling pupils to acquire in-depth knowledge about their school subjects and apply this to complex, real problems. The third is Knowledge Creation: enabling pupils to create new knowledge that is required in today's society. The framework contains syllabus examples and examination specifications. In 2013, UNESCO launched Guidelines for adaptation of the UNESCO ICT Competency framework for teachers. The current version of the framework is under revision.

MEDIA AND	Framework;	Six key teacher competencies:	2011	Intern	Teacher	United Nations	Teachers;

INFORMATION LITERACY CURRICULUM FOR TEACHERS	Modules	1) Understanding the Role of Media and Information in Democracy; 2) Understanding Media Content and Its Uses; 3) Accessing Information Effectively and Efficiently; 4) Critically Evaluating Information and Information Sources; 5) Applying New and Traditional Media Formats; 6) Situating the Sociocultural Context of Media Content; 7) Promoting MIL Among Students and Managing Required Changes.	ationa l	education; Continuing teacher education	Educational, Scientific and Cultural Organization (UNESCO)	Teacher education institutions

Link: http://unesdoc.unesco.org/images/0019/001929/192971e.pdf

Notes: The Media and Information Literacy Curriculum for Teachers combines media and information competence in a single concept. The purpose of the framework is to help teachers investigate and understand how media content and information are produced, how information can be evaluated, and how it can be used for different purposes, locally or globally. Teachers should be able to produce new content and share it via different media, as well as develop an ability to assess how pupils interpret media and information from a number of sources, and teach them to create their own content, that they can share with others. The framework contains six 'curriculum areas' (Policy and Vision; Curriculum and Assessment; Pedagogy; Media and Information; Organisation and Administration; and Teacher Professional Development), as well as three 'interrelated thematic areas' (Knowledge of Media and Information for Democratic Discourse; Evaluation of Media and Information; and Production and Use of Media and Information). These reflect seven key competencies for teachers. Each competency is linked to the modules, and contains a brief definition and a number of descriptors for teachers. The modules (fourteen in total) provide an overview of content and activities, that highlight specific knowledge and skills that teachers should acquire, and which teacher educators and teacher education institutions can adapt to their local needs. The framework is based on a number of pedagogical approaches for competence development (Issue-enquiry Approach; Problem-based Learning; Scientific Enquiry; Case Study; Cooperative Learning; Textual Analysis; Contextual Analysis; Translations; Simulations; and Production). The framework also contains an overview of UNESCO's resources in relation to media, information competence, or ICT competence. The Media and Information Literacy Curriculum for Teachers does not contain progression levels, and the

	competencies described apply to both student teachers and practising teachers. The entire framework is characterised by democracy, democratic citizenship, and participation. The framework also includes a glossary that explains the concepts used in the framework.						
ICT-ENHANCED TEACHER STANDARDS FOR AFRICA	Framework	Six standards: 1) Engage in Instructional Design Processes; 2) Facilitate and Inspire Student Learning, Innovation and Creativity; 3) Create and Manage Effective Learning Environments; 4) Engage in Assessment and Communication of Student Learning; 5) Engage in Professional Development and Model Ethical Responsibilities; 6) Understand Subject Matter for Use in Teaching. Three successive stages of teachers' development: 1) Emerging; 2) Applying; 3) Infusing; 4) Transforming.	2012	Africa	Teacher education; Continuing teacher education	UNESCO International Institute for Capacity Building in Africa	Student teachers; Teachers

Link: http://unesdoc.unesco.org/images/0021/002161/216105e.pdf

Notes: The development of ICT-Enhanced Teacher Standards for Africa was initiated by the UNESCO International Institute for Capacity Building in Africa in 2009, as part of the strategy for developing teacher education in Africa. The work involved eighteen countries, and a bottom-up approach, in which ICT standards are integrated into general standards for the teaching profession. The purpose of the framework is to guide the development of quality in teacher education and continuing teacher education.

ECDL MODULE ICT IN EDUCATION	Skills attainment tests	Four categories: 1) Key Concepts; 2) Planning; 3) Selecting ICT Resources; 4) Managing the Learning Environment.	2016	International	Continuing teacher education	European Computer Driving Licence Foundation (ECDL Foundation)	Teachers

Link: http://www.ecdl.org/programmes/media/ECDLICTinEducation_Syllabus1.01.pdf

Notes: The ESCL module ICT in Education was developed by a non-profit social enterprise, the ECDL Foundation, which was founded via the Council of European Professional Informatics Societies (CEPIS), and recommended by the European Commission High Level Group, ESDIS, as a European certification scheme. The module is currently being piloted in a limited number of countries. It describes knowledge and skills associated with the effective pedagogical use of ICT for supporting and improving teaching, learning, and assessments in the classroom. The module is based on input from ECDL/ICDL's national operators and the European Schoolnet. At the moment (2016), the module is also being piloted in Trinity College Dublin, with a group of teachers, in order to validate the programme. The module contains four categories that are further subdivided into skill sets: Benefits; Pedagogy and ICT; Lesson Planning Considerations; Safety; Security and Well-Being; ICT Resources for Teaching and Learning; ICT Resources for Assessment; Sourcing, Evaluating ICT Resources; Classroom Technologies; and Learning Platforms. Each skill set contains a number of items or concrete descriptors. The module is rooted in pedagogy, while general digital competence is integrated across categories in the descriptors.

MENTEP – MENTORING TECHNOLOGY ENHANCED PEDAGOGY	Self-evaluation tool	Four areas: 1) Digital Pedagogy; 2) Digital Content Use and Production; 3) Digital Communication and Collaboration; 4) Digital Citizenship. Five proficiency levels: 1) Newcomer; 2) Beginning; 3) Capable; 4) Proficient; 5) Expert.	2015-2018	Europe	Continuing teacher education	European Computer Driving Licence Foundation (ECDL Foundation)	Teachers

Link: http://mentep.eun.org

Notes: The MENTEP project is funded by the European Commission via the Erasmus+ programme, and is coordinated by the European Schoolnet. The purpose of the project is to: develop self-evaluation tools to strengthen teachers' competence and confidence in using ICT in the classroom; increase the number of teachers capable of creating something new with the aid of ICT; strengthen the use of ICT in teaching and learning; strengthen the teaching profession's professional profile; obtain better data about teachers' digital competence and training requirements; and promote a stronger correlation between the EU and national approaches to the assessment of competence in technology-supported teaching.

Norwegian steering documents, frameworks and evaluation tools for teachers

TITLE	TYPE	STRUCTURE	YEAR	GEOGRAPHICAL SCOPE	EDUCATION SECTOR	DEVELOPER	TARGET GROUP
NATIONAL GUIDELINES FOR TEACHER EDUCATION	Steering document	Three types of learning outcome: 1) Knowledge; 2) Skills; 3) General competence.	2010	Norway	Teacher education: GLU 1st-7th level; GLU 5th-10th level; LU 8th-13th level; Sami GLU; PPU; Three-year FLU in PEF; Three-year YFLU.	Norwegian Ministry of Education and Research	Student teachers; Teacher educators

Link: http://www.uhr.no/index.php?objectId=15595&method=view

Notes: The regulations relating to the framework plan for teacher education programmes provide the basis for all national guidelines. The guidelines are intended to provide guidance for the institutions' programme descriptions, and ensure nationally coordinated teacher education that

		satisfies the quality requirements for teacher education programmes. The guidelines for each subject contain descriptions of the expected learning outcome, which describe what the candidates should know, and be able to do, upon completion of the subject. The learning outcomes were formulated on the basis of the overarching descriptions in the National Qualifications Framework, which describe the knowledge, skills and general competence a candidate should have at different stages of the education pathway. Each individual subject has a responsibility to ensure that the candidates learn how they can work on the pupils' development of the subject's basic skills. GLU 1-10: digital skills are not mentioned as one of the skills that are of fundamental importance for learning in general. The formulation used in the descriptors in some subjects is "use of digital tools", without specification of what this means in the context of the subject (e.g. knowledge: "have knowledge about the use of digital tools"; skills: "can use various digital tools"). LU 8-13: basic skills, including digital skills, are not mentioned. Just one of the descriptors for the Professions subject uses a formulation including 'technological aids'. Sami GLU: digital skills are not mentioned as one of the skills that are of fundamental importance for learning in general, but "being able to use digital tools" is both a prerequisite for developing professional knowledge and part of subject competence in all subjects. Digital skills are not found in the descriptors. PPU: basic skills, including digital skills, are not mentioned. Just one of the descriptors linked to development and change competence uses a formulation including 'technological aids'. Three-year FLU in PEF: some descriptors use formulations that describe the "use of digital tools" as one of the basic skills (skill in the Professions subject), "use digital media" (skill in Design, Arts and Crafts), and "use digital learning arenas" (general competence in Design, Arts and Crafts). Three-year YFLU: being able to use digital tools, together with other basic skills, is a prerequisite for the development of professional knowledge, and part of the professional competence of vocational teachers. It should be mentioned that digital learning methods play an important role in the organisation of three-year vocational teacher education, even though the formulation "technological skills", associated with development and change competence, is the only skill found in the descriptors.					
TEACHER-MENTOR	Self-evaluation tool	Four areas: 1) Pedagogy and ICT; 2) Digital production; 3) Digital communication; 4) Digital judgement. Five progression levels: 1) Become acquainted; 2) Put to use; 3) Integration; 4) Reorientation; 5) Development.	2012	Norway	Continuing teacher education	Norwegian Centre for ICT in Education	Teachers

Notes: Teacher-Mentor is aimed at teachers in all types of schools. In their work with the service, individual teachers should reflect on their own competence, become aware of their own position, and receive suggestions concerning relevant skills development measures. The areas that have been chosen are based on the Basic Skills Framework (Norwegian Directorate for Education and Training, 2012). Some modifications have been made to make space for a separate area concerning pedagogy and ICT. Each area contains descriptions or claims, organised into five levels. Level 1 is the lowest level; level 5 is the highest. The levels are based on Hooper & Rieber's (1995) competence development model. Digital judgement is both an independent interdisciplinary area, and is also included in the other three digital areas. Areas such as problem solving and cooperation are not mentioned. Teacher-Mentor was wound up in 2016.

Other national frameworks and evaluation tools for teachers

TITLE	TYPE	STRUCTURE	YEAR	GEOGRAPHICAL SCOPE	EDUCATION SECTOR	DEVELOPER	TARGET GROUP
NATIONAL ICT COMPETENCY STANDARD	Framework	Four domains: A) Technology operations and concepts;	2006	Philippines	Continuing teacher education	Commission on Information and Communications	Teachers

(NICS) FOR TEACHERS		B) Social and Ethical; C) Pedagogical; D) Professional.				Technology	

Link: http://www.ncc.gov.ph/nics/files/NICS-Teachers.pdf

Notes: The National Competency Standard (NICS) for Teachers defines the competencies, knowledge and skills that teachers are required to have for their job. The framework's references include ISTE NETS·S and the IFIP Curriculum – Professional Development of Teachers. The framework consists of four competence domains. Each of the competence domains is comprised of four elements: names of standards; descriptions of standards; descriptions of performances in individual standards; and indicators that define- skills and knowledge have been attained. The first domain focuses on technology operations and concepts, that cover competence associated with these. The second domain focuses on competence associated with social, ethical and legal considerations and society. The third (pedagogical) domain contains competencies associated with the use of technology in teaching processes (planning and designing good learning environments that are supported by technology; implementation, facilitation and follow-up of teaching; learning strategies that integrate ICT in order to foster and improve pupils' learning; and assessment and evaluation of students' learning and performance). The fourth domain centres on professional development, research, innovation and cooperation. The framework does not contain progression over several levels.

PRE-SERVICE TECHNOLOGY COMPETENCIES	Framework	Ten standards: 1) Knowledge of Subject Matter; 2) Knowledge of Human Development and Learning; 3) Adapting Instruction for Individual	2010	USA	Teacher education	Idaho State Department of Education	Student teachers

		Needs; 4) Multiple Instructional Strategies; 5) Classroom Motivation and Management Skills; 6) Communication Skills; 7) Instructional Planning Skills; 8) Assessment of Student Learning; 9) Professional Commitment and Responsibility; 10) Community and Partnerships.					

Link: http://www.sde.idaho.gov/academic/standards/archives/common-core/general/implementation/Pre-Service-Technology-Competencies.pdf

Notes: Pre-service Technology Competencies is based on the ISTE Standards for Teachers and K-12 Idaho Communication and Technology (ICT) Standards. The knowledge and performance indicators described should be used in teacher education programmes, in a manner that accords with the programmes' conceptual framework, and which ensures the attainment of competence. It should be noted that, while the indicators are widely acknowledged, they are not all-encompassing or absolute. There is also the Proposed New Pre-Service Technology Standards, which contains the following indicators: Facilitate and Inspire Student Learning and Creativity; Design and Develop Digital-Age Learning Experiences and Assessments; Model Digital-Age Work and Learning; Promote and Model Digital Citizenship and Responsibility; Engage in Professional Growth and Leadership. All of these indicators are fairly comprehensive, and integrate technology into pedagogical work well.

THE GUIDELINES	Framework and self-evaluation tool	Six competencies: 1) Knowledge and awareness of ICT	2011	Slovenia	Continuing teacher education	Ministry of	Teachers; Principals; IT

OF THE STANDARD E-COMPETENT TEACHER, SCHOOL PRINCIPAL, IT EXPERT		tools, critical use; 2) Communication and online collaboration; 3) Search, select, process, evaluate data, information and concepts; 4) Safe use of the web; ethical and legal use of information; 5) Design, produce, publish and adapt materials; 6) Plan, perform, evaluate learning and teaching by using ICT.				Education, Science, Culture and Sport	personnel

Link: http://portal.sio.si/fileadmin/dokumenti/bilteni/E-solstvo_BILTEN_ANG_2012_screen.pdf

Notes: The development of standards for digitally component teachers, school principals and IT personnel forms part of the Slovenian national strategy and e-education project. The standards are based on textbooks for lifelong competence that include, among other things, developing pupils' digital competence. This framework contains a broad outline of six digital competencies that teachers should develop, and which are viewed in the context of schools as digitally competent organisations. The competencies described are aimed at teachers and pupils simultaneously, i.e. teachers should develop these competencies themselves and transmit them to pupils through pedagogical work. The framework also provides a brief overview of the concept of digital competency/literacy. The framework comes with a web-based self-evaluation tool for teachers.

NATIONAL	Framework	Seven standards: 1) Know students and how they learn;	2011	Australia	Teacher education	Australian Institute	Student teachers; N qualified teachers

PROFESSIONAL STANDARDS FOR TEACHERS: ICT ELABORATIONS FOR GRADUATE TEACHER STANDARDS	2) Know the content and how to teach it; 3) Plan for and implement effective teaching and learning; 4) Create and maintain supportive and safe learning environments; 5) Assess, provide feedback and report on student learning; 6) Engage in professional learning; 7) Engage professionally with colleagues, parents/carers and the community.	for Teaching and School Leadership

Link: http://acce.edu.au/sites/acce.edu.au/files/TTF - Graduate Teacher Standards - ICT Elaborations - 200411.pdf

Notes: The National Professional Standards for Teachers: ICT Elaborations for Graduate Teachers is part of a national project established in 2009, which resulted in, among other things, the development of the Australian Professional Standards for Teachers in 2011. The aim of the project was to create professional standards for teachers in order to improve teacher quality, and make a positive contribution to the understanding of the teaching profession. The most important elements of high-quality teaching are described in three primary domains (Professional knowledge, Professional practice and Professional engagement – the framework and its three domains build on TPACK), which are further subdivided into seven standards. These articulate what teachers are expected to know, and be able to do, at four stages of their career (Graduate, Proficient, Highly accomplished, and Lead). The standards are extensive, and are further subdivided into 'focus areas'. Some of these contain ICT. The National Professional Standards for Teachers: ICT Elaborations is aimed at newly qualified teachers, and contains descriptions that cover the integration of ICT in the teaching profession.

TEACHERS COMPETENCY FRAMEWORK FOR SMART EDUCATION	Framework	Thirteen competencies: 1) Creative problem-solving; 2) Social ability; 3) Flexibility; 4) Technology literacy; 5) Ethics; 6) Passion; 7) Understanding future education; 8) Expertise in content; 9) Rapport building with learners; 10) Instructional design and development; 11) Learning affordance building; 12) Evaluation and reflection; 13) Network building.	2012	South Korea	Continuing teacher education	Government of Korea	Teacher

Link: http://demo.pentasi.net/klien/unesco/sites/default/files/Korean ICT Competency Standards.pdf

Notes: South Korea has implemented a SMART (Self-directed, Motivated, Adaptive, Resources, and Technology Embedded) education strategy that integrates ICT in order to support the development of pupils' competencies for the 21st century. This framework describes thirteen competencies, which are divided into two main categories: Fundamentals and Practical Expertise. One of the basic competencies is aimed directly at technological competence, while in others, ICT has been integrated as part of teachers' general professional competence. Each competence has its own definition and indicators.

OPEKA	Self-evaluation tool	Four areas: 1) Digital operating environment; 2) Organisational culture; 3) Pedagogical activities; 4) Competences.	2012	Finland	Continuing teacher education	Finnish National Agency for Education; Association of Finnish Local and Regional Authorities; Tampere Research Centre for Information and Media (TRIM)	Teacher

Link: http://opeka.fi/en/presentation/kysymykset; http://ropeka.fi/en

Notes: Opeka is a self-evaluation package, that maps and provides information about digital competence for teachers, schools and administrations. The purpose of the tool is to establish a basis for the development and monitoring of ICT development plans for schools. The section aimed at teachers contains four areas for self-evaluation.

IT COMPETENCY FRAMEWORK FOR TEACHERS	Framework	Three key tasks: A) Pedagogical approach; B) Working in the school context; C) Professional development.	2012	The Netherlands	Continuing teacher education	Kennisnet	Teacher

Link: http://archief.kennisnet.nl/fileadmin/contentelementen/kennisnet/Ict-bekwaamheidseisen/it-competency-framework.pdf

Notes: In its introduction, the framework refers to basic digital skills that apply to all citizens, including teachers. It continues with three general descriptions of thematic areas, and the importance of digital competence in this context. The 'three key tasks' described in this framework correspond with the 'three professional contexts' that the Education Cooperative described in 2012. The framework is fairly general and has no progression levels, but contains resources that teachers can use in the practise of their profession. Kennisnet is working on a new version of the framework, that merges competencies for student teachers and teachers.

KENNISBASIS ICT: ICT KNOWLEDGE STANDARDS	Framework	Five themes: 1) Attitude; 2) Digital skills; 3) Digital media and information literacy; 4) Didactic implementation.	2013	The Netherlands	Teacher education;	Kennisnet	Student teache

Link: https://www.10voordeleraar.nl/documents/site_10voordeleraar-nl/Toetsgidsen/Kennisbasis%20ICT%202013.pdf

Notes: The Kennisbasis ICT: ICT Knowledge Standards are part of a larger focus on the development of a knowledge base for teacher education. The framework therefore plays a guiding role in the development of policy within teacher education, curricula and assessments of competence for student teachers, who will teach at a lower/upper secondary school level. The framework is divided into four thematic areas without progression levels, and contains a total of forty-five competencies. Each area contains a general definition, which is divided into categories/concepts. The categories are also defined, and include concrete examples. Kennisnet is working on a new version of the framework, that merges competencies for student teachers and teachers.

EVALUATION MODEL FOR EDUCATORS' DIGITAL COMPETENCE	Evaluation tool	Five modules: 1) Learning in the Digital Era; 2) Designing the learning environment and the assessment of the digital era; 3) Learning process in the digital era; 4) Teacher in the digital society;	2013	Estonia	Continuing teacher education	Estonian Innovation Centre (HITSA); Information Technology Foundation for	Teacher

		5) Teacher professional development in the digital era. Five levels of competencies: 1-5				Education	

Link: http://tulevikuopetaja.hitsa.ee/koolitusprogrammist/

Notes: This evaluation tool is based on the ISTE Standards for Teachers, and therefore contains the same concept of digital competence. Besides this, there is also a self-evaluation matrix with five progression levels (http://goo.gl/1SULRs), and a web-based self-evaluation tool (http://koolitused.e-ope.ee)

ICT COMPETENCY FRAMEWORK FOR TEACHERS FOR SIPSE CURRICULUM PATHWAYS	Framework	Seven competencies: 1) Policy; 2) Curriculum; 3) Pedagogy; 4) ICT; 5) Organization and management; 6) Professional development. Four level of competencies: 1) emerging stage; 2) applying stage; 3) proficient stage; 4) transformative stage.	2013	Kenya and Tanzania	Continuing teacher education	Global E-Schools and Communities Initiative (GESCI), Kenya	Teacher

Link: http://demo.pentasi.net/klien/unesco/sites/default/files/Kenyan%20and%20Tanzanian%20ICT%20Competency%20Standards.pdf

Notes: Kenya has, in collaboration with Tanzania, developed the ICT Competency Framework for Teachers, which builds on the UNESCO ICT Competency Framework for Teachers and the TPACK model, but which has been adapted to its national context. The framework is part of the SIPSE project (Strengthening Innovation and Practice in Secondary Education), which focuses on professional learning and teachers' development. The project manager is GESCI, which was established by the then UN ICT Task Force. The ICT Competency Framework for

Teachers was created for teachers in upper secondary schools, who teach natural sciences. It contains a number of competencies that span competence areas, and appear in several places in the framework, such as communication and cooperation.

The JISC: DIGITAL PRACTICE AND THE UK PROFESSIONAL STANDARDS FRAMEWORK	Framework	Three dimensions: 1) Areas of activity; 2) Core knowledge; 3) Professional values.	2013	UK	Higher education	Joint Information Systems Committee (JISC)	Higher educati teachers;

Link: https://www.webarchive.org.uk/wayback/archive/20150702162207/http://www.JISCinfonet.ac.uk/infokits/digital-practice-ukpsf/resources-teachers/

Notes: The JISC: Digital Practice and the UK Professional Standards Framework is aimed at teachers in higher education. The framework shows what teachers' general competence, described under three dimensions in the UK Professional Standards Framework for teaching and supporting learning in higher education (https://www.heacademy.ac.uk/ukpsf), looks like from a digital perspective. The framework comes with a number of resources for teachers. There are no progression levels.

COMMON DIGITAL COMPETENCE	Framework	Five competence areas: 1) Information; 2) Communication; 3) Content creation;	2014	Spain	Teacher education; Continuing teacher education	Ministry of Education, Culture and	Student teachers; Te

FRAMEWORK FOR TEACHERS		4) Safety; 5) Problem solving. Three proficiency levels: 1) Initial; 2) Medium; 3) Advanced.			Sports		
Link:	http://blog.educalab.es/intef/2015/10/22/common-framework-for-digital-competence-of-educators/						
Notes:	The Common Digital Competence Framework for Teachers is based on the DIGCOMP Framework for Citizens, and the five competence areas described therein. In accordance with the definition of digital competence, this framework also contains examples of knowledge, skills and attitudes, and therefore operationalises competencies described in the framework at a more general level. The framework is part of the Portfolio of the Digital Teaching Competence, which contains self-evaluation tools, background documentation concerning teachers' digital competence, as well as a digital passport that teachers can use to document their digital competence. A new version of the framework was published in 2017.						
SIX ELEMENTS OF DIGITAL LITERACY: **TEACHER PROFILE**	Framework	Six elements: 1) ICT proficiency; 2) Information, data and media literacy (critical use); 3) Digital creation, scholarship and innovation (creative production); 4) Digital communication, collaboration and participation (participating); 5) Digital learning and personal/ professional development (learning); 6) Digital identity and well-being (self-actualising).	2015	UK	Teacher education; Continuing teacher education	Joint Information Systems Committee (JISC)	Pupils; Students; HE teachers; Researche
Link:	https://digitalcapability.JISCinvolve.org/wp/files/2015/06/1.-Digital-capabilities-6-elements.pdf						
Notes:	The framework is based on JISC: Developing Digital Literacies, which was developed in 2010, for students in higher education. This version						

		merges information literacy and media literacy, and expands the target group with teachers and researchers in higher education. The framework takes an individual approach to developing competencies, but it should be noted that it can be used in larger contexts, such as in teams, or at an organisational level.					
Digi.kompP	Framework	Eight categories: A) Basic digital skills; B) Living digitally; C) Designing digital materials; D) Teaching and learning digitally; E) Teaching and learning digitally in the subject; F) Digital administration; G) Digital school organisation; H) Digitally inclusive CPD. Three development phases: 0) Before studies; 1) During studying;	2016	Austria	Teacher education; Continuing teacher education	Federal Ministry of Education; Onlinecampus Virtuelle PH;	Student teachers; Te

	2) During the first five years of practice.		

Link: http://www.virtuelle-ph.at/digikomp/

Notes: The Digi.kompP-Digitale kompetenzen für Pädagoginnen framework is part of a larger focus on digital competence in the Austrian education system, which includes frameworks for pupils' digital skills (digi.komp4, digi.komp8 and digi.komp12/13), as well as DIGIcheck self-evaluation tools. Category A corresponds to general digital skills that student teachers have developed in their basic education, while they develop categories B to H during their teacher education, and as newly qualified teachers.

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Professional Digital

Competence Framework for Teachers

The Professional Digital Competence Framework for Teachers is a guidance document that policy developers, heads of department, teacher educators, teachers, student teachers and others can use as a reference in their work on improving the quality of teacher education and systematic further and continuing teacher education. The centre hopes that this framework will give substance and meaning to the concept of teachers' professional digital competence. The framework indicates the complexity and breadth of knowledge, skills and competencies in teaching professions that are associated with understanding the opportunities and challenges in today's digital society.

The Norwegian Centre for ICT in Education is an advisory, administrative agency under the Ministry of Education and Research. The centre's mission is to help improve the digital competence of staff in kindergarten, primary and lower secondary education, the quality of the pedagogical work on digital skills with children and young people, and the quality of the sector's infrastructure and administrative processes. The centre's target groups are kindergartens, primary and lower secondary schools, upper secondary schools and teacher education programmes.

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