DigComp Helping Shape the Education Ecosystem in Europe

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Abstract. The Digital Competence Framework for Citizens (DigComp) provides a common understanding of what digital competence is and can thus support curriculum planning, instruction and assessment both at EU level and in Member States. Additionally, a reference framework such as DigComp can be a tool to support policy-making and monitoring (e.g. setting targets for digital up/re-skilling) and certification processes. All these components are integral parts of education ecosystems (e.g. curriculum planning, assessment, certification, policy-support). In this paper, a number of examples will be given and it will be argued that especially when digital transformation is shaping education ecosystems in Europe, common reference frameworks can support education actors to collaborate, share good practices and learn from one another both within a country and across them. This contribution first outlines the DigComp 2.2 update and then focuses on the uptake at EU level and in Member States.

Keywords: Digital competence framework · DigComp · Reference framework · EU · Digital education ecosystem

1 Introduction

Within the EU, digital competence is defined as follows: "*Digital competence involves the confident, critical and responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society. It includes information and data literacy, communication and collaboration, media literacy, digital content creation (including programming), safety (including digital well-being and competences related to cybersecurity), intellectual property related questions, problem solving and critical thinking.* [1]".

Moreover, the same document, Key Competences for Lifelong Learning, defines competences as a combination of knowledge, skills and attitudes: in other words, they are composed of concepts and facts (i.e. knowledge), descriptions of skills (i.e. the ability to carry out processes) and attitudes (i.e. a disposition, a mindset to act).

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Based on the above definition, the Digital Competence Framework for Citizens, also known as DigComp, provides a common language to identify and describe the key areas of digital competence. Over the last decade, DigComp has become a tool to improve citizens' digital competence, plan education and training initiatives to improve the digital competence of specific target groups, and help policy-makers formulate policies that support digital competence building.

In this paper, the DigComp 2.2 update is first discussed and then some examples of uptake are given where DigComp is used to support curriculum planning, instruction, assessment and certification processes as well as policy-making and policy monitoring. It is argued that all these components are integral parts of education ecosystems and can help digital transformation of European education.

2 Background

The first DigComp reference framework was published in 2013 defining digital competence as a combination of 21 competences grouped in five main areas [2]. DigComp was revised first in 2016 defining its five areas as Information and data literacy; Communication and collaboration; Digital content creation; Safety; and Problem solving [3], and then in 2017, the 8 proficiency levels were established [4].

The DigComp framework is composed of five dimensions that outline the underlying data model (Table 1). Dimensions organise various elements of the framework and show how they relate to one another.

Table 1. The DigComp data model.

Main dimensions of DigComp	
Dimension 1.	**Areas** identified to be part of the digital competence
Dimension 2.	**Competence descriptors and titles** that are pertinent to each area
Dimension 3.	**Levels of proficiency** for each competence
Dimension 4.	**Examples of the knowledge, skills and attitudes** applicable to each competence
Dimension 5.	**Use cases** on the applicability of the competence to different contexts.

Dimension 1 and 2 form the *conceptual reference model* comprising the competence areas, titles and their descriptors. Dimension 3 describes the eight proficiency levels, whereas Dimension 4 and 5 describe various examples related to each competence. The two latter ones add value and context to the conceptual reference model and thus, they are not intended to be exhaustive. Dimension 4 focuses on examples of knowledge, skills and attitudes (the 2.2 update), and use cases pertaining in specific contexts (e.g. learning and employment) are described in Dimension 5.

3 The Digital Competence Framework for Citizens 2.2

3.1 Aim of the Update

In March 2022, an updated version of the Digital Competence Framework for Citizens was published which consists of more than 250 new examples of knowledge, skills and attitudes [5]. These address key themes that are relevant in today's society such as.

- misinformation and disinformation in social media and news sites (e.g. fact-checking information and its sources, fake news, deep fakes) linked with information and media literacy;
- the trend of datafication of internet services and apps (e.g. focus on how personal data is exploited) and emerging technologies such as Internet of Things (IoT);
- citizens interacting with AI systems (including data-related skills, data protection and privacy, but also ethical considerations);
- environmental sustainability concerns (e.g. resources consumed by ICT); and
- new and emerging contexts (e.g. remote work and hybrid work).

The update was conducted as an open collaborative co-creation process where practitioners (e.g. those already using DigComp in education and training) and academics were invited to join the process in December 2020. Over hundred individuals participated in the process which was led by the Joint Research Centre of the European Commission. The process is explained in detail in [5].

3.2 Formulation of Knowledge, Skills and Attitudes Examples

In DigComp 2.2, for each of the 21 competences, 10–15 statements were formed to illustrate timely and contemporary themes that stem from recent developments and current practices in the digital world. To illustrate such developments, a scenario of citizens interacting with systems driven by Artificial Intelligence (AI) is elaborated in the text below with links to a small number of new examples in Table 2.

Table 2. Examples of knowledge, skills and attitudes pertinent to a given competence (source: DigComp 2.2[5]).

Competence	Example	Type
2.6 Managing digital identity	**Aware that** AI systems collect and process multiple types of user data (e.g. personal data, behavioural data and contextual data) to create user profiles which are then used, for example, to predict what the user might want to see or do next (e.g. offer advertisements, recommendations, services)	Know-ledge
2.6 Managing digital identity	**Knows how to** modify user configurations (e.g. in apps, software, digital platforms) to enable, prevent or moderate the AI system tracking, collecting or analysing data (e.g. not allowing the mobile phone to track the user's location)	Skill
4.2 Protecting personal data and privacy	**Weighs the benefits and risks** before allowing third parties to process personal data (e.g. recognises that a voice assistant on a smartphone, that is used to give commands to a robot vacuum cleaner, could give third parties - companies, governments, cybercriminals - access to the data)	Attitude

Scenario: Many everyday technologies integrate some type of artificial intelligence, e.g. to translate voice commands into a concrete action such as making a call, turning the lights on or starting up a robot vacuum cleaner. However, a few people are aware that such systems can collect personal data about the user, their context (e.g. location where the vacuum robot cleans) and actions (e.g. time of the day). Even more seldom users seem to realise that such data can be used for a multitude of purposes (e.g. not only training AI algorithms, but data can also be shared with third parties for various purposes). This brings a range of privacy or safety concerns.

In Table 2, the left column names a *competence* (e.g. 2.6 Managing digital identity), then in the middle column an *example statement* is given and the right column shows the *type* of statement (knowledge, skill, attitude) following a certain wording (see terms in **bold**). All examples in Table 2 are related to the above scenarios with the aim to help citizens become more confident, critical, and yet open-minded users of today's technologies, while helping mitigate risks related to safety, personal data and privacy.

4 DigComp as Part of Education Ecosystems

4.1 Instructional Planning

The new examples are intended to help curriculum planning and updating existing syllabus in education and training. Especially across schools in Europe (ISCED levels 1, 2, 3), nearly half of the European education systems refer to the European key competence definitions for digital competence and DigComp areas are addressed in terms of learning outcomes [6]. Therefore, the new examples can become helpful as a basis to update descriptions of learning objectives to better illustrate the application and integration of emerging technologies in curriculum.

A number of other training providers and public sector actors also use the DigComp framework to guide their training programs and course syllabus (for further information see [7]): the 2.2 update will also support them refreshing training content and creating more relevant learning experiences.

4.2 (Self-)Assessment

Digital competence assessment is one of the key components of education ecosystems and in this area too, the DigComp framework has contributed to supporting different actors and tools. The French implementation of PIX [8] is one such example of task-based digital competence testing grounded on DigComp. It can be used to assess, develop, and certify individual's digital skills – even at global level.

On the other hand, self-assessment of digital competence can also offer a promising proxy to a more objective testing. DigCompSat is a self-reflection tool to assess all 21 DigComp competences corresponding to proficiency levels 1 to 6 [9]. The item bank is composed of 82 self-assessment questions that have sound psychometric properties including their validity and internal consistency. DigCompSat, which is available under open license, perform three main functions: it measures existing competences at area level based on the respondents' self-assessment; identifies competence gaps; and raises awareness of what digital competence means. The self-assessment can be taken online at mydigiskills.eu. Similar self-assessment tools are provided in all EU languages by the European Commission on the Digital Skills and Jobs Platform[10] and as part of the Europass CV Online tool [11].

4.3 Certification

At national as well at EU level, certification is one of the key components of an education ecosystem. For example in Austria, it is possible to obtain certificates to prove digital competence in a certification system according to the Austrian version of Digital Competence Framework (DigComp 2.2 AT), the development was supported by the Federal Ministry for Digital and Economic Affairs, and the association fit4internet [12].

Currently, the European Commission is exploring the development of a European Digital Skills Certificate, based on DigComp, to support the recognition of digital skills of individuals by employers, training providers, and others, in a consistent manner. A feasibility study is set up to explore different scenarios for such certificate, the study

will also map existing digital skills certification schemes in Europe and carry out a gap analysis to understand the added value.

4.4 Policy Target Setting

Since 2015, the European Commission has monitored the level of EU citizens' digital activities using the Digital Skills Indicator (DSI) [13]. Initially this composite indicator was based on DigComp's four competence areas (information, communication, content creation and problem solving), and since 2022, the fifth area of Safety was added [14].

DigComp and the DSI also play a central role in guiding and monitoring efforts to achieve the ambitious EU objectives with regard to the digital upskilling of the whole population. In the Digital Compass for Europe's digital decade, the EU has set the policy targets of reaching a minimum of 80% of the population with at least basic digital skills by 2030 [15].

5 Further Discussion

A vibrant digital ecosystem for education and training in Europe needs collaboration and cross-pollination across national and regional education systems in order to take advantage of European cultural richness and its diversity. Open reference frameworks can facilitate this in terms of offering an open and transparent way to identify common interests and areas for collaboration and co-construction, and to further learn from each other's practices. As illustrated above, DigComp has been used in various areas of education ecosystem (e.g. curriculum planning, assessment, certification, policy-support) by offering a reference framework that can support digital transformation and further help shaping education ecosystems within Europe - and eventually also across its education systems. DigComp's strength is its flexibility and how it can be adapted to local needs while still keeping a reference at European level through providing a common understanding of what digital competence is.

References

1. European Commission: Key competences for lifelong learning. Publications office of the European Union, Luxembourg (2019). https://op.europa.eu/s/wFTn
2. Ferrari, A.: DIGCOMP: a framework for developing and understanding digital competence in Europe. Publications office of the European Union, Luxembourg (2013). https://doi.org/10.2788/52966
3. Vuorikari, R., Punie, Y., Carretero Gomez, S., Van den Brande, L.: DigComp 2.0: The Digital Competence Framework for Citizens. Update Phase 1: the Conceptual Reference Model. Publications Office of the European Union, Luxembourg (2016). https://publications.jrc.ec.europa.eu/repository/handle/JRC101254
4. Carretero, S., Vuorikari, R., Punie, Y.: DigComp 2.1: the Digital Competence Framework for Citizens with eight proficiency levels and examples of use. Publications Office of the European Union Luxembourg (2017). https://data.europa.eu/doi/10.2760/38842

5. Vuorikari, R., Kluzer, S., Punie, Y.: DigComp 2.2: The Digital Competence Framework for Citizens - With new examples of knowledge, skills and attitudes. Publications Office of the European Union Luxembourg (2022). https://publications.jrc.ec.europa.eu/repository/handle/JRC128415
6. Eurydice: Digital Education at school in Europe. Publications office of the European Union, Luxembourg (2019). https://eurydice.eacea.ec.europa.eu/publications/digital-education-school-europe
7. Kluzer, S., Pujol, L.: DigComp into Action - Get inspired, make it happen. Publications office of the European Union, Luxembourg (2018). https://doi.org/10.2760/112945
8. Pix: https://pix.fr/competences/. Accessed 02 Aug 2022
9. Clifford,I., Kluzer, S., Troia, S., Jakobsone, M., Zandbergs, U.: DigCompSat. Publications office of the European Union, Luxembourg (2020). https://doi.org/10.2760/77437
10. Digital Skills and Jobs Platform: http://digital-skills-jobs.europa.eu/digitalskills. Accessed 2 Aug 2022
11. Europass CV Online tool: http://europa.eu/europass/en/how-describe-my-digital-skills. Accessed 2 Aug 2022
12. Fit4internet: https://www.fit4internet.at/view/faq-digcomp-cert/&lang=EN. Accessed 2 Aug 2022
13. Eurostat DSI data browser: https://ec.europa.eu/eurostat/databrowser/bookmark/42649c8d-b03d-4a66-9859-41a2e603c078?lang=en. Accessed 2 Aug 2022
14. Vuorikari, R., Jerzak, N., Karpinski, Z., Pokropek, A.: Measuring Digital Skills across the EU: Digital Skills Indicator 2.0. Publications Office of the European Union, Luxembourg, *forthcoming*. https://publications.jrc.ec.europa.eu/repository/handle/JRC130341
15. European Commission: https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/europes-digital-decade-digital-targets-2030_en. Accessed 2 Aug 2022