European Commission

Joint Research Centre

DigComp 3.0 European Digital Competence Framework

Fifth edition

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2025

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The Joint Research Centre: EU Science Hub
https://joint-research-centre.ec.europa.eu

JRC144121
EUR 40491

Print	ISBN 978-92-68-34351-7	ISSN 1018-5593	doi:10.2760/7379058	KJ-01-25-521-EN-C
PDF	ISBN 978-92-68-32677-0	ISSN 1831-9424	doi:10.2760/0001149	KJ-01-25-521-EN-N

Luxembourg: Publications Office of the European Union, 2025

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How to cite this report: Cosgrove, J. and Cachia, R., *DigComp 3.0: European Digital Competence Framework - Fifth Edition*, Publications Office of the European Union, Luxembourg, 2025, https://data.europa.eu/doi/10.2760/0001149, JRC144121.

Layout: Carmen Capote de la Calle

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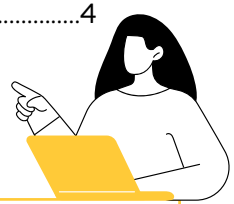
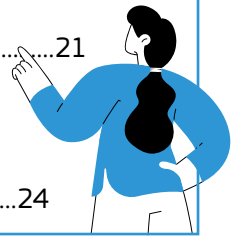
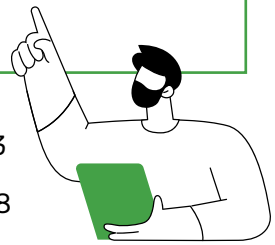
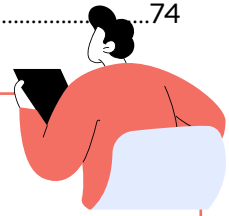






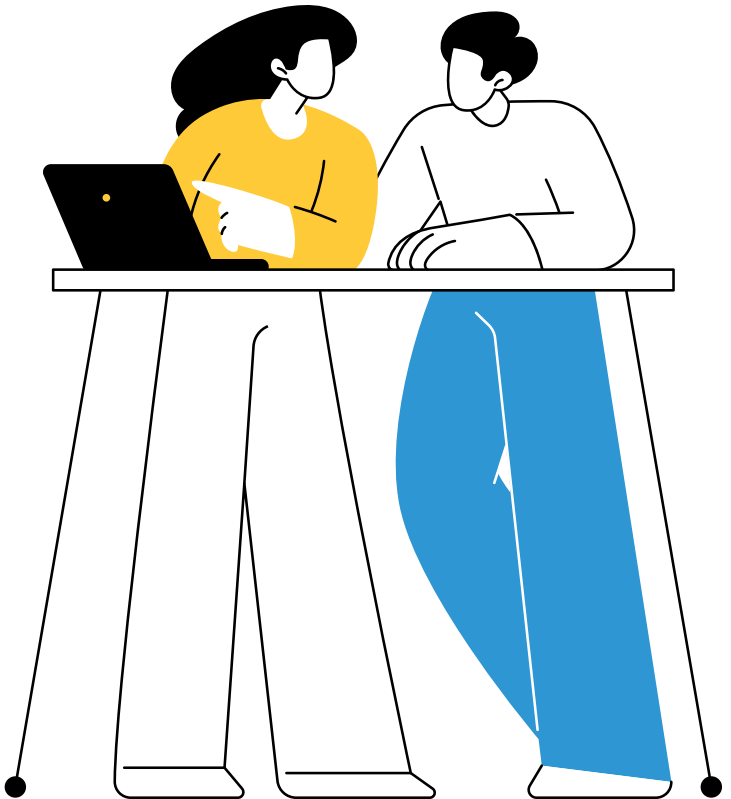


ABSTRACT

DigComp 3.0 is the fifth edition of the European Digital Competence Framework. It describes knowledge, skills and attitudes that are needed to be digitally competent for daily life, participation in society, working and learning, and can be used with both children and adults. The framework is technology-neutral and is designed to be tailored and adapted for a variety of purposes in education, training and employment contexts. DigComp is intended for individuals and organisations, whether local, regional, national, European or international, which share the common goal of understanding and identifying digital competence needs and supporting their development. It supports EU policies and initiatives on digital skills (such as the Union of Skills, where DigComp is explicitly mentioned, and the Digital Decade Policy Programme) and the societal and economic implications of the digital transformation (such as the AI Continent Action Plan and the European Strategy for a Better Internet for Kids). DigComp 3.0 incorporates digital technological developments, trends and practices that have occurred since 2022, and which have wide-ranging implications for digital competence. It also includes a new section outlining learning outcomes which provides a more granular view of digital competence that allows easy and consistent interpretation and application of the framework, as well as the systematic and transversal integration of AI competence across the framework.

Expert contributors

This framework has been developed with the expert advice of Ulrike Domany-Funtan, Anastasia Economou, Māra Jākobsone, Lidija Kralj, Stefano Kluzer, Luis Pereira, Yves Punie, Attila Rausch, Arianna Sala, Roland Stürz and Riina Vuorikari.



FOREWORD

The importance of equipping individuals in Europe with robust digital skills cannot be overstated. As our societies increasingly rely on digital technologies including the widespread diffusion of AI, the need for digital competence becomes essential for both personal and professional growth.

The Digital Competence Framework (DigComp) outlines the knowledge, skills and attitudes that individuals need to be digitally competent and operational in today's world. Since its initial publication in 2013, DigComp's comprehensive scope, scientific robustness and adaptability have driven its widespread adoption in employment, education and training initiatives at international, European, national, regional and local levels. It is also the basis for the Digital Skills Indicator (DSI) to measure digital skills in the European Union (EU) as part of the Digital Decade Policy Programme.

DigComp 3.0, the fifth edition of the framework, is developed by the European Commission's Joint Research Centre (JRC) in collaboration with the Directorate-General for Employment, Social Affairs and Inclusion (DG EMPL). Aligned with major European policies, DigComp 3.0 also integrates key rights and obligations under EU digital regulations.

This iteration introduces substantial **content updates** to reflect advancements in AI, cybersecurity, digital rights, choice and responsibility, wellbeing, and the need to tackle increased misinformation. These updates ensure that the framework remains relevant and comprehensive in defining digital competence. DigComp 3.0 includes, for the first time, a **learning outcomes approach**. This is a well-established policy and practical tool which helps to ensure that the framework is easily and consistently interpreted and applied. Additionally, a **linked open data supplement** enhances its interface with other machine-readable information, offering new avenues to analyse and bridge digital skills gaps across Europe.

This ambitious version of DigComp underscores the critical role of digital skills for all citizens in Europe, to ensure participation in society, learning, work and social inclusion.

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ACKNOWLEDGEMENTS

DigComp 3.0 has been published thanks to the contributions and support of many individuals and organisations. We are grateful to the 42 experts who participated in initial meetings in June and October 2024 and in the validation workshop in June 2025: Giovanni Adorni, Michela Bastianelli, Olena Bekh, Denis Bertinchamps, Antonio Blasco López, Paula Bleckman, Linda Castañeda, Jonatan Castaño Muñoz, Stephane Chaudron, Cristina Costa, Mads Ronald Dahl, Veronica Ellis, Neil Farren, Luís Fernández Sanz, Andrei Frank, Ismael García-Varea, María Jesús García San Martín, Angeliki Giannakopoulou, Montse Guitert, Theodora Kakouri, Linda Keane, Kari Kivinen, Dmitrijs Kulss, Roberto Lejarzegi, Olivia Levrini, Margarida Lucas, Cristina Pantiru, Georg Pirker, Anastasia Pouliou, Michaela Preuner, Marelle Rice, Alexander Schmölz, Panagiotis Skiniotis, Vasileios Symeonidis, Iñaki Tellería Olabarrieta, Françoise Tort, Karen Triquet, Sandra Troia, Luis Francisco Vargas-Madriz, Monica Ward, and Daniel Wisiniewski. We also would like to thank Karolina Jakubowska and Ruth Santos O'Brien for supporting the work with experts during 2024.

Thanks to the 260 individuals and organisations from 24 Member States who took part in the DigComp stakeholder consultation, and the 174 individuals who provided feedback to the consultation in April 2025.

We are very grateful to all EC colleagues who have supported, reviewed and provided guidance during this project, namely Ann Branch, Ana Carrero, Julie Fionda, Michael Horgan, Koen Nomden, Céline Jambon, Chiara Riondino, and Melina Tasiovasilis (DG.EMPL), Dana Verbal, Ivana Vrhovski, Simona Petkova (DG.EAC), Johannes Boermann (SG.REFORM), Alina Brebenel (DIGIT), Giulia Carsaniga, Vitis Faure Tilgaard, Giuliana Paes Kotkievicz (DG.CNECT), Antti Luukas Veivo (DG.COMM), Bernd-Roland Killmann (DG.SJ), Nikolaos Apostolou (DG.AGRI), Kari Kivinen, Antoine Aubert, Claire Castel, Véronique Delforge, Ziga Drobnic and Harrie Temminik (EUIPO); to Francesca Campolongo, Michele Vespe, Eva Martinez Rodriguez, Montserrat Lopez-Cóbo, Alice Bertoletti, Clara Centeno, César Herrero, Daniel Villar-Onrubia, Sandrine Wattraint, Isabel Gaton, Silvia Sarti, Sofia Kekampanou, Javier Picon Lorca, Carmen Capote de la Calle, Miriam Giubilei, Francesca Siciliano, Michele Chinosi, Alessandro Miola, Irena Mitton, Andrea Musumeci, Guia Bianchi, Alexander Kotzev, Mario Scharfbillig and Tatiana Somia (JRC).

Thanks to our collaborators in ALL DIGITAL, the Digital Education Hub, and the Digital Skills and Jobs Platform for supporting awareness-raising on the development of DigComp 3.0, and to the individuals and organisations that responded to the call for submissions on their work on DigComp: Aarhus University, ALL DIGITAL, Servicios Públicos de Empleo de CCAA y SEPE, AUPEX, CERTIPASS, Cruz Roja Española y Fundación Secretariado Gitano, Digital Skills Office at OeAD, Dipartimento della funzione pubblica, Diputació de Barcelona, Education and Youth Board (Harno), European Council for Steiner Waldorf Education, Finnish National Board of Education, fit4internet, Fundación Cibervoluntarios, HAN University of Applied Sciences, ICDL Foundation, IDCERT, Junta de Castilla y León, Junta de Castilla y León, Latvian Information and Communication Technology Association, Liceo BR Motzo, Lyceum Sykhivsky, National Academy of Medical Sciences of Ukraine, Pix, Quality and Qualifications Ireland, Repubblica Digitale - Dipartimento per la trasformazione digitale, SCRIPT, Secretaría de Estado de Digitalización e Inteligencia Artificial, Sistemi Formativi Confindustria, SMILE Lab, Socialinnov, Technische Hochschule Nürnberg, TECNALIA Research & Innovation, Tknika (Basque Government), Trentino School of Management, Ufficio Scolastico Regionale, Universidad de Castilla-La Mancha, Universitá di Bologna, Universitat Oberta de Catalunya, University of Aveiro, University of Genoa, University of Milano-Bicocca, Victoria Mejias, and Vilnius Coding School.

EXECUTIVE SUMMARY

In today's rapidly evolving technological landscape, digital skills are essential. The European Digital Competence Framework (DigComp) describes what is needed to be digitally competent in today's society. This update of the framework responds to digital technological developments, trends and practices, and supports several EU policy initiatives on digital skills. As a generic transversal framework, it is non-prescriptive and acts as a starting point from which to develop, update, or evaluate initiatives that support the development of digital competence.

In Europe, there is a clear need to prioritise digital competence. In 2023, only 56% of EU adults had at least basic digital skills, falling short of the 80% target set for 2030. Among secondary school students in the same year, 43% lacked basic digital skills. Over nine in ten (92%) workers in the EU used digital technologies in their work in 2024-2025 and 30% of EU workers used AI systems in work in the same year. In 2024, 42% of EU workers reported an AI skills gap, yet only 15% had participated in AI skills training.

DigComp promotes a shared and common understanding of digital competence – knowledge, skills and attitudes for the *confident, critical and responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society*. It is used by a large majority of EU Member States and beyond, as well as at European and international levels, to inform policymaking; develop assessments; enhance transparency or comparability of education and training courses; recognise or validate learning (such as through digital skills certification); and define profiles of digital competence in specific jobs or roles.

The first version of the DigComp framework was published in 2013, with updates published in 2016, 2017 and 2022. All versions of the framework are underpinned by a scientific evidence-based approach and consultation with experts and stakeholders. Similary, this iteration of DigComp has been shaped by scientific research and input and feedback from around 300 experts and stakeholders from a diversity of backgrounds.

This update responds to significant developments, trends and practices in relation to digital technologies that have occurred since 2022. It is shaped by five main priorities identified in expert and stakeholder consultations and policy and academic literature: AI competence; cybersecurity competence; rights, choice and responsibility; wellbeing in digital environments; and competence to deal with misinformation and disinformation. In addition, DigComp3.0 embodies the human-centric values of the European Declaration on Digital Rights and Principles for the Digital Decade.

Like the previous editions, DigComp 3.0 has five **competence areas:** (i) information search, evaluation and management; (ii) communication and collaboration; (iii) content creation; (iv) safety, wellbeing and responsible use, including the environmental impact of digital technologies; and (v) problem identification and solving. These are further divided into 21 **competences**. Four **proficiency levels** (basic, intermediate, advanced and highly advanced) describe levels of progression. This iteration of the framework includes **new and revised competence statements** and over 500 **new learning outcomes**. Learning outcomes are statements for each competence that describe what an individual is expected to know, understand or be able to do after a learning process. They are classified by knowledge, skills and attitudes. Competence statements do not distinguish between knowledge, skills and attitudes, but contain all of the key content of the learning outcomes. As the framework is already used by many stakeholders in various initiatives, the update reflects a balance between structural and conceptual consistency on one hand, and changes needed in response to digital technological developments on the other.

In addition to this framework document, readers can access the JRC-DigComp web space, which provides:

- a clear and user-friendly description of DigComp 3.0;
- an editable version of the framework;
- a spreadsheet version, and a linked open data[1] version (in JavaScript Object Notation, JSON[2] format) of the tabular elements of DigComp 3.0.

1. Linked open data is freely accessible data in an interoperable format (European Commission, 2022).
2. JSON is a widely used, lightweight, data interchange format (Colantoni et al., 2021).

QUICK GUIDE TO DIGCOMP 3.0

Read about the context for developing the framework, and how DigComp is used to support digital competence initiatives

Sections 1.1, 1.2 and 1.3

Get an overview of the values and priorities underpinning DigComp 3.0, and what is new in DigComp 3.0

Sections 1.4, 1.5 and 1.6

Understand the different components of the framework

Sections 2.1, 2.2, 2.3, 2.4 and 2.5

See how AI competence has been integrated into DigComp 3.0

Section 2.6

Explore the DigComp 3.0 framework content

Section 3

Check the meaning of words or terms used in the framework

Glossary of terms and definitions

Understand the differences between DigComp 3.0 and DigComp 2.2

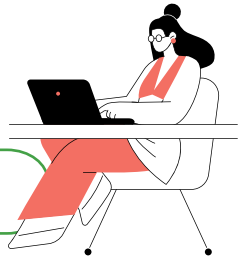
Annex 1

See the learning outcomes for DigComp 3.0

Annex 2

Understand how DigComp 3.0 was developed

Annex 3



1

INTRODUCTION

1. INTRODUCTION

1.1 Importance of digital competence

Digital environments are intertwined with daily life, working and learning, bringing both benefits and risks, and requiring a range of digital competences. Yet, substantial digital skills gaps remain. It is essential to identify and close these gaps and provide opportunities for everyone to build their digital capabilities. Digital competences bring a range of benefits to individuals (such as ability to use public and commercial platforms and services, to broaden employment and learning opportunities, to foster social connection and civic participation, and to support privacy management and wellbeing in digital environments) (Morte-Nadal & Esteban-Navarro, 2025; Stalmach et al., 2023; Pouliakis et al., 2025; Țarcă et al., 2024), as well as a means to tackle social exclusion (Boerkamp et al., 2024; Brundle et al., 2025) and to enhance the competitiveness of economies (Draghi, 2024; Pakhnenko et al., 2025). **Figure 1** illustrates some of the implications of digital technologies for digital competence among children and youth, adults in general, and workers, through a selection of statistical evidence from recent surveys.

Figure 1. Digital competence – a selection of facts and figures.

Children and youth	Adults in general	Workers
– **43%** of secondary school students in the EU did not reach a basic level of digital skills in 2023. (Source)	– **56%** of adults in the EU had at least basic digital skills in 2023. (Source)	– **92%** of EU workers used digital devices, tools or equipment to do their job in 2024-2025. (Source)
– **96%** of 15-year-olds in the EU used social media daily in 2022. (Source)	– **70%** of adults who use the internet interacted digitally with public services in 2024. (Source)	– **35%** of EU workers needed to learn new digital technology to do their job in 2020-2021 (Source).
– **9-12%** of students aged 11-15 reported problematic social media use in 2022. (Source)	– **58%** of adults used the internet in 2022 to look for health-related information. (Source)	– **30%** of EU workers used AI systems in work in 2024-2025. (Source)
– **14%-16%** of students aged 11-15 reported experiencing cyberbullying at least twice in a two-month period in 2022. (Source)	– **49%** of adults reported having seen untrue or doubtful content on social media or news sites online in 2023. (Source)	– **42%** of workers across 11 European countries reported an AI skills gap in 2024. (Source)

Source: Compiled by JRC, citing existing sources.

1.2 European initiatives to support digital competence

In policies and initiatives, 'digital skills' and 'digital competence' are often used interchangeably.[3] In DigComp 3.0, the term 'digital competence' is used, to incorporate knowledge, skills and attitudes.

In response to the digital transformation and its implications for digital economy and society, the EU undertakes a range of actions and initiatives. **Box 1** outlines some of the key ones.

3. See, for example, the discussion in European Commission (2023b), pp. 50-51.

Box 1. Some key European policy initiatives related to digital competence.

The Digital Decade Policy Programme sets out objectives and targets for Europe's digital transformation towards 2030. In 2023, only 56% of adults in Europe had at least basic digital skills (European Commission, 2025a). The European Pillar of Social Rights includes principles related to education, training and lifelong learning. It is accompanied by a European Pillar of Social Rights Action Plan (2021) which sets a target of 60% of adults participating in education and training every year by 2030. In 2022, this figure stood at 47%.

The Union of Skills (European Commission, 2025b) is an overarching strategy which aims to ensure that everyone in Europe is empowered to build solid skills foundations and engage in lifelong upskilling and reskilling. It includes an Action Plan for Basic Skills (European Commission, 2025c) to address declining levels of basic skills (DigComp 3.0 is one of its actions), a STEM Education Strategic Plan (European Commission, 2025d), and a 2030 Roadmap on the future of digital education and skills based on a review of the European Digital Education Action Plan (DEAP) (European Commission, 2020, under which DigComp 2.2, the fourth edition of DigComp, was completed).

The Guide to EU Citizenship (European Commission, 2023c) contains information on rights and opportunities associated with being a citizen of the EU, many of which require at least a basic level of digital competence to access and avail of.

The European Commission's commitment to safer digital environments for all citizens, in particular minors and youth, is evident in the European Strategy for a Better Internet for Kids (BIK+) (2022), which aims to ensure that children are protected, respected and empowered online. Other initiatives include an EU-wide inquiry on the broader impacts of social media on wellbeing and a European Action Plan Against Cyberbullying.

The European Commission has also published the AI Continent Action Plan (2025) and the Apply AI Strategy (2025) which, alongside other initiatives, aim to promote AI literacy among all workers across sectors and to educate and train the next generation of AI experts (including multidisciplinary profiles), as well as attract European and international AI talent to work in Europe. The Apply AI Strategy encourages the adoption of competence approaches stemming from frameworks such as DigComp. The Commission is also working on an AI literacy framework for primary and secondary education with the OECD, the first draft of which was published in May 2025. The AI literacy framework will be finalised in 2026.

Several **European digital laws and regulations** have been published in recent years. These help to protect the rights of individuals, as well as setting out their responsibilities, along with obligations of the providers of digital products, platforms and services. The General Data Protection Regulation (GDPR) (2018) sets out principles, conditions and obligations for the processing of personal data and on the free movement of such data. The European Accessibility Act (2025) aims to improve the functioning of the internal market for accessible products and services, including computers and operating systems, smartphones, banking and e-commerce.

The Cyber Resilience Act (2024) protects individual consumers and businesses buying software or hardware products. It introduces mandatory cybersecurity requirements for the providers of these products. The Digital Markets Act (2022) gives consumers new powers of choice in digital services, data ownership and portability, streamlined access to services, and the right to unbiased search results. The Digital Services Act (2022) helps to prevent illegal and harmful activities online, including the spread of disinformation. It regulates online intermediaries and platforms such as marketplaces, social networks, content-sharing platforms, app stores, and online travel and accommodation platforms. It ensures user safety, including children, protects fundamental rights, and creates a fair and open online platform environment. Guidelines for the protection of minors under the Digital Services Act have also been published by the European Commission.

The AI Act (2024) addresses risks to individuals' health, safety, and fundamental rights in relation to AI systems. It provides developers and deployers with clear requirements and obligations regarding specific uses of AI, while reducing administrative and financial burdens for businesses to facilitate innovation. It bans the use of AI systems that are incompatible with European values, while imposing requirements on AI systems that are classified as 'high risk'. For all providers and deployers of AI systems, Article 4 of the AI Act mandates to ensure a sufficient level of AI literacy among the staff and persons dealing with the systems on their behalf. To support the implementation of Article 4, the Commission has published a Q&A and a repository of AI literacy practices from companies and public sector organisations.

The European Digital Identity Regulation (2024) mandates Member States to provide EU Digital Identity (eID) Wallets to citizens within 24 months of the Implementing Acts' adoption. The European Media Freedom Act (2024) establishes the European Board for Media Services to promote effective and consistent application of the (revised) Audio-Visual Media Services Directive (2018).

Source: Compiled by JRC, citing existing sources.

1.3 Adoption and use of DigComp

An important feature of DigComp is the extent to which experts and stakeholders from Europe and beyond contribute to its development. This helps to ensure its quality and relevance and supports its adoption. DigComp is widely used in Europe and beyond in employment, education and training contexts (Centeno et al., 2024b; Centeno & Cosgrove, 2025, Kluzer et al., 2020), and forms the conceptual basis of the Digital Skills Indicator (DSI) (Vuorikari et al., 2022b), which is used to monitor the level of basic digital skills in Europe through the Digital Decade Policy Programme. As well as providing a common understanding of digital competence, DigComp is used to guide European, national and regional policies; develop assessments; enhance transparency or comparability of education and training courses; recognise or validate learning (such as through digital skills certification); and define profiles of digital competence in specific jobs or roles, amongst others.

1.4 Values and principles guiding DigComp 3.0

*The **vision** for DigComp 3.0 is that it provides a unifying, coherent, clear, relevant and up-to-date view of digital competence that builds on previous versions, and which can be used by a variety of stakeholders who share the common goal of understanding and identifying digital competence needs and supporting their development.*

DigComp 3.0, the fifth edition of the framework,[4] continues to be the key reference framework for digital competence in the EU. Digital competence is one of the eight key competences of the Council Recommendation on key competences for lifelong learning (European Commission, 2006; 2018). *Key competences* are knowledge, skills, and attitudes needed by all for personal fulfilment and development, employability, social inclusion and active citizenship.

DigComp 3.0 embodies the values of the European Declaration on Digital Rights and Principles for the Digital Decade (European Commission, 2023a) which promotes a human-centric vision of the digital transformation.[5] It is organised into six themes (see **Figure 2**). The Declaration builds on the EU Charter of Fundamental Rights (European Commission, 2012).[6]

Figure 2. The six themes of the European Declaration on Digital Rights and Principles (2023).

People at the centre

Digital technologies should **protect people's rights, support democracy, and ensure that all digital players act responsibly and safely**. The EU promotes these values around the world.

Solidarity and inclusion

Technology should **unite, not divide, people**. Everyone should have access to the internet, to digital skills, to digital public services, and to fair working conditions.

Freedom of choice

People should benefit from a **fair online environment, be safe from illegal and harmful content, and be empowered** when they interact with new and evolving technologies like artificial intelligence.

Participation

Citizens should be able to **engage in the democratic process** at all levels and have **control over their own data**.

Safety and security

The digital environment should be **safe and secure**. All users, from childhood to old age, should be empowered and protected.

Sustainability

Digital devices should support **sustainability and the green transition**. People need to know about the environmental impact and energy consumption of their devices.

Source: Based on https://digital-strategy.ec.europa.eu/en/fact-pages/digital-rights-and-principles

4. The first version of DigComp (1.0) was published in 2013 (Ferrari, 2013). DigComp 2.0 was published in 2016. It consisted of a revision to the competence areas and competences (Vuorikari et al., 2016). DigComp 2.1 (2017) entailed development of the proficiency levels of DigComp 1.0. (Carretera et al., 2017). The fourth iteration, DigComp 2.2 (Vuorikari et al., 2022a) was published in 2022 under the Digital Education Action Plan, to include AI competence and the use of data.

5. An Annual Monitoring Report on the Declaration on Digital Rights and Principles (European Commission, 2025e) provides an overview of actions at both the EU level and national level.

6. The rich cultural and linguistic diversity of the EU with its 24 official languages and over 60 regional and minority languages is also important to acknowledge, particularly with the advantages (e.g. Rehm & Way, 2023) and constraints (e.g. Helm et al., 2024) for multilingualism brought about by recent digital technological developments.

1.5 What is new in DigComp 3.0

Several priority themes relating to *content* (i.e. what digital competence consists of) and *application* (i.e. how the framework is adapted and used and its role in education, training and employment systems) guided the development of DigComp 3.0 (**Figure 3**). These were identified on the basis of policy and academic literature and consultation with experts and stakeholders and are embedded holistically into the content and design of the framework.

Figure 3. Content and application themes guiding DigComp 3.0 development.

Content Themes
Artificial Intelligence (including generative AI) competence
Cybersecurity competence
Digital rights, choice and responsibilities
Wellbeing in digital environments
Competence to tackle misinformation and disinformation
Application Themes
Digital competence as a key part of lifelong learning
Recognition of pre-requisites for acquiring basic-level digital competence
Recognition of differences in digital competence needs across individuals and over time
Need for flexible, agile applications of the framework

Source: JRC own elaboration.

Figure 4 summarises the objectives and key features of the DigComp 3.0 update, which are described in detail in **Section 2** and **Annex 1.** The update to DigComp 3.0 is driven by substantial technological developments, trends and practices (such as the rapid diffusion of generative AI) that have occurred since the publication of DigComp 2.2 in 2022. These have wide-ranging implications for individuals' digital competences and are expressed in policy priorities and stakeholder concerns (Abendroth-Dias et al., 2025; Farias-Gaythan et al., 2023; Lewandowsky et al., 2020; Onesi-Oizigagun et al., 2023). DigComp 3.0 also responds to requests from existing users and stakeholders, who have sought more clarity on practical applications of DigComp. A key recommendation in a study on the feasibility of a European Digital Skills Certificate involving 650 stakeholders across all EU Member States was to develop learning outcomes for DigComp (Centeno et al., 2024a).

Figure 4. DigComp 3.0: objectives, developments and resources for implementation.

OBJECTIVES	1. Incorporate recent and emerging digital technological trends and their implications for digital competence, while maintaining overall framework structure and technology neutrality. 2. Develop learning outcomes and other appropriate enhancements to support clarity and operational alignment in how DigComp is applied.
CHANGES AND DEVELOPMENTS	– **Updates** to the **wording** of the five **competence areas** and 21 **competences** to reflect current technological trends. – A **new** general description of **proficiency levels** (Basic, Intermediate, Advanced and Highly advanced) which are 'mappable' to the previous version, and **new and revised competence statements** for each proficiency level and competence. – Development of **learning outcomes**, for clearer interpretation and implementation. – A systematic, transversal **integration of AI competence** into the framework which builds on DigComp 2.2, as well as incorporating recent developments in relation to AI.
RESOURCES FOR IMPLEMENTATION	– A detailed **Glossary** around 120 key terms in this document. – Clear and user-friendly information on DigComp 3.0 on the JRC-DigComp web space. – Also on the JRC-DigComp web space, versions of DigComp 3.0 in spreadsheet and linked open data (JSON) formats.

Source: JRC own elaboration.

1.6 Using DigComp 3.0

DigComp 3.0 is non-prescriptive and should be adapted and tailored to specific uses and applications.

DigComp is designed to guide and inspire initiatives and actions that support the development of digital competence of individuals, both generally (as in general policymaking), or among specific groups (such as young learners, adult learners, vulnerable or marginalised individuals, workers or jobseekers). As such, it should be considered as a starting point, to be adapted to fit a specific purpose.

The next two sections of this framework document describe the main components of DigComp 3.0.

2

DIGCOMP 3.0
FRAMEWORK COMPONENTS

2. DIGCOMP 3.0 FRAMEWORK COMPONENTS

2.1 Overview

Table 1 describes the components of DigComp 3.0, and their purposes: **definition** of digital competence, **competence areas**, **competences**, **proficiency levels**, and l**earning outcomes**.

Table 1. Components of the DigComp 3.0 framework.

Component	Description and purpose
Definition of digital competence	Establishes the content and scope of the framework, distinguishing between knowledge, skills and attitudinal aspects of digital competence, and positions the framework in the broader context of key competences for lifelong learning. See **Section 2.2**.
Competence areas	Organises competences into five thematic groups, consisting of competence area names (titles) and descriptors (short descriptions of the competences covered in each competence area). See **Section 2.3**.
Competences	Defines 21 competences, organised under the five competence areas, consisting of competence names (titles) and descriptors (short descriptions of what each competence consists of). See **Section 2.3**.
Proficiency levels	Establishes a continuum of proficiency based on cognitive demand, task complexity and level of autonomy. **General** proficiency levels (see **Section 2.4**) describe digital competence along Basic, Intermediate, Advanced and Highly Advanced levels. **Competence statements** (see **Section 3**) provide a more detailed view of the proficiency levels for each of the 21 competences.
Learning outcomes	Learning outcomes (see **Section 2.5** and **Annex 2**) provide the most 'granular' view of the framework and consist of statements of what an individual is expected to know or be able to do after completing learning (of any kind). Each of the learning outcome statements is classified by competence, proficiency level, and knowledge, skill or attitude. Learning outcomes have been developed to enable a concrete and consistent interpretation of the framework.

Source: JRC own elaboration.

2.2 Definition of digital competence

The Council Recommendation on Key Competences for Lifelong learning (European Commission, 2018) defines digital competence, which can be applied to both children and adults, as:

> *...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. (European Commission, 2018, p. 9)*

Competences are defined as a combination of knowledge, skills and attitudes, where:

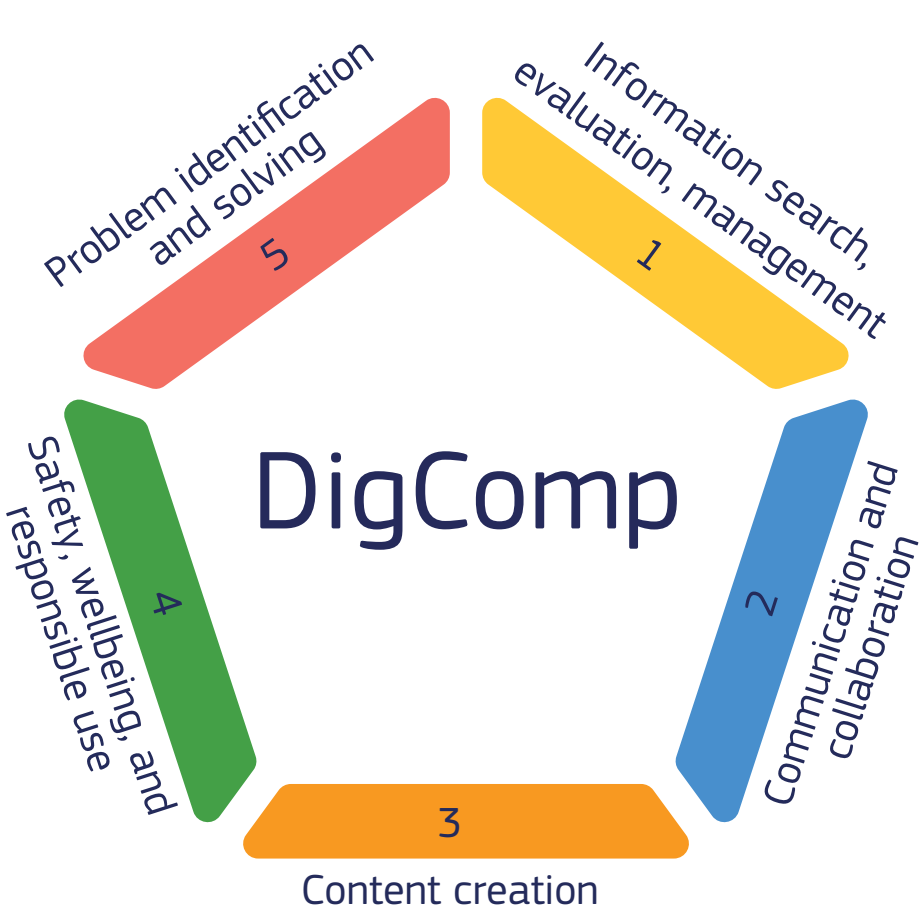
- **Knowledge** is composed of the facts and figures, concepts, ideas and theories which are already established and support the understanding of a certain area or subject;
- **Skills** are defined as the ability and capacity to carry out processes and use the existing knowledge to achieve results; and
- **Attitudes** describe the disposition and mind-sets to act or react to ideas, persons or situations.

DigComp 3.0 continues to align with this overall definition, at the same time reflecting recent and emerging trends and priorities.

2.3 Competence areas and competences

Figure 5 shows how the competences are grouped into the competence areas, while **Table 2** shows, in addition, the descriptors for each competence area and competence. **Annex 1** (**Table A2**) compares the competence areas and competences of DigComp 3.0 with the previous version.[7]

Figure 5. DigComp 3.0 competence areas and competences.



1
- 1.1 Browsing, searching, filtering
- 1.2 Evaluating
- 1.3 Managing

2
- 2.1 Interacting
- 2.2 Sharing
- 2.3 Engaging in citizenship
- 2.4 Collaborating
- 2.5 Digital behaviour
- 2.6 Digital identity

3
- 3.1 Developing
- 3.2 Integrating and re-elaborating
- 3.3 Copyright and licenses
- 3.4 Computational thinking and programming

4
- 4.1 Devices
- 4.2 Personal data and privacy
- 4.3 Wellbeing
- 4.4 Environment

5
- 5.1 Technical problems
- 5.2 Needs and technological responses
- 5.3 Creative solutions
- 5.4 Digital competence needs

Source: JRC own elaboration.

7. DigComp 3.0 competences can be inter-related to one another. For example, Competence 3.4, Computational thinking and programming, has transversal relevance, i.e. can enable aspects of several other competences. However, its position is maintained in 3.4 for structural consistency with the previous version.

Table 2. DigComp 3.0 competence area and competence titles and descriptors.

COMPETENCE AREA TITLE AND DESCRIPTOR	COMPETENCE TITLE	COMPETENCE DESCRIPTOR
1. INFORMATION SEARCH, EVALUATION AND MANAGEMENT To articulate information needs, and to search for, locate and retrieve digital information and content. To judge the relevance of the source and its content in digital environments. To critically evaluate digital sources, content, and processes used to generate them. To store, manage, organise and analyse digital information and data.	**1.1 Browsing, searching and filtering information**	To articulate information needs, to know how and where to search for information and content in digital environments, and to access and navigate between them. To select appropriate digital tools to create, implement and update searches in digital environments and to be able to distinguish between relevant and irrelevant information and content.
	1.2 Evaluating information	To assess and compare the credibility and reliability of sources of information and content in digital environments. To interpret and critically evaluate information and content in digital environments, and the processes used to generate them.
	1.3 Managing information	To organise, store and retrieve information and data in digital environments. To collect, process and analyse information and data in structured digital environments.
2. COMMUNICATION AND COLLABORATION To interact, share, communicate and collaborate in digital environments while being aware of cultural, generational and other diversity and the features and limitations of digital technologies. To participate in society through digital technologies. To assert one's rights and exercise choice in digital environments. To manage one's digital presence, identity and reputation.	**2.1 Interacting through and with digital technologies**	To interact through and with a variety of digital technologies, and to use appropriate digital communication for a given context.
	2.2 Sharing through digital technologies	To share information and content ethically and responsibly with others through appropriate digital technologies.
	2.3 Engaging in citizenship through digital technologies	To participate in society through the ethical and responsible use of digital platforms and services. To seek opportunities for self-empowerment and participation through appropriate digital technologies. To be aware of and assert one's rights, and to exercise choice, in digital environments.
	2.4 Collaborating through digital technologies	To use digital technologies ethically and responsibly for collaborative purposes, and for the co-construction and co-creation of information, resources and knowledge.
	2.5 Digital behaviour	To be aware of behavioural norms, and to know how to behave respectfully while using digital technologies and interacting in digital environments. To adapt communication to specific contexts, and to be aware of and respect cultural, generational and other diversity in digital environments.
	2.6 Managing digital identity	To manage one or multiple digital identities. To take actions to help protect one's digital reputation (how one is perceived based on online presence), and to manage one's digital footprint (the data that is produced through use of and by digital platforms and services).

COMPETENCE AREA TITLE AND DESCRIPTOR	COMPETENCE TITLE	COMPETENCE DESCRIPTOR
3. CONTENT CREATION To create and edit digital content. To improve and integrate information and content into an existing body of knowledge while understanding how copyright and licences are to be applied, adopting an ethical and responsible approach in the creation, improvement and integration of digital content. To know how to apply computational thinking and programming techniques to give instructions to a computer system.	**3.1 Developing digital content**	To use digital technologies ethically and responsibly to create and edit a variety of content. To express oneself through digital means.
	3.2 Integrating and re-elaborating digital content	To modify, refine and integrate new information and content into existing knowledge and resources to create new and original content and knowledge.
	3.3 Copyright and licences	To understand how copyright and licences, as well as associated legal and ethical issues, apply to digital content, and how to correctly apply them.
	3.4 Computational thinking and programming	To understand and implement steps to analyse a problem, recognise sub-problems, and plan and develop a sequence of instructions for a computing system to solve a given problem or to perform a specific task.
4. SAFETY, WELLBEING AND RESPONSIBLE USE To protect, devices, content, personal data and privacy in digital environments. To support physical, mental and social wellbeing of oneself and others, and to be aware of the benefits and risks of digital technologies for wellbeing and social inclusion. To be aware of the environmental impact of digital technologies and their use, to take action to reduce such impact, and to use digital technologies to support sustainability.	**4.1 Protecting devices**	To apply safety and cybersecurity measures in order to protect digital devices and content. To be aware of the evolving nature of risks and threats in digital environments, and to have due regard to security of digital devices and their contents.
	4.2 Protecting personal data and privacy	To be aware of and exercise one's rights in relation to personal data and privacy in digital environments. To evaluate and manage privacy risks and protect personal data and privacy in digital environments. To use and share one's own and others' personal data safely, ethically and responsibly.
	4.3 Supporting wellbeing	To use digital technologies in ways that support wellbeing and inclusion. To minimise risks and threats to physical, mental and social wellbeing of oneself and others while using digital technologies. To balance usage of digital technologies with offline activities to support wellbeing. To take action to help protect oneself and others from possible dangers in digital environments (e.g. cyberbullying, harmful content), and to know how to respond to such dangers.
	4.4 Environmental impacts of digital technologies	To be aware of the environmental impacts of digital technologies, including device production, operation, repair, recycling, disposal, data storage infrastructure, energy consumption and usage of tools and applications. To take action to reduce such impact and to use digital technologies to support sustainability.

COMPETENCE AREA TITLE AND DESCRIPTOR	COMPETENCE TITLE	COMPETENCE DESCRIPTOR
5. PROBLEM IDENTIFICATION AND SOLVING To identify and assess needs, and to use digital technologies and adapt digital environments to meet these needs. To identify and resolve technical and conceptual problems and problem situations in digital environments. To use digital technologies to make improvements in, or new solutions for, processes and products. To build capabilities to operate autonomously in digital environments. To stay informed about digital technological developments and their implications.	**5.1 Identifying and solving technical problems**	To identify technical problems when operating digital devices and in digital environments, and to solve them through a variety of means.
	5.2 Identifying needs and digital technological responses	To assess one's own and others' needs and to evaluate, select, use and adapt digital technologies to meet these needs. To adjust and customise digital environments to the contexts, goals and needs (e.g. accessibility) of oneself and others.
	5.3 Identifying creative solutions using digital technologies	To use digital technologies to make improvements in or new solutions for processes and products, using a human-centric approach. To engage individually and collectively in critical thinking processes, and the creative and purposeful use of digital technologies, to understand and resolve conceptual problems and problem situations.
	5.4 Identifying and addressing digital competence needs	To recognise where one's own digital competence needs to be improved or updated. To address digital competence needs within a broader process of lifelong learning, building capacity and autonomy. To support others with their digital competence development. To stay informed about digital technological developments and their personal, professional and societal implications.

Source: JRC own elaboration.

2.4 Proficiency levels

2.4.1 PROFICIENCY LEVEL DESCRIPTIONS

In DigComp 3.0, proficiency levels describe the level of digital competence acquisition of an individual on the basis of a combination of cognitive demand, task complexity and level of autonomy.[8] DigComp 3.0 distinguishes between four proficiency levels (Basic, Intermediate, Advanced and Highly Advanced). **Table 3** provides a short description of what an individual can be expected to know and be able to do at each of the four levels and the purposes that each of the four levels of proficiency serve.

Box 2 provides some notes and definitions on the proficiency levels to guide interpretation and use. **Table A3** in **Annex 1** shows how these four proficiency levels can be 'mapped' to the more granular eight-level structure of the previous version of DigComp that is used in some contexts (e.g., assessment, certification), as well as to a six-level scheme adopted by some users of the framework.

> ***Section 3*** *shows what the four proficiency levels look like for each of the competences through specific* ***Competence Statements****. There are* ***362*** *competence statements,* ***27%*** *(97) at* ***Basic*** *level,* ***28%*** *(103) at* ***Intermediate*** *level,* ***25%*** *(89) at* ***Advanced*** *level, and* ***20%*** *(73) at* ***Highly advanced*** *level.*

Table 3. DigComp 3.0 proficiency level descriptions and purposes.

Proficiency Level	Short description of competence acquisition	Purpose
Basic	At basic level, individuals remember and implement simple tasks with guidance as needed.	To support personal, learning and/or working goals and participate in society.
Intermediate	At intermediate level, individuals identify and implement well-defined tasks and solve well-defined problems autonomously.	To support personal, learning and/or working goals and participate autonomously in society.
Advanced	At advanced level, individuals assess and apply solutions to a variety of complex tasks autonomously and adapt to a variety of contexts to evaluate and execute tasks appropriately, guiding others if and as required.	To support personal, learning and/or working goals, participate effectively in society, and manage or support others in achieving their goals.
Highly advanced[9]	At highly advanced level, individuals assess, evaluate and resolve highly complex or specialised problems to create new solutions or adapt existing ones, leading and guiding others if and as required.	To support personal, learning and/or working goals, help others to participate effectively in society, lead or support others to achieve complex goals, and/or lead or contribute to improvements in or new solutions for highly complex problems.

Source: JRC own elaboration.

8. The approach to the DigComp proficiency levels is inspired by the European Qualifications Framework (EQF) (Carretero et el., 2017). Nonetheless, the 'levels' of the EQF do not mean the same as the 'levels' of DigComp proficiency. For example, a naïve mapping between the EQF (or a National Qualifications Framework (NQF)) and DigComp could suggest that primary school children (EQF Level 1) would need only Basic-level DigComp competences. However, many children may reach Intermediate or even Advanced levels for some competences, depending on their stage of development and curricular aims. Some countries (e.g. Digital Austria, 2024), have mapped DigComp to an NQF.

9. While Highly Advanced digital competence in DigComp 3.0 is relevant to ICT specialists (i.e. many ICT specialist roles can benefit from Highly Advanced DigComp competences), they are not the same as ICT specialist skills. ICT specialists are workers who have the ability to develop, operate and maintain ICT systems, for whom ICT constitute the main part of their job (Eurostat, 2025), and typically require specialised training. Eurostat provides a list of occupations which are classified as ICT specialists.

Box 2. Guiding notes and definitions related to DigComp 3.0 proficiency levels.

Each of the four proficiency levels of DigComp 3.0 includes (i) a short description of competence acquisition and (ii) the purposes that each level can serve. It is important to acknowledge that **digital competence needs vary across individuals and change over time,** due to life transitions and digital technological developments.

A **task** is a specific activity which involves the use of digital technologies that contributes to a goal, in any context – everyday life, work, or learning. Tasks can vary in size, duration and complexity and may be carried out individually or in collaboration with others. Tasks may range from simple to complex. In DigComp 3.0, a **simple task** is one which is well-defined, consisting of few parts, and easy to understand and complete. In contrast, a **complex task** is one which is not well-defined, consisting of many different and inter-connected parts, and therefore intricate and not easy to understand or complete. Complexity of a task is often described on the basis of task characteristics alone – however, the experience and characteristics of an individual undertaking a task are also relevant (Chen et al., 2023).

At **Advanced** and **Highly Advanced** levels of digital competence, individuals may draw on experience and/or specialised knowledge alongside digital competences to complete tasks. Here, **specialised** knowledge and skills refer to competences relating to a particular discipline, field or area.

Source: JRC own elaboration.

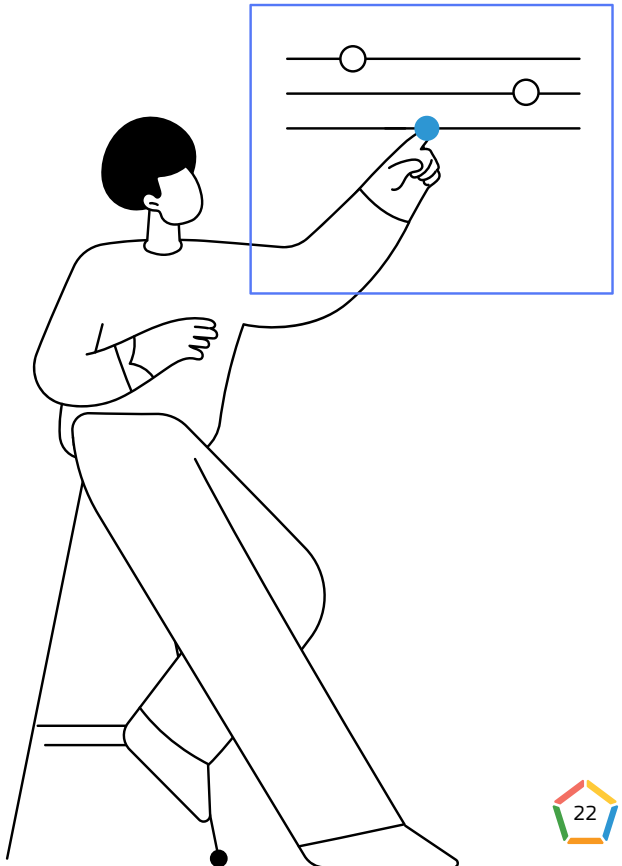
2.4.2 PRE-REQUISITES OF BASIC-LEVEL DIGITAL COMPETENCE

The European Commission's Action Plan on Basic Skills (European Commission, 2025c), part of the overarching Union of Skills strategy (European Commission, 2025b) emphasises the importance of basic digital skills (along with skills in reading, numeracy, science, and citizenship). These form the foundations of other competences, such as critical thinking and creativity, which are essential for participation in society, democratic life and the economy and/or labour market. The importance of basic digital skills for all individuals is also acknowledged by the United Nations (UN) Global Digital Compact (GDC), the first comprehensive framework for global digital governance agreed by UN Member States in 2024, which aims to foster an inclusive, open, safe and secure digital space that respects, protects and promotes human rights.

It is important that initiatives designed to support basic digital competence development include a consideration of what is needed by individuals to access and participate in learning to reach basic digital competence as it is described in DigComp 3.0. If this is not considered, digital exclusion may widen, or the initiative may exclude certain groups and individuals.

As an example, Austria includes an Area 0, Foundations, Access and Digital Understanding, in its national adaptation of DigComp, DigComp 2.3 AT (Nárosy et al., 2022).

Several **pre-requisites** must be in place for an individual to be able to reach the DigComp 3.0 basic level of digital competence, starting with a level of literacy that is sufficient to decode basic visual, textual and/or audio information. Other pre-requisites include access to a sufficiently fast and stable internet connection; access to one or more suitable digital devices to connect to the internet which have the applications required by the user; to technical assistance, where needed; and to appropriate guidance and support, if needed, to adapt devices and settings to individual physical, cognitive or psychological needs (ITU, 2022).



2.5 Learning outcomes

In DigComp 3.0, learning outcomes are statements of what an individual knows, understands or is able to do on completion of a learning process, and are defined in terms of knowledge, skills and attitudes.

Learning outcomes are an important **policy and practical tool**. Used well, they act as the 'glue' that joins education and training with labour market contexts (Cedefop, 2024a). They influence policy, education, training, assessment and the labour market in a range of ways – to guide curriculum or course content development, implementation and revision; as a reference point for the recognition and validation of formal, non-formal and informal learning; to define and inform qualifications frameworks and standards; to support summative and formative assessment; to signal key employment skills in occupational profiling; and to contribute to sectoral needs analysis (Cedefop, 2017, 2022, 2024a).

The development of learning outcomes in DigComp 3.0 builds on extensive existing work on learning outcomes at European level (e.g. Cedefop, 2017, 2021, 2022, 2024a; Council of the EU, 2017). They aim to provide a practical way of integrating the DigComp competences into existing or new policies, training material or curricula development, amongst others.

It is important to distinguish between **intended** and **achieved** learning outcomes. Intended learning outcomes are statements of what an individual is *expected* to know, understand or be able to do after completion of a learning process. They relate to principles and concepts and might be observed in curricula, qualifications descriptions and standards. Achieved learning outcomes are what an individual is able to *demonstrate* after completion of a learning process. They are related to practice and are the result of an education or training and assessment process (Cedefop, 2022).

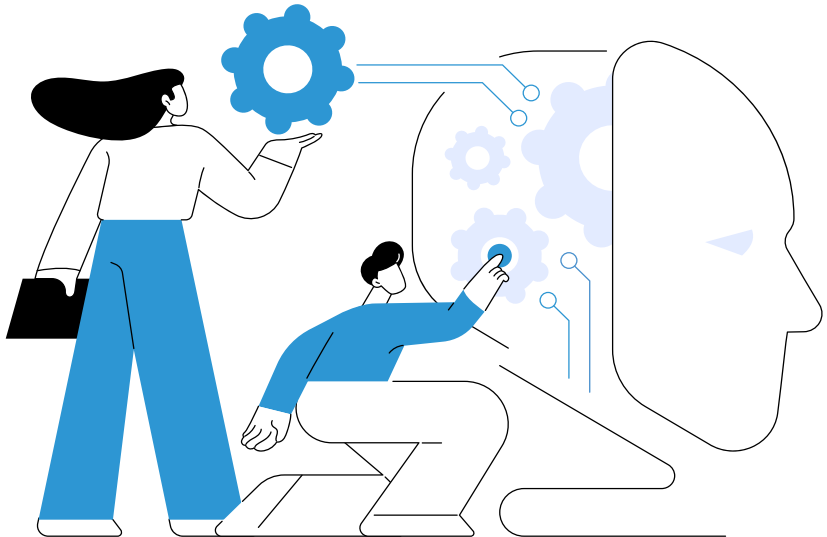
The term 'learning outcomes' in DigComp 3.0 refers to intended, not achieved, learning outcomes.

For the development of DigComp 3.0, the JRC, with input from experts and stakeholders, has carefully considered the balance between **specificity** and **generality** to try to ensure that the wording of the learning outcomes is sufficiently generic to apply across various contexts, while at the same time being sufficiently precise to be clear and unambiguous.

*Features of the DigComp 3.0 learning outcomes, practical considerations for their usage, and the full set of DigComp 3.0 learning outcomes themselves, are in **Annex 2**.*

*In **Annex 2**, learning outcomes are grouped by competence, proficiency level, and knowledge, skill or attitude. In total, there are **523** learning outcomes: **29%** (151) are at the **Basic** level, **32%** (170) **Intermediate**, **23%** (119) **Advanced** and **16%** (83) **Highly advanced**. Also, **42%** (217) of the learning outcomes relate to **knowledge**, **38%** (199) to **skills**, and **20%** (107) to **attitudes**.*

***Section 3** shows competence statements for each competence and proficiency level (see also **Section 2.4**). The competence statements contain the content of the learning outcomes in **Annex 2**, with a lot of commonality in wording, but do not distinguish between knowledge, skills or attitudes.*



2.6 AI competence in DigComp 3.0

DigComp 3.0 builds on the initial work of DigComp 2.2 to systematically include the aspects of AI competence that are relevant for individuals to develop as part of their digital competence. AI competence is intertwined with and builds on other elements of digital competence, as AI systems are widely diffused, and increasingly embedded within existing digital technologies. In DigComp 3.0, AI is framed as one digital technology among a range of digital technologies, while keeping the focus on the digital competences themselves.

Several definitions and analyses of AI literacy have been proposed, from the **literature** (e.g. Touretzky et al. 2019, 2023; Long & Magerko, 2020; Ng et al., 2021); **legislation** (the 2024 AI Act, Regulation (EU) 2024/1689); recent **AI literacy frameworks** (e.g. OECD, 2025; Mills et al., 2024; UNESCO, 2024); and **policy reports** (e.g. Miao et al., 2022; Di Vinadio et al., 2022). These various sources emphasise conceptual understanding of what AI is (and is not), contexts for its application, and critical, ethical and responsible approaches to using AI. These features are reflected in DigComp 3.0.

To ensure that AI competence is well-integrated in DigComp 3.0, the JRC, with experts, has undertaken a review of recent and emerging digital technology trends and a mapping between the competences of the (draft) European Commission-OECD AI literacy framework (OECD, 2025) and DigComp 3.0 (see **Annex 3** for more detail).

In DigComp 3.0, we define AI as per the AI Act (Article 3(1)):

> *...a machine-based system designed to operate with varying levels of autonomy, that may exhibit adaptiveness after deployment and that, for explicit or implicit objectives, infers from the input it receives how to generate output, such as predictions, content, recommendations or decisions that can influence physical or virtual environments. This definition takes a lifecycle perspective, covering both pre-deployment and deployment.*[10]

In DigComp 3.0, the terms 'AI' and 'AI system' are used in their broad sense and include generative AI (systems). However, reference to generative AI in DigComp 3.0 is made when it is considered to be of central relevance to a competence. In DigComp 3.0, **generative AI** is defined as a subset of AI that uses specialised machine learning models designed to produce a wide and general variety of outputs, capable of a range of tasks and applications, such as generating text, image or audio (Abendroth-Dias et al., 2025).

Competence statements (in **Section 3**) which explicitly mention AI systems are labelled '**[AI-E]**' (AI-explicit), while those for which AI or AI systems are implicitly relevant but that do not explicitly mention AI systems are labelled '**[AI-I]**' (AI-implicit). Similarly, individual learning outcomes (**Annex 2**) are labelled as being AI-Explicit, AI-Implicit, or AI not Implicit or Explicit.

10. See the Guidelines on the definition of an artificial intelligence system for more details (European Commission, 2025f).

Box 3 provides more information on the meaning of AI-explicit and AI-implicit in DigComp 3.0.

Box 3. Explicit and implicit AI competence in DigComp 3.0.

DigComp 3.0 distinguishes between AI-explicit and AI-implicit competences in the **competence statements** and the **learning outcomes.**

Of the 362 competence statements in DigComp 3.0 (**Section 3**), **14%** (50) are **AI-explicit**, **68%** (246) are **AI-implicit**, and **18%** (67) **do not implicitly or explicitly feature AI**.

Of the 523 learning outcomes in DigComp 3.0 (**Annex 2**), **13%** (69) are **AI-explicit, 63%** (330) are **AI-implicit,** and **24%** (124) **do not implicitly or explicitly feature AI.**

AI competence features explicitly, implicitly, or both, across **all 21 competences**. This demonstrates the **transversal impact of AI systems** on digital competence. The aspects of competences which do not explicitly or implicitly feature AI are those involving digital technologies other than AI or which are inherently 'human', requiring attributes such as choice, preferences or situational judgement.

AI labelling of competence statements in **Section 3** and learning outcomes in **Annex 2** as AI-explicit or AI-implicit is intended as a **broad guide** only.

AI-explicit or [AI-E] means that AI systems are explicitly relevant to that competence.

Meanwhile, **AI-implicit or [AI-I]** applies to competences for one or more of four reasons. The competence statement or learning outcome could:

I. **Involve the use of AI systems as one of several available digital technologies**
Example (see Section 3, *Competence statement 2.2.08*)**:** A person is trying to decide whether or not to use an AI system for a content creation task. To do so, they need to establish what output is desired and consider the added benefits of using an AI system over another digital technology.

II. **Involve the use of a digital technology that has AI system functionality embedded in it**
Example (see Section 3, *Competence statement 2.4.08*)**:** A collaboration tool has an AI-driven note-taking function. A person needs to decide whether or not to use it for a meeting. To do so, they need to consider what kind of meeting record is needed, and what benefits the AI-driven note-taking function might provide over and above a human taking notes.

III. **Relate to an understanding of how AI systems operate**
Example (see Section 3, *Competence statement 2.1.14*)**:** A person has a long text to read and is considering using an AI system to help provide a summary. If they decide to use AI, they need to select an appropriate AI tool. They also need to be competent in devising appropriate inputs or commands (prompts), experiment with and re-draft both the prompt(s) and output(s), and check the quality and accuracy of the output.
and/or

IV. **Relate to personal, ethical or societal implications of AI systems**
Examples: In choosing to use an AI system for a content creation task (in example (i) above) or for a text summarising task (example (iii)), the individual would need to ensure that the use of an AI system is transparent, and consider environmental impact – the latter of which is not immediately apparent to an individual user. In choosing to use the AI-driven note-taking function (example (ii)), consent of people attending the meeting would be required and, if the meeting topic is sensitive, privacy concerns would need to be considered.

Source: JRC own elaboration.

3

DIGCOMP 3.0 FRAMEWORK

3. DIGCOMP 3.0 FRAMEWORK

3.1 How to read DigComp 3.0

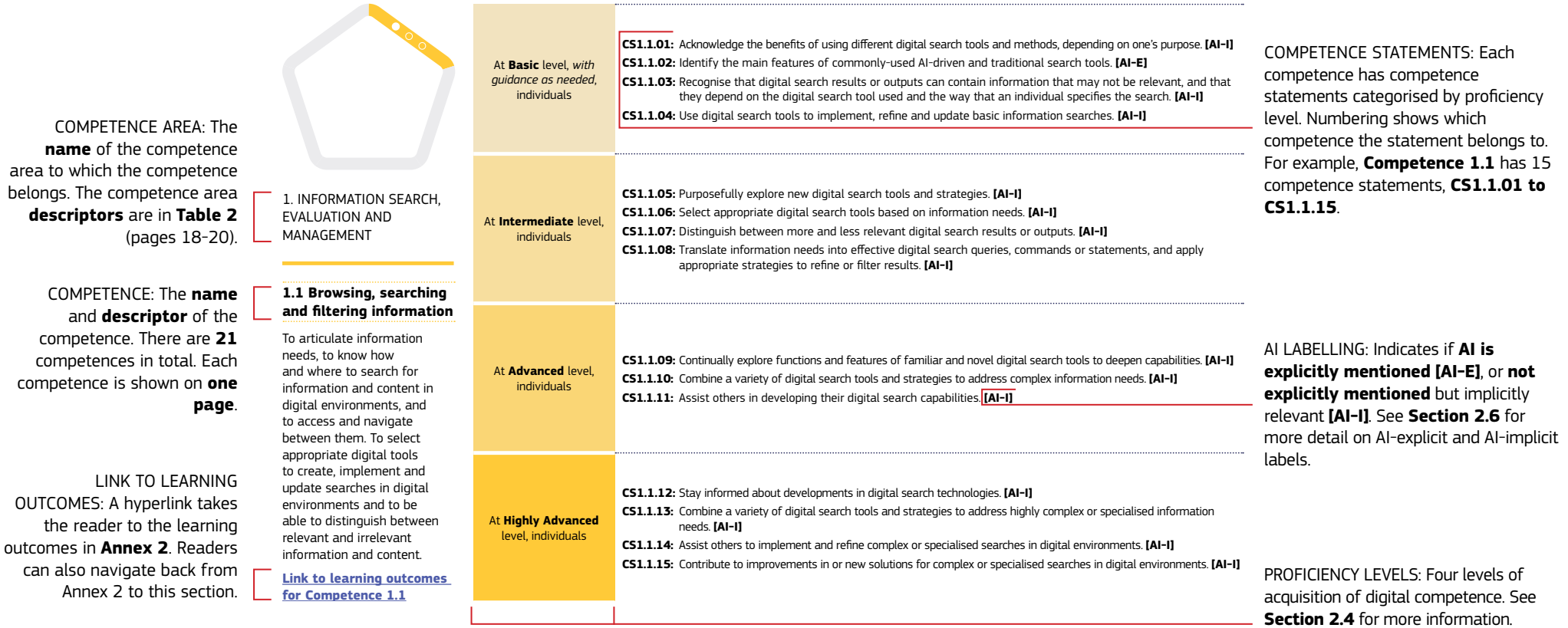
This section presents an integrated view of DigComp 3.0. It is recommended to review **Section 2** along with this one. Readers can also consult the **Glossary** for any terms that may be unclear. **Figure 6** explains how to navigate the contents of this section.

Figure 6. How to read DigComp 3.0.

COMPETENCE STATEMENTS AND LEARNING OUTCOMES – WHAT'S THE DIFFERENCE?

Learning outcomes (Annex 2) are classified by proficiency level and by knowledge, skills and attitudes. They provide the **most detailed view** of the framework and are for 'granular' purposes such as design or revision of education and training, teaching, learning and assessment content.

Competence statements (this Section 3) cover all of the key content in the learning outcomes, and are classified by proficiency level, but do not distinguish between knowledge, skills or attitudes. They are intended to **give a concrete sense** of each competence at each proficiency level.



Source: JRC own elaboration.

3.2 DigComp 3.0

1. INFORMATION SEARCH, EVALUATION AND MANAGEMENT

1.1 Browsing, searching and filtering information

To articulate information needs, to know how and where to search for information and content in digital environments, and to access and navigate between them. To select appropriate digital tools to create, implement and update searches in digital environments and to be able to distinguish between relevant and irrelevant information and content.

Link to learning outcomes for Competence 1.1

At **Basic** level, *with guidance as needed*, individuals	**CS1.1.01:** Acknowledge the benefits of using different digital search tools and methods, depending on one's purpose. **[AI-I]** **CS1.1.02:** Identify the main features of commonly-used AI-driven and traditional search tools. **[AI-E]** **CS1.1.03:** Recognise that digital search results or outputs can contain information that may not be relevant, and that they depend on the digital search tool used and the way that an individual specifies the search. **[AI-I]** **CS1.1.04:** Use digital search tools to implement, refine and update basic information searches. **[AI-I]**
At **Intermediate** level, individuals	**CS1.1.05:** Purposefully explore new digital search tools and strategies. **[AI-I]** **CS1.1.06:** Select appropriate digital search tools based on information needs. **[AI-I]** **CS1.1.07:** Distinguish between more and less relevant digital search results or outputs. **[AI-I]** **CS1.1.08:** Translate information needs into effective digital search queries, commands or statements, and apply appropriate strategies to refine or filter results. **[AI-I]**
At **Advanced** level, individuals	**CS1.1.09:** Continually explore functions and features of familiar and novel digital search tools to deepen capabilities. **[AI-I]** **CS1.1.10:** Combine a variety of digital search tools and strategies to address complex information needs. **[AI-I]** **CS1.1.11:** Assist others in developing their digital search capabilities. **[AI-I]**
At **Highly Advanced** level, individuals	**CS1.1.12:** Stay informed about developments in digital search technologies. **[AI-I]** **CS1.1.13:** Combine a variety of digital search tools and strategies to address highly complex or specialised information needs. **[AI-I]** **CS1.1.14:** Assist others to implement and refine complex or specialised searches in digital environments. **[AI-I]** **CS1.1.15:** Contribute to improvements in or new solutions for complex or specialised searches in digital environments. **[AI-I]**

1. INFORMATION SEARCH, EVALUATION AND MANAGEMENT

1.2 Evaluating information

To assess and compare the credibility and reliability of sources of information and content in digital environments. To interpret and critically evaluate information and content in digital environments, and the processes used to generate them.

Link to learning outcomes for Competence 1.2

At **Basic** level, *with guidance as needed*, individuals	**CS1.2.01:** Acknowledge the benefits of a cautious approach in interpreting information and content in digital environments. **[AI-I]** **CS1.2.02:** Recognise that some digital information sources and systems may not be trustworthy. **[AI-I]** **CS1.2.03:** Recognise that it can be difficult to distinguish between information and content generated by humans and AI systems. **[AI-E]** **CS1.2.04:** Recognise examples of misinformation, disinformation, and sources of bias. **[AI-I]** **CS1.2.05:** Recognise examples of social media influencing and filter bubbles. **[AI-I]** **CS1.2.06:** Make a basic assessment of the reliability and credibility of digital information sources and content. **[AI-I]**
At **Intermediate** level, individuals	**CS1.2.07:** Identify the source of online information and the purposes of fact-checking services to develop pre-bunking and de-bunking capabilities. **[AI-I]** **CS1.2.08:** Recognise that the data used to train AI systems and how they are trained affects the reliability of the information they provide. **[AI-E]** **CS1.2.09:** Recognise that some digital technologies, such as AI systems, might function like a 'black box', making it difficult to explain why or how an output has been produced. **[AI-E]** **CS1.2.10:** Recognise that AI systems may produce output which is inaccurate, even if it may seem plausible, and that the human using the AI system is responsible for checking the quality and validity of information and content generated. **[AI-E]** **CS1.2.11:** Recognise that individual (cognitive and affective) biases and AI system biases play a role in the generation and interpretation of information. **[AI-E]** **CS1.2.12:** Recognise and respond effectively to user-directing strategies in digital environments such as clickbait, nudging and gamification. **[AI-I]** **CS1.2.13:** Critically assess the reliability of sources, information and content in digital environments, considering the role of AI systems, personalisation effects, and commercial or other interests. **[AI-E]**
At **Advanced** level, individuals	**CS1.2.14:** Continually scrutinise how AI systems, biases, and various interests shape generation, presentation and interpretation of information in digital environments. **[AI-E]** **CS1.2.15:** Describe features of trustworthy digital technologies, such as AI systems. **[AI-E]** **CS1.2.16:** Describe personal, social and political consequences of misinformation, disinformation, sources of bias, social media influencing and filter bubbles. **[AI-I]** **CS1.2.17:** Thoroughly assess the reliability and accuracy of a diversity of digital sources, information and content, considering a range of potential influencing factors. **[AI-I]** **CS1.2.18:** Support others to develop capabilities to assess the credibility and reliability of digital sources, information and content. **[AI-I]**
At **Highly Advanced** level, individuals	**CS1.2.19:** Systematically assess and evaluate digital sources, information and content to support complex decision-making. **[AI-I]** **CS1.2.20:** Help others to develop capabilities to critically evaluate information and content, and resilience to misinformation and disinformation, in digital environments. **[AI-I]** **CS1.2.21:** Lead or contribute to initiatives that support accurate interpretation of information in digital environments. **[AI-I]**

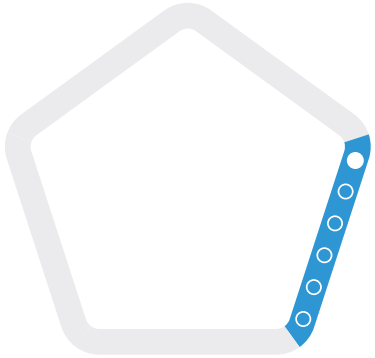
1. INFORMATION SEARCH, EVALUATION AND MANAGEMENT

1.3 Managing information

To organise, store and retrieve information and data in digital environments. To collect, process and analyse information and data in structured digital environments.

Link to learning outcomes for Competence 1.3

At **Basic** level, *with guidance as needed*, individuals	**CS1.3.01:** Acknowledge the benefits of managing and organising information in digital environments. **CS1.3.02:** Recognise functions of data removal, restoration and backup, and main properties of digital files and folders. **CS1.3.03:** Download, save, retrieve, move and delete digital files. **CS1.3.04:** Organise and format simple data in a structured digital environment, such as in spreadsheets. **CS1.3.05:** Update one's contacts, such as on phone, email or social media.
At **Intermediate** level, individuals	**CS1.3.06:** Acknowledge the importance of careful and ethical management of data and information in digital environments. **[AI-I]** **CS1.3.07:** Apply naming conventions to digital files and hierarchies to digital folders. **CS1.3.08:** Organise folders, and manage, save and delete files on digital devices, external storage, and cloud services. **CS1.3.09:** Identify common types of data and their formats, and use data collection tools for simple processing of data. **[AI-I]** **CS1.3.10:** Manage information in one's digital accounts, such as email. **[AI-I]** **CS1.3.11:** Organise and format data and apply basic formulas in a structured digital environment, such as in spreadsheets.
At **Advanced** level, individuals	**CS1.3.12:** Prioritise ethical and transparent management and processing of data and information in digital environments. **[AI-I]** **CS1.3.13:** Apply a variety of functions to transfer and manage data and information in digital environments. **[AI-I]** **CS1.3.14:** Describe examples, applications and limitations of open data and big data. **[AI-I]** **CS1.3.15:** Use range of digital tools and methods to collect and process a variety of data and information. **[AI-I]** **CS1.3.16:** Apply appropriate analysis to information and data in digital environments to contribute to complex decision-making. **[AI-I]** **CS1.3.17:** Assist others with data and information management, processing and analysis in digital environments. **[AI-I]**
At **Highly Advanced** level, individuals	**CS1.3.18:** Acknowledge the importance of structuring and documenting data and information in digital environments for the benefit of others. **CS1.3.19:** Develop and implement strategies for complex or specialised data and information management, processing and analysis in digital environments. **[AI-I]** **CS1.3.20:** Use a variety of digital tools and methods to process, manage or analyse complex data or large volumes of information. **[AI-I]** **CS1.3.21:** Lead or contribute to initiatives that support others in advanced information and data management, processing and analysis in digital environments. **[AI-I]** **CS1.3.22:** Contribute to improvements in or new solutions for data management, processing or analysis in digital environments. **[AI-I]**



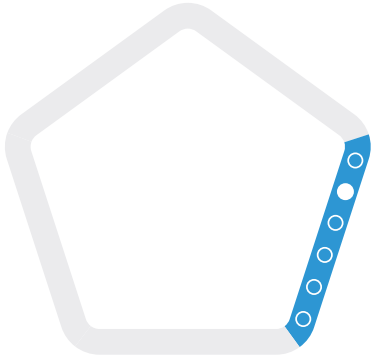
2. COMMUNICATION AND COLLABORATION

2.1 Interacting through and with digital technologies

To interact through and with a variety of digital technologies, and to use appropriate digital communication for a given context.

Link to learning outcomes for Competence 2.1

At **Basic** level, *with guidance as needed*, individuals	**CS2.1.01:** Identify and use basic features of digital communication tools to interact with individuals and groups. **[AI-I]** **CS2.1.02:** Acknowledge the importance of taking others' preferences into account in digital communication. **CS2.1.03:** Recognise differences between digital and non-digital interactions, and between physical and virtual realities. **[AI-I]** **CS2.1.04:** Identify basic features of virtual assistants (chatbots) and recognise key differences between human-to-machine and human-to-human interactions. **[AI-I]** **CS2.1.05:** Recognise in general terms what a robot is, the non-human nature of robots, and that humans interact with robots to carry out tasks. **[AI-I]**
At **Intermediate** level, individuals	**CS2.1.06:** Acknowledge the importance of tailoring one's digital communication to specific contexts. **CS2.1.07:** Recognise that there is a reality-virtuality continuum in digital environments. **[AI-I]** **CS2.1.08:** Identify a suitable communication means for a given context or purpose. **[AI-I]** **CS2.1.09:** Use multiple features of a variety of digital communication tools to interact with and manage individuals, groups and channels. **[AI-I]** **CS2.1.10:** Develop and refine questions, commands or statements (prompts) for virtual assistants (chatbots) and AI systems to handle non-complex interactions. **[AI-E]** **CS2.1.11:** Define how humans can interact with robots, identifying their key features (such as sensors, software, motion controls and human interface), and recognising that they can operate with varying degrees of autonomy. **[AI-I]**
At **Advanced** level, individuals	**CS2.1.12:** Continually adapt communication in digital environments in response to a variety of contexts. **CS2.1.13:** Combine digital communication tools and methods for complex communication and interaction tasks. **[AI-I]** **CS2.1.14:** Systematically develop and progressively refine questions, commands or statements (prompts) for AI systems to handle complex interactions. **[AI-E]** **CS2.1.15:** Assist others to assess and select suitable digital communication tools for a given purpose. **[AI-I]** **CS2.1.16:** Organise and/or moderate complex digital events. **[AI-I]** **CS2.1.17:** Assess benefits and disadvantages of robotic applications in a specific context. **[AI-I]**
At **Highly Advanced** level, individuals	**CS2.1.18:** Stay informed about developments in digital communication and interaction tools and methods. **[AI-I]** **CS2.1.19:** Assess and combine digital communication and interaction tools for highly complex or novel tasks. **[AI-I]** **CS2.1.20:** Provide guidance, support or leadership in the advanced use of communication and interaction tools. **[AI-I]** **CS2.1.21:** Lead or contribute to improvements in or new solutions for digital communication or human-machine interaction. **[AI-I]**



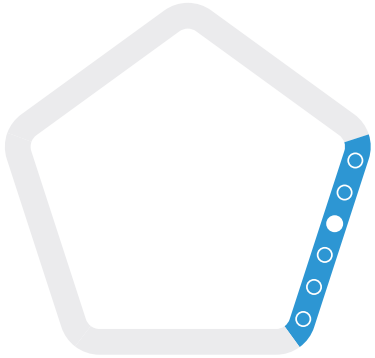
2. COMMUNICATION AND COLLABORATION

2.2 Sharing through digital technologies

To share information and content ethically and responsibly with others through appropriate digital technologies.

Link to learning outcomes for Competence 2.2

At **Basic** level, *with guidance as needed*, individuals	**CS2.2.01:** Acknowledge the importance of ethical and responsible sharing of information and content. **[AI-I]** **CS2.2.02:** Identify functions and uses of social media, and examples of common social media platforms. **[AI-I]** **CS2.2.03:** Recognise benefits and risks of sharing information and content in digital environments, and that individuals can choose how and what to share. **[AI-I]** **CS2.2.04:** Recognise that content can be shared in a variety of ways by AI systems as well as humans. **[AI-E]** **CS2.2.05:** Identify purpose and target audience of information and content to be shared in digital environments. **CS2.2.06:** Use simple processes to share information and content in digital environments appropriately and in accordance with goals.
At **Intermediate** level, individuals	**CS2.2.07:** Acknowledge the importance of assessing the value and accuracy of information and content prior to sharing it in digital environments. **CS2.2.08:** Define responsibilities associated with sharing information and content in digital environments. **[AI-I]** **CS2.2.09:** Describe and implement effective and ethical ways to share information and content in a variety of digital environments. **[AI-I]** **CS2.2.10:** Report or flag misinformation and disinformation that has been shared in digital environments. **[AI-I]**
At **Advanced** level, individuals	**CS2.2.11:** Acknowledge the value of sharing information and content in digital environments to assist others. **CS2.2.12:** Share information and content in digital environments to support personal, learning or professional goals of oneself and others. **[AI-I]** **CS2.2.13:** Advise others on effective and ethical ways to share information and content in digital environments. **[AI-I]**
At **Highly Advanced** level, individuals	**CS2.2.14:** Facilitate complex sharing of information across a variety of digital technologies, exploring new and alternative means as needed. **[AI-I]** **CS2.2.15:** Contribute to complex or specialised initiatives for sharing information and content in digital environments. **[AI-I]** **CS2.2.16:** Lead or contribute to improvements in or new solutions for sharing information and content in digital environments. **[AI-I]**



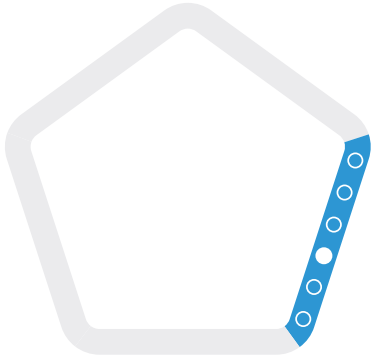
2. COMMUNICATION AND COLLABORATION

2.3 Engaging in citizenship through digital technologies

To participate in society through the ethical and responsible use of digital platforms and services. To seek opportunities for self-empowerment and participation through appropriate digital technologies. To be aware of and assert one's rights, and to exercise choice, in digital environments.

Link to learning outcomes for Competence 2.3

At **Basic** level, *with guidance as needed*, individuals	**CS2.3.01:** Identify main purposes and functions of digital platforms and services, using them with assistance as needed. **[AI-I]** **CS2.3.02:** Recognise the potential of digital technologies for participation and empowerment – and exclusion – of oneself and specific groups and communities. **[AI-I]** **CS2.3.03:** Recognise that there are laws and regulations to protect the rights of users of digital platforms and services. **[AI-I]** **CS2.3.04:** Use digital tools to search for and find communities for civic participation on issues of interest. **[AI-I]**
At **Intermediate** level, individuals	**CS2.3.05:** Participate in discussions on digital citizenship topics. **[AI-I]** **CS2.3.06:** Prioritise the exploration of ways that digital technologies can enhance one's civic and societal participation. **[AI-I]** **CS2.3.07:** Describe the potential benefits of common forms of digital participation, recognising that civic participation occurs along a continuum. **CS2.3.08:** Recognise key rights under relevant digital laws and regulations, and define how to exercise them. **[AI-I]** **CS2.3.09:** Describe how digital technologies such as social media platforms can influence some aspects of basic democracy (for example, distortion of the electoral process). **[AI-I]** **CS2.3.10:** Describe the concept of the platform economy, including opportunities, risks, social and ethical implications. **[AI-I]** **CS2.3.11:** Describe the concepts and functions of civic monitoring and e-Government. **CS2.3.12:** Interact autonomously and effectively with digital platforms and services. **[AI-I]**
At **Advanced** level, individuals	**CS2.3.13:** Participate in discussions on digital technologies' ethical, political and social implications, prioritising the continual exploration of ways in which digital technologies can support empowerment and civic participation. **[AI-I]** **CS2.3.14:** Assess the potential of digital technologies for inclusion, exclusion, and civic intervention. **[AI-I]** **CS2.3.15:** Assess several implications of digital technologies such as social media platforms in democratic processes. **[AI-I]** **CS2.3.16:** Distinguish between high-risk and prohibited AI systems (according to legislation) and their potential societal, political or economic impacts. **[AI-E]** **CS2.3.17:** Assist others to identify opportunities and participate in digital environments for (self or community) empowerment and civic participation. **CS2.3.18:** Support others to inform themselves about and exercise their rights under digital legislation. **[AI-I]**
At **Highly Advanced** level, individuals	**CS2.3.19:** Use up-to-date knowledge of digital technologies and legislative developments to evaluate impacts of digital technologies on society, political processes, or the economy, from a range of perspectives. **[AI-I]** **CS2.3.20:** Assist others to comprehend the main provisions of digital legislation, given a specific context. **[AI-I]** **CS2.3.21:** Lead or design digital citizenship initiatives, for example to promote civic participation, inclusion or empowerment. **[AI-I]**



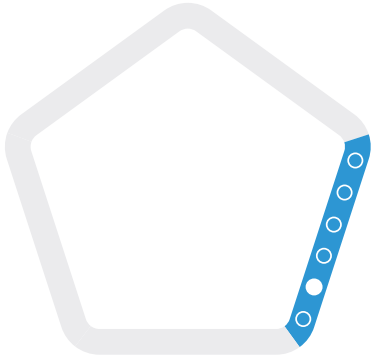
2. COMMUNICATION AND COLLABORATION

2.4 Collaborating through digital technologies

To use digital technologies ethically and responsibly for collaborative purposes, and for the co-construction and co-creation of information, resources and knowledge.

Link to learning outcomes for Competence 2.4

At **Basic** level, *with guidance as needed*, individuals	**CS2.4.01:** Participate in collaborative groups via digital collaboration tools, recognising their benefits and limitations. **[AI-I]** **CS2.4.02:** Recognise the presence of AI systems in digital collaboration tools. **[AI-E]** **CS2.4.03:** Acknowledge the importance of effective communication skills for successful collaboration in digital environments.
At **Intermediate** level, individuals	**CS2.4.04:** Create, manage and contribute effectively to simple collaborative tasks in digital environments. **[AI-I]** **CS2.4.05:** Recognise main features and functions of a variety of collaboration tools, selecting them to meet collaboration goals. **[AI-I]** **CS2.4.06:** Identify examples of ethical, responsible and effective human-AI collaboration. **[AI-E]** **CS2.4.07:** Take account of different perspectives to help achieve a common goal in digital environments.
At **Advanced** level, individuals	**CS2.4.08:** Use and combine a variety of digital collaboration tools, ensuring proportionate and ethical use of digital technologies and human-AI collaboration processes that meet the needs of projects, tasks and groups. **[AI-E]** **CS2.4.09:** Lead collaboration in digital environments. **[AI-I]** **CS2.4.10:** Help others to develop their capabilities to collaborate in digital environments. **[AI-I]**
At **Highly Advanced** level, individuals	**CS2.4.11:** Promote and support proportionate, ethical and effective use of digital technologies including AI systems in collaborations. **[AI-E]** **CS2.4.12:** Design complex or specialised collaboration strategies or systems for digital environments. **[AI-I]** **CS2.4.13:** Assist others to develop capabilities to lead collaboration in digital environments. **[AI-I]** **CS2.4.14:** Lead or contribute to improvements in or new solutions for human-AI collaboration. **[AI-E]**



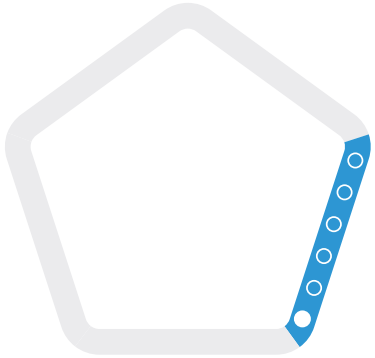
2. COMMUNICATION AND COLLABORATION

2.5 Digital behaviour

To be aware of behavioural norms, and to know how to behave respectfully while using digital technologies and interacting in digital environments. To adapt communication to specific contexts, and to be aware of and respect cultural, generational and other diversity in digital environments.

Link to learning outcomes for Competence 2.5

At **Basic** level, *with guidance as needed*, individuals	**CS2.5.01:** Recognise differences in verbal and non-verbal behaviour in digital and non-digital environments, and that there are cultural and contextual differences in verbal and non-verbal digital communication. **CS2.5.02:** Acknowledge the importance of giving space to the opinions of others in digital environments. **CS2.5.03:** Recognise that some behaviour in digital environments may not be acceptable to others, and/or may have legal consequences. **[AI-I]** **CS2.5.04:** Use appropriate tone and visual expression such as emoji in formal and non-formal digital environments.
At **Intermediate** level, individuals	**CS2.5.05:** Describe the relationship between digital behaviour and digital reputation. **CS2.5.06:** Prioritise behaviour that supports inclusion and a positive digital reputation for oneself and others. **CS2.5.07:** Identify key rights and responsibilities of children and adults in relation to digital behaviour. **[AI-I]**
At **Advanced** level, individuals	**CS2.5.08:** Respond with effective and respectful communication and behaviour to difficult or complex situations in digital environments. **CS2.5.09:** Distinguish between ethical, legal and illegal behaviours in digital environments, recognising that these distinctions may be complex. **[AI-I]** **CS2.5.10:** Analyse patterns of abuse of specific groups in digital environments and their potential impacts, and describe ways in which they can be reported and tackled. **[AI-I]** **CS2.5.11:** Promote and support inclusive and respectful behaviour in digital environments. **CS2.5.12:** Support others to develop their capacities for inclusive and respectful behaviour in digital environments.
At **Highly Advanced** level, individuals	**CS2.5.13:** Stay informed about developments in policies and legislation relating to behaviour in digital environments. **[AI-I]** **CS2.5.14:** Assist others to understand key rights and responsibilities under policies or legislation relating to digital behaviour in a given context. **[AI-I]** **CS2.5.15:** Lead or contribute to digital behaviour policies or initiatives. **[AI-I]**



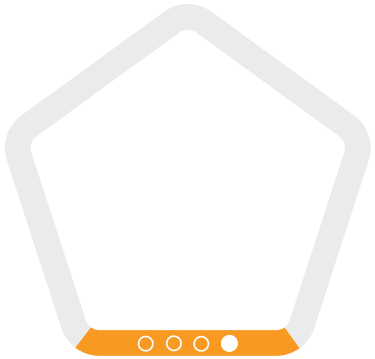
2. COMMUNICATION AND COLLABORATION

2.6 Managing digital identity

To manage one or multiple digital identities. To take actions to help protect one's digital reputation (how one is perceived based on online presence), and to manage one's digital footprint (the data that is produced through use of and by digital platforms and services).

Link to learning outcomes for Competence 2.6

At **Basic** level, *with guidance as needed*, individuals	**CS2.6.01:** Acknowledge the benefits of implementing measures to help manage one's digital identity. **CS2.6.02:** Recognise features of physical and digital identities, and identify aspects of physical identity that can be linked to digital identity. **CS2.6.03:** Recognise digital identity as both a means of authenticating (validating) an individual and the data generated by an individual's online activities, and identify common forms and uses of digital identity. **[AI-I]** **CS2.5.04:** Recognise the concept and components of a digital footprint. **[AI-I]** **CS2.6.05:** Recognise that digital identity protection laws protect individuals' data and privacy. **[AI-I]** **CS2.6.06:** Identify and implement simple measures, such as limiting tracking and deleting browsing history, to manage digital identity.
At **Intermediate** level, individuals	**CS2.6.07:** Acknowledge the importance of one's own role and rights in the management of digital identity. **[AI-I]** **CS2.6.08:** Identify examples of actively and passively generated information in relation to digital identity. **[AI-I]** **CS2.6.09:** Analyse the scope of one's own digital identity to implement protections. **[AI-I]** **CS2.6.10:** Adjust settings on devices and apps, online accounts and activity tracking to help manage one's digital identity. **[AI-I]** **CS2.6.11:** Curate and manage one or more digital identities using a variety of features and functionalities on digital platforms or services. **[AI-I]**
At **Advanced** level, individuals	**CS2.6.12:** Describe ways to exercise legal rights in issues relating to digital identity. **[AI-I]** **CS2.6.13:** Assess one's digital identity on an ongoing basis, and use a variety of processes to manage digital identity. **[AI-I]** **CS2.6.14:** Assess benefits, social and ethical implications of the use of AI systems in digital identity management. **[AI-E]** **CS2.6.15:** Curate and manage digital identities for personal, professional and/or organisational purposes across a variety of platforms and services. **[AI-I]** **CS2.6.16:** Assist others with basic digital identity management. **[AI-I]**
At **Highly Advanced** level, individuals	**CS2.6.17:** Stay informed about developments in digital technologies in relation to digital identity management and protection. **[AI-I]** **CS2.6.18:** Support others to deepen their capabilities in the management and curation of digital identities. **[AI-I]** **CS2.6.19:** Advise others on complex aspects of digital identity management and rights. **[AI-I]**



3. CONTENT CREATION

3.1 Developing digital content

To use digital technologies ethically and responsibly to create and edit a variety of content. To express oneself through digital means.

Link to learning outcomes for Competence 3.1

At **Basic** level, *with guidance as needed*, individuals	**CS3.1.01:** Acknowledge the benefits of exploring a variety of digital content creation tools to support content creation goals. **[AI-I]** **CS3.1.02:** Acknowledge the importance of accessible and inclusive digital content. **CS3.1.03:** Identify common types of digital content and file formats, and common operational functions across digital content creation tools. **[AI-I]** **CS3.1.04:** Recognise that while AI systems can generate content, humans are essential to ensure ethical, responsible, and context-appropriate outputs. **[AI-E]** **CS3.1.05:** Recognise that generative AI is a particular type of AI and is one of various digital technologies that can be used to support content creation. **[AI-E]** **CS3.1.06:** Use basic features of content creation tools to create and edit digital content. **[AI-I]**
At **Intermediate** level, individuals	**CS3.1.07:** Purposefully explore features and functions of digital content creation tools to deepen capabilities. **[AI-I]** **CS3.1.08:** Describe benefits and limitations in the use of digital technologies such as AI systems for content creation, using them selectively and ethically. **[AI-E]** **CS3.1.09:** Use a variety of content creation tools to create and edit digital content. **[AI-I]** **CS3.1.10:** Apply strategies that enable efficient digital content creation. **[AI-I]** **CS3.1.11:** Assess audience accessibility and inclusivity needs, and create and edit digital content accordingly. **[AI-I]**
At **Advanced** level, individuals	**CS3.1.12:** Acknowledge the importance of assessing capabilities, constraints and ethical aspects of digital content creation tools. **[AI-I]** **CS3.1.13:** Select and combine digital content creation tools and methods to meet complex content creation task and audience requirements. **[AI-I]** **CS3.1.14:** Create and edit complex or specialised digital content, tailored appropriately to goals and audience. **[AI-I]** **CS3.1.15:** Support others to develop their capabilities in digital content creation using ethical and responsible approaches. **[AI-I]**
At **Highly Advanced** level, individuals	**CS3.1.16:** Promote and support accessibility and inclusivity, and the selective and ethical use of AI systems, in digital content creation. **[AI-E]** **CS3.1.17:** Help others to develop advanced digital content creation capabilities. **[AI-I]** **CS3.1.18:** Lead or contribute to complex or specialised digital content creation initiatives. **[AI-I]** **CS3.1.19:** Lead or contribute to improvements in or new solutions for complex or specialised digital content. **[AI-I]**

3. CONTENT CREATION

3.2 Integrating and re-elaborating digital content

To modify, refine and integrate new information and content into existing knowledge and resources to create new and original content and knowledge.

Link to learning outcomes for Competence 3.2

At **Basic** level, *with guidance as needed*, individuals	**CS3.2.01:** Acknowledge the importance of ethical and transparent practices when re-using or elaborating existing digital content. **[AI-I]** **CS3.2.02:** Acknowledge the benefits of exploring digital content integration and elaboration tools and techniques. **[AI-I]** **CS3.2.03:** Distinguish between editable and uneditable digital content. **CS3.2.04:** Make changes to digital content using basic editing, formatting and integration functions. **[AI-I]**
At **Intermediate** level, individuals	**CS3.2.05:** Purposefully explore a variety of ways to integrate and re-elaborate digital content. **[AI-I]** **CS3.2.06:** Adjust or integrate digital content to meet format, structure and audience requirements. **[AI-I]** **CS3.2.07:** Modify or transform digital textual, numeric or visual representations to effectively and accurately convey the meaning of data and information. **[AI-I]** **CS3.2.08:** Use digital technologies in a selective, ethical, transparent and responsible way to make enhancements or integrations to existing digital content. **[AI-I]**
At **Advanced** level, individuals	**CS3.2.09:** Adjust or integrate a variety of digital content to meet complex format, structure, and audience requirements. **[AI-I]** **CS3.2.10:** Apply digital technologies in a selective, ethical and transparent way to make improvements or integrations to complex digital content. **[AI-I]** **CS3.2.11:** Support others in developing their capabilities in digital content enhancement. **[AI-I]**
At **Highly Advanced** level, individuals	**CS3.2.12:** Promote and support ethical and transparent practices in digital content integration and re-elaboration, informed by current digital technological developments. **[AI-I]** **CS3.2.13:** Evaluate and apply advanced design and data visualisation techniques to complex or specialised digital content integration and re-elaboration. **[AI-I]** **CS3.2.14:** Assist others with complex digital content integration or re-elaboration tasks. **[AI-I]** **CS3.2.15:** Lead or contribute to complex digital content integration or re-elaboration initiatives, or to improvements in or new solutions for digital content integration or re-elaboration. **[AI-I]**

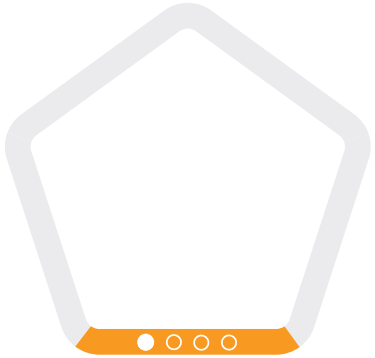
3. CONTENT CREATION

3.3 Copyright and licences

To understand how copyright and licences, as well as associated legal and ethical issues, apply to digital content, and how to correctly apply them.

Link to learning outcomes for Competence 3.3

At **Basic** level, *with guidance as needed*, individuals	**CS3.3.01:** Recognise the general concepts of copyright and licence in digital contexts, and that an individual's original digital content is automatically copyrighted. **CS3.3.02:** Recognise that copyright and licences can apply to digital content, including AI-generated content, and that these determine how content can be used and shared. **[AI-E]** **CS3.3.03:** Recognise that AI-generated content should be labelled as such to help others understand its origin and possibilities for further use. **[AI-E]** **CS3.3.04:** Use and share digital content in compliance with basic legal and ethical guidelines, and identify digital content that can be used free of charge. **[AI-I]**
At **Intermediate** level, individuals	**CS3.3.05:** Acknowledge the complexity of copyright and licences in digital contexts, prioritising a cautious approach. **[AI-I]** **CS3.3.06:** Define the concept of intellectual property, and distinguish between copyright, trademark, design and patent. **[AI-I]** **CS3.3.07:** Identify common types and purposes of licences in digital contexts, including Creative Commons. **CS3.3.08:** Describe ethical, legal and commercial implications of copyright violations in digital contexts. **[AI-I]** **CS3.3.09:** Identify examples of legal and ethical challenges relating to copyright in the training of AI models. **[AI-E]** **CS3.3.10:** Apply legal and ethical guidelines appropriately when using and sharing digital content. **[AI-I]**
At **Advanced** level, individuals	**CS3.3.11:** Describe key features of current legislation in relation to digital copyright and licences. **[AI-I]** **CS3.3.12:** Describe examples of where copyright applies and does not apply in digital contexts, distinguishing between training data for AI systems and AI-generated content. **[AI-E]** **CS3.3.13:** Assess and correctly apply legal and ethical guidelines for using and sharing digital content in complex contexts (for example in relation to AI systems). **[AI-E]** **CS3.3.14:** Assist others to use and share digital content in compliance with legal and ethical guidelines. **[AI-I]**
At **Highly Advanced** level, individuals	**CS3.3.15:** Promote and support awareness and understanding of legal and ethical copyright and licensing practices in digital contexts. **[AI-I]** **CS3.3.16:** Apply advanced knowledge of intellectual property rights, copyright and licensing concepts in digital contexts to inform decision-making. **[AI-I]** **CS3.3.17:** Lead or contribute to policies or guidelines on copyright and licensing in digital contexts. **[AI-I]**



3. CONTENT CREATION

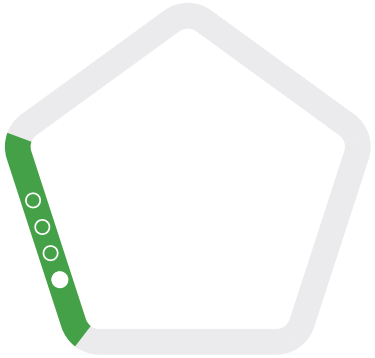
3.4 Computational thinking and programming

To understand and implement steps to analyse a problem, recognise sub-problems, and plan and develop a sequence of instructions for a computing system to solve a given problem or to perform a specific task.

Note: *Computational thinking and programming is a transversal competence, relevant to other DigComp competences. It is included under Competence Area 3, to maintain structural consistency with the previous version.*

Link to learning outcomes for Competence 3.4

At **Basic** level, *with guidance as needed*, individuals	**CS3.4.01:** Recognise the role of programming in society, and common uses of computer programs and applications. **CS3.4.02:** Recognise computational thinking as a human activity which involves the identification of steps that can be performed by a computer to solve a problem or task. **CS3.4.03:** Recognise what AI is in general terms, making a basic distinction between what is and what is not an AI system. **[AI-E]** **CS3.4.04:** Represent simple sequences symbolically, interpret simple symbolic sequences, and give basic instructions to a computer to perform simple tasks. **[AI-I]**
At **Intermediate** level, individuals	**CS3.4.05:** Acknowledge the relevance of computational thinking, algorithmic representation and programming to everyday contexts. **[AI-I]** **CS3.4.06:** Distinguish between a computational model of reality and reality itself. **[AI-I]** **CS3.4.07:** Define differences between a computable problem and a non-computable problem, and general steps in computational thinking. **CS3.4.08:** Define foundational programming concepts and recognise that there are a variety of programming languages, each with a range of potential uses. **[AI-I]** **CS3.4.09:** Recognise that machine learning is a type of programming used in AI that enables algorithms to learn from data and make predictions. **[AI-E]** **CS3.4.10:** Recognise that there are steps that should be followed to develop, validate and deploy a computer program or an AI system. **[AI-E]** **CS3.4.11:** Translate basic information into logical operations, develop basic programs with control structures, and create visual representations to illustrate basic algorithms. **[AI-I]**
At **Advanced** level, individuals	**CS3.4.12:** Acknowledge the importance of human oversight and human-centric approaches in the development and deployment of computer programs and AI systems. **[AI-E]** **CS3.4.13:** Describe the main steps in developing, validating and deploying a computer program or an AI system. **[AI-E]** **CS3.4.14:** Describe examples of the application of computational thinking and programming in robotics. **[AI-I]** **CS3.4.15:** Distinguish between main types of machine learning. **[AI-E]** **CS3.4.16:** Assess ethical and practical aspects of the development and deployment of computer programs and AI systems. **[AI-E]** **CS3.4.17:** Identify and (partially or fully) automate routine tasks with programming tools or AI systems. **[AI-E]** **CS3.4.18:** Apply programming tools or AI systems to complex computational thinking tasks. **[AI-E]**
At **Highly Advanced** level, individuals	**CS3.4.19:** Promote and support ethical programming and/or AI system development practices. **[AI-E]** **CS3.4.20:** Stay informed about current developments in programming techniques and related applications of AI systems, such as robotics. **[AI-E]** **CS3.4.21:** Lead or contribute to complex projects focused on applications of computational thinking, programming or AI systems, including developing, validating and deploying computer programs or AI systems. **[AI-E]** **CS3.4.22:** Assist others to develop basic programming capabilities and/or capabilities in the application of AI systems to computational thinking tasks. **[AI-E]**



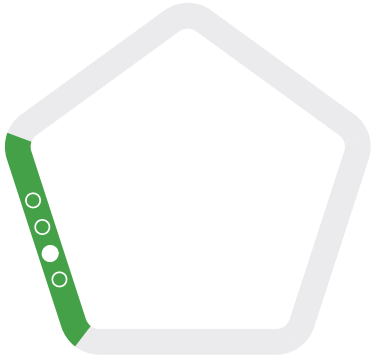
4. SAFETY, WELLBEING AND RESPONSIBLE USE

4.1 Protecting devices

To apply safety and cybersecurity measures in order to protect digital devices and content. To be aware of the evolving nature of risks and threats in digital environments, and to have due regard to security of digital devices and their contents.

Link to learning outcomes for Competence 4.1

At **Basic** level, *with guidance as needed*, individuals	**CS4.1.01:** Acknowledge the importance of one's individual role in protecting digital devices and their contents. **CS4.1.02:** Recognise that individual actions and cybersecurity tools work together to help keep devices and their contents secure. **CS4.1.03:** Recognise that there is cybersecurity legislation that helps to ensure the security of products and services. **CS4.1.04:** Identify and apply basic device protection measures such as antivirus software, screen locking, strong passwords, and multi-factor authentication.
At **Intermediate** level, individuals	**CS4.1.05:** Acknowledge the importance of remaining vigilant to and up-to-date with cybersecurity practices. **[AI-I]** **CS4.1.06:** Describe main features of malware and apply a variety of malware prevention techniques to protect devices and their contents. **[AI-I]** **CS4.1.07:** Recognise that recent and emerging digital technologies such as AI systems can be used for both cyberattacks and cybersecurity. **[AI-E]**
At **Advanced** level, individuals	**CS4.1.08:** Prioritise regular checking and updating of cybersecurity measures to protect devices and their contents in response to evolving digital threats. **[AI-I]** **CS4.1.09:** Describe key rights of individuals under current cybersecurity legislation. **[AI-I]** **CS4.1.10:** Identify examples of how recent and emerging technologies such as AI systems are used in cyberattacks and cybersecurity. **[AI-E]** **CS4.1.11:** Assist others in implementing basic cybersecurity protection measures, such as antivirus software, screen locking, strong passwords and multi-factor authentication.
At **Highly Advanced** level, individuals	**CS4.1.12:** Stay informed about digital technological and legislative developments in relation to cybersecurity. **[AI-I]** **CS4.1.13:** Assess rights of individuals under relevant provisions of current cybersecurity legislation. **[AI-I]** **CS4.1.14:** Lead or contribute to citizen-focused cybersecurity initiatives. **[AI-I]** **CS4.1.15:** Support others to build their capabilities in protecting devices and their contents against digital threats. **[AI-I]**



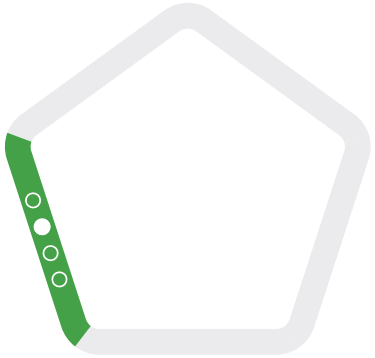
4. SAFETY, WELLBEING AND RESPONSIBLE USE

4.2 Protecting personal data and privacy

To be aware of and exercise one's rights in relation to personal data and privacy in digital environments. To evaluate and manage privacy risks and protect personal data and privacy in digital environments. To use and share one's own and others' personal data safely, ethically and responsibly.

Link to learning outcomes for Competence 4.2

At **Basic** level, *with guidance as needed*, individuals	**CS4.2.01:** Acknowledge the importance of a cautious approach to the sharing of personal data in digital environments. **CS4.2.02:** Recognise that personal data is collected and generated through a large variety of sources and processes. **[AI-I]** **CS4.2.03:** Recognise that manipulative methods can be used in digital environments to deceive individuals into providing access to personal data, accounts or other sensitive information. **CS4.2.04:** Identify risks of sharing personal data in digital environments, including specific risks in relation to AI systems. **[AI-E]** **CS4.2.05:** Recognise that individuals have a right to privacy and that their personal data is protected under legislation. **[AI-I]** **CS4.2.06:** Implement basic security measures for online payments and transactions. **CS4.2.07:** Block or flag personal information that has been inappropriately shared online. **CS4.2.08:** Recognise and respond appropriately to signs of identity theft.
At **Intermediate** level, individuals	**CS4.2.09:** Recognise the importance of careful handling of personal data of oneself and others, especially vulnerable individuals and children. **CS4.2.10:** Recognise key concepts related to data protection and privacy legislation. **[AI-I]** **CS4.2.11:** Define the purpose of online privacy statements and main privacy policy concepts. **CS4.2.12:** Define personal data breach under current data protection and privacy legislation. **CS4.2.13:** Describe privacy implications associated with the use of shared online content, such as to train AI systems, recognising that regulation of personal data ownership of content shared online is complex. **[AI-E]** **CS4.2.14:** Describe techniques related to social engineering in digital environments, such as phishing or baiting, identifying and responding appropriately to instances of them. **CS4.2.15:** Safely manage personal data and privacy across a variety of digital environments, including use of privacy tools. **[AI-I]**
At **Advanced** level, individuals	**CS4.2.16:** Continually explore data ownership and privacy issues in relation to digital technological developments. **[AI-I]** **CS4.2.17:** Support others to understand their rights under current data protection and privacy legislation. **[AI-I]** **CS4.2.18:** Assist others to implement basic strategies to protect personal data and manage privacy in digital environments. **[AI-I]**
At **Highly Advanced** level, individuals	**CS4.2.19:** Stay informed about digital technological and legislative developments in relation to personal data, data ownership and privacy. **[AI-I]** **CS4.2.20:** Advise on policy or regulatory aspects of data protection and privacy in digital contexts. **[AI-I]** **CS4.2.21:** Lead or contribute to the design of personal data protection strategies in digital contexts. **[AI-I]**



4. SAFETY, WELLBEING AND RESPONSIBLE USE

4.3 Supporting wellbeing

To use digital technologies in ways that support wellbeing and inclusion. To minimise risks and threats to physical, mental and social wellbeing of oneself and others while using digital technologies. To balance usage of digital technologies with offline activities to support wellbeing. To take action to help protect oneself and others from possible dangers in digital environments (e.g. cyberbullying, harmful content), and to know how to respond to such dangers.

Link to learning outcomes for Competence 4.3

At **Basic** level, *with guidance as needed*, individuals	**CS4.3.01:** Acknowledge the benefits of balancing online and offline activities, and the benefits and risks to one's own physical, mental and social wellbeing in using digital technologies. **[AI-I]** **CS4.3.02:** Acknowledge the interplay between one's own digital habits and features of digital platforms or services that are designed to capture and maintain users' attention. **[AI-I]** **CS4.3.03:** Recognise that there is a variety of information, groups and communities in digital environments that can support one's physical, mental and/or social wellbeing. **[AI-I]** **CS4.3.04:** Identify limitations and risks of using virtual assistants and AI systems to support human wellbeing. **[AI-E]** **CS4.3.05:** Recognise that there are laws and regulations that help protect the wellbeing of individuals in digital environments. **[AI-I]** **CS4.3.06:** Make a basic assessment of one's digital habits in relation to one's physical, mental and social wellbeing, with an awareness of signs of problematic usage, and identify and implement strategies to support one's wellbeing.
At **Intermediate** level, individuals	**CS4.3.07:** Acknowledge the importance of one's own and others' right to disconnect and the benefits of regularly reviewing one's digital usage patterns. **CS4.3.08:** Describe impacts of harmful behaviour, content and deceptive design in digital environments on oneself and others. **[AI-I]** **CS4.3.09:** Identify reliable sources of information, and inclusive groups and communities in digital environments, that can support one's physical, mental and/or social wellbeing. **[AI-I]** **CS4.3.10:** Identify possible ways to flag or intervene if harmful behaviour or content is encountered in digital environments. **[AI-I]** **CS4.3.11:** Describe ways in which some digital technologies, such as social media, augment and perpetuate bias, stereotyping and exclusion. **[AI-I]** **CS4.3.12:** Implement strategies to protect against and respond effectively to harmful behaviour, content and deceptive design in digital environments, and to support and maintain one's own and others' wellbeing. **CS4.3.13:** Adapt to changing digital technological developments and needs to support and maintain physical, mental and social wellbeing. **[AI-I]**
At **Advanced** level, individuals	**CS4.3.14:** Continually scrutinise the role of digital technologies such as social media in augmenting and perpetuating bias, stereotyping and exclusion. **[AI-I]** **CS4.3.15:** Flag or intervene effectively in instances of harmful behaviour or content in digital environments. **[AI-I]** **CS4.3.16:** Assist others to review and adapt their usage of digital technologies and to develop awareness of harmful behaviour, content and deceptive design in digital environments. **[AI-I]** **CS4.3.17:** Help others to build capacity to counteract the role of digital technologies such as social media in augmenting and perpetuating bias, stereotyping and exclusion. **[AI-I]** **CS4.3.18:** Assist others to understand their rights in relation to wellbeing and/or inclusion in digital environments. **[AI-I]**
At **Highly Advanced** level, individuals	**CS4.3.19:** Promote actions that support wellbeing and inclusion in digital environments. **[AI-I]** **CS4.3.20:** Assess and evaluate evidence on wellbeing and/or inclusion in digital environments to guide decision-making. **[AI-I]** **CS4.3.21:** Lead or contribute to initiatives that support wellbeing and/or inclusion in digital environments. **[AI-I]** **CS4.3.22:** Contribute to legal and regulatory decision-making in relation to individuals' wellbeing and/or inclusion in digital environments. **[AI-I]**

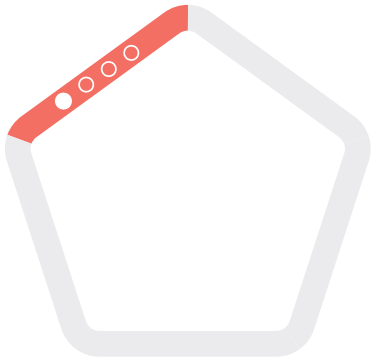
4. SAFETY, WELLBEING AND RESPONSIBLE USE

4.4 Environmental impacts of digital technologies

To be aware of the environmental impacts of digital technologies, including device production, operation, repair, recycling, disposal, data storage infrastructure, energy consumption and usage of tools and applications. To take action to reduce such impact and to use digital technologies to support sustainability.

Link to learning outcomes for Competence 4.4

At **Basic** level, *with guidance as needed*, individuals	**CS4.4.01:** Acknowledge the role that individuals can play to help reduce the environmental impact of digital technologies. **CS4.4.02:** Recognise that some digital technologies and infrastructures, such as AI systems and data centres, have large impacts on the environment. **[AI-E]** **CS4.4.03:** Recognise that the full environmental impacts of digital technologies are not immediately apparent to an individual user. **[AI-I]** **CS4.4.04:** Recognise the role of digital technologies in supporting energy efficiency and sustainability. **[AI-I]** **CS4.4.05:** Identify and apply simple strategies to reduce energy and data consumption while using digital technologies. **[AI-I]**
At **Intermediate** level, individuals	**CS4.4.06:** Continually assess the environmental impacts of one's usage of digital technologies. **[AI-I]** **CS4.4.07:** Identify environmental impacts of digital technologies that occur during manufacturing, usage and disposal, and of data centres and e-commerce. **[AI-I]** **CS4.4.08:** Describe how some digital technologies can support sustainable living. **[AI-I]** **CS4.4.09:** Describe potential environmental benefits of the digital sharing and circular economy models. **CS4.4.10:** Assess and apply a variety of strategies to reduce the environmental impact of one's use of digital technologies and digital devices. **[AI-I]**
At **Advanced** level, individuals	**CS4.4.11:** Stay informed about the environmental impacts of digital technologies and ways in which digital technologies can support sustainability. **[AI-I]** **CS4.4.12:** Evaluate the environmental impacts of digital technologies and infrastructures to support decision-making or advocacy. **[AI-I]** **CS4.4.13:** Help others to assess their use of digital technologies to identify ways in which to reduce environmental impact. **[AI-I]**
At **Highly Advanced** level, individuals	**CS4.4.14:** Stay informed about the environmental and sustainability implications of digital technologies across a range of sectors. **[AI-I]** **CS4.4.15:** Promote and support actions for environmentally sustainable usage of digital technologies. **[AI-I]** **CS4.4.16:** Lead or contribute to digital sustainability initiatives. **[AI-I]** **CS4.4.17:** Contribute to improvements in or solutions for digital sustainability. **[AI-I]**



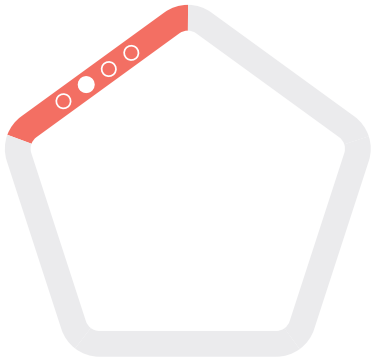
5. PROBLEM IDENTIFICATION AND SOLVING

5.1 Identifying and solving technical problems

To identify technical problems when operating digital devices and in digital environments, and to solve them through a variety of means.

Link to learning outcomes for Competence 5.1

At **Basic** level, *with guidance as needed*, individuals	**CS5.1.01:** Acknowledge the commonplace nature of technical problems in digital environments and the benefits of seeking assistance to help resolve them. **CS5.1.02:** Differentiate between operating systems and software and identify the main features of hardware, software, connectivity, and common peripheral devices. **CS5.1.03:** Identify common technical issues and follow instructions to help to solve them. **CS5.1.04:** Install and update software and applications, as needed.
At **Intermediate** level, individuals	**CS5.1.05:** Acknowledge the benefits of building capacity and autonomy in addressing common technical issues. **CS5.1.06:** Troubleshoot technical problems in digital environments using a variety of search and problem-solving strategies (whether human-assisted or digital technology-assisted). **[AI-I]** **CS5.1.07:** Update and adjust settings on main and peripheral digital devices to maintain good performance.
At **Advanced** level, individuals	**CS5.1.08:** Prioritise the development of one's capacity to diagnose and solve technical issues in digital environments. **[AI-I]** **CS5.1.09:** Assist others to diagnose and solve technical problems in digital environments. **CS5.1.10:** Use various solution-finding strategies to troubleshoot complex technical problems in digital environments. **[AI-I]**
At **Highly Advanced** level, individuals	**CS5.1.11:** Help others to develop confidence and autonomy to solve technical problems in digital environments. **CS5.1.12:** Design or deliver training to support the use of digital devices or systems. **[AI-I]**



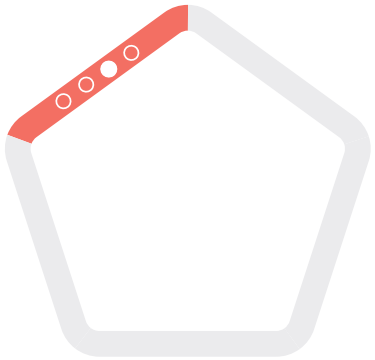
5. PROBLEM IDENTIFICATION AND SOLVING

5.2 Identifying needs and digital technological responses

To assess one's own and others' needs and to evaluate, select, use and adapt digital technologies to meet these needs. To adjust and customise digital environments to the contexts, goals and needs (e.g. accessibility) of oneself and others.

Link to learning outcomes for Competence 5.2

At **Basic** level, *with guidance as needed*, individuals	**CS5.2.01:** Acknowledge the importance of individual choice in digital environment configurations. **CS5.2.02:** Recognise the concept and purpose of a digital assistance tool and the presence of AI systems in such tools. **[AI-E]** **CS5.2.03:** Identify the purpose of technology accessibility and examples of common assistive technologies. **[AI-I]**
At **Intermediate** level, individuals	**CS5.2.04:** Acknowledge the benefits of exploring adaptations to digital environment configurations and features of digital assistance tools. **[AI-I]** **CS5.2.05:** Make informed use of digital assistance tools to support one's own and others' needs, with awareness of their benefits and limitations. **[AI-I]** **CS5.2.06:** Adjust features of one's digital environment to suit one's own and others' needs and preferences. **[AI-I]**
At **Advanced** level, individuals	**CS5.2.07:** Prioritise an ongoing assessment of how digital environmental configurations, digital assistance tools and/or assistive technologies can meet the needs of oneself and others. **[AI-I]** **CS5.2.08:** Adjust features of digital environments, and use digital assistance tools and assistive technologies, to suit one's own and others' needs and preferences. **[AI-I]** **CS5.2.09:** Assess the accessibility, inclusivity, fairness and/or rights-sensitivity of digital technologies in a given context. **[AI-I]** **CS5.2.10:** Support others to make informed use of digital assistance tools and adjustments to digital environment configurations. **[AI-I]**
At **Highly Advanced** level, individuals	**CS5.2.11:** Promote and support inclusive and accessible digital technologies. **[AI-I]** **CS5.2.12:** Assess complex needs of individuals to identify and/or design tailored digital solutions. **[AI-I]** **CS5.2.13:** Contribute to improvements in or solutions for digital assistance tools, accessible digital environment configurations, and/or assistive technologies. **[AI-I]**



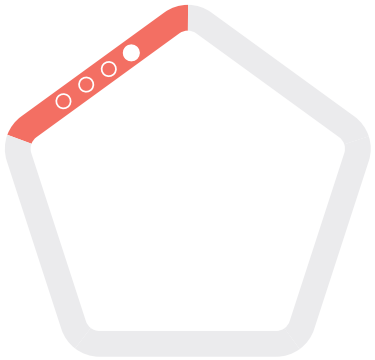
5. PROBLEM IDENTIFICATION AND SOLVING

5.3 Identifying creative solutions using digital technologies

To use digital technologies to make improvements in or new solutions for processes and products, using a human-centric approach. To engage individually and collectively in critical thinking processes, and the creative and purposeful use of digital technologies, to understand and resolve conceptual problems and problem situations.

Link to learning outcomes for Competence 5.3

At **Basic** level, *with guidance as needed*, individuals	**CS5.3.01:** Recognise that digital technologies can support, but not replace, human creativity. **[AI-I]** **CS5.3.02:** Identify examples of how digital technologies are used to solve real-world problems and to make improvements to or create new solutions, products or services. **[AI-I]** **CS5.3.03:** Identify examples of where digital technologies can support or augment human creativity. **[AI-I]**
At **Intermediate** level, individuals	**CS5.3.04:** Define the concept of human-centric and its role in digital technologies development and usage. **[AI-I]** **CS5.3.05:** Describe strengths, weaknesses and ethical considerations of digital technologies including AI systems in relation to human creativity and problem-solving. **[AI-E]** **CS5.3.06:** Use a variety of digital technologies responsibly and ethically to support problem-solving as an individual or in a group. **[AI-I]**
At **Advanced** level, individuals	**CS5.3.07:** Use a variety of digital technologies efficiently, responsibly and ethically, prioritising human-centric approaches, to help solve complex problems. **[AI-I]** **CS5.3.08:** Support others to develop their confidence and capabilities in using digital technologies to help solve real-world problems. **[AI-I]** **CS5.3.09:** Contribute to the (co-) creation or (co-) construction of complex knowledge about or solutions to real-world problems in digital environments. **[AI-I]**
At **Highly Advanced** level, individuals	**CS5.3.10:** Lead or contribute to initiatives focused on the application of digital technologies for highly complex or specialised problem-solving. **[AI-I]** **CS5.3.11:** Lead or contribute to initiatives that use digital technologies to help make improvements to or find new solutions for real-world problems. **[AI-I]** **CS5.3.12:** Support others to develop their capabilities to use digital technologies for complex or specialised problem-solving tasks. **[AI-I]**



5. PROBLEM IDENTIFICATION AND SOLVING

5.4 Identifying and addressing digital competence needs

To recognise where one's own digital competence needs to be improved or updated. To address digital competence needs within a broader process of lifelong learning, building capacity and autonomy. To support others with their digital competence development. To stay informed about digital technological developments and their personal, professional and societal implications.

Link to learning outcomes for Competence 5.4

At **Basic** level, *with guidance as needed*, individuals	**CS5.4.01:** Acknowledge the value of developing one's digital competence, and the benefits of seeking support in addressing digital competence needs. **[AI-I]** **CS5.4.02:** Recognise that digital competence is much broader than technical skills, and requires regular updating for daily life, working and learning. **[AI-I]** **CS5.4.03:** Identify opportunities to improve one's digital competences. **[AI-I]**
At **Intermediate** level, individuals	**CS5.4.04:** Acknowledge the benefits of staying informed about developments in digital technologies to help identify learning needs. **[AI-I]** **CS5.4.05:** Accurately assess one's own digital competences and digital competence needs. **[AI-I]** **CS5.4.06:** Participate actively in learning to meet one's digital competence needs. **[AI-I]**
At **Advanced** level, individuals	**CS5.4.07:** Continually assess digital technological developments and their implications for one's own and others' digital competence needs. **[AI-I]** **CS5.4.08:** Engage in ongoing self-development to meet digital competence needs. **[AI-I]** **CS5.4.09:** Support others to develop confidence, autonomy and problem-solving capabilities in digital environments. **[AI-I]** **CS5.4.10:** Compile available digital competence learning opportunities for a particular purpose. **[AI-I]**
At **Highly Advanced** level, individuals	**CS5.4.11:** Engage in ongoing self-development to meet complex or specialised digital competence needs. **[AI-I]** **CS5.4.12:** Mentor others in identifying and addressing their digital competence needs. **[AI-I]** **CS5.4.13:** Design learning material to help others to meet complex or specialised digital competence needs. **[AI-I]**

4

CONCLUDING REMARKS

4. CONCLUDING REMARKS

DigComp 3.0 aims to provide a unifying, coherent, clear and relevant description of digital competence, for any individual or organisation that wants to understand digital competence and to identify ways to support its development, whether among children or adults. As digital technologies are rapidly evolving, the technology-neutral and flexible nature of DigComp can provide a stable reference point from which to build policy and foster improvements in levels of digital competence. It is hoped its users will continue to raise awareness of the framework and its uses, as well as to encourage and promote its adoption (Centeno & Cosgrove, 2025).

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LIST OF ACRONYMS

AGRI	Directorate-General for Agriculture and Rural Development
AI	Artificial Intelligence
AR	Augmented Reality
CNECT	Directorate-General for Communications Networks, Content and Technology
DIGIT	Directorate-General for Digital Services
EAC	Directorate-General for Education, Youth, Sport and Culture
EC	European Commission
EMPL	Directorate-General for Employment, Social Affairs and Inclusion
EQF	European Qualifications Framework
ESTAT	Eurostat
EU	European Union
EUIPO	European Union Intellectual Property Office
GDPR	General Data Protection Regulation
ICILS	International Computer and Information Literacy Study
ICT	Information and Communications Technologies
ITU	International Telecommunications Union
JRC	Joint Research Centre
JSON	JavaScript Object Notation
MR	Mixed Reality
NQF	National Qualifications Framework
OECD	Organisation for Economic Cooperation and Development
OER	Open Educational Resources
REFORM	Reform and Investment Task Force
SJ	Le Service juridique (Legal service of the European Commission)
STEM	Science, Technology, Engineering and Mathematics
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organisation
VET	Vocational Education and Training
VR	Virtual Reality
XR	eXtended Reality

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GLOSSARY OF TERMS AND DEFINITIONS

Term	Explanation	Source(s)
Accessibility	Extent to which products, systems, services, environments and facilities can be used by people from a population with the widest range of user needs, characteristics and capabilities to achieve identified goals in identified contexts of use (which includes direct use or use supported by assistive technologies).	Generative AI Outlook Report (2025)
AI system	A machine-based system designed to operate with varying levels of autonomy, that may exhibit adaptiveness after deployment and that, for explicit or implicit objectives, infers from the input it receives how to generate output, such as predictions, content, recommendations or decisions that can influence physical or virtual environments.	AI Act (2024)
Algorithm	A formula or set of rules (or procedure, processes, or instructions) for solving a problem or for performing a task. Common examples include decision trees, clustering algorithms, classification algorithms, or regression algorithms.	Adapted from Generative AI Outlook Report (2025)
Anonymisation	In the General Data Protection Regulation (GDPR, 2018), anonymisation refers to the processing of data with the aim of irreversibly preventing the identification of an individual person.	General Data Protection Regulation (GDPR) (2018)
Antivirus software	A computer program designed to prevent, detect and remove malware. *Also referred to as anti-malware.*	Adapted from Jovanovic et al. (2021)
Application/App	A computer program or software application, especially one designed to run on a mobile device such as a smartphone, tablet, or watch.	Adapted from Cambridge English Dictionary
Assistive technologies	An umbrella term for assistive products and their related systems and services. In DigComp, assistive technologies refer to those used in digital environments. Examples include but are not limited to screen readers, adaptive keyboards, alternative input devices, reading assistants, augmented and alternative communication tools, and electronic magnifiers.	Adapted from WHO Assistive Technology Factsheet (2024) and AccessibilityChecker.org (2024)
Baiting	*See Social engineering*	

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Term	Explanation	Source(s)
Bias	A systematic deviation from a true state. There are different forms of bias, such as the subjective bias of individuals, data and algorithm bias, developer bias and institutionalised biases that are ingrained in the underlying societal context.	Adapted from Generative AI Outlook Report (2025)
Big data	Massive and complex data sets that traditional data management tools cannot handle. Big data can be characterised by large volume, high variety (frequently in unstructured or semi-structured formats), high velocity in generation and processing time, and varying degrees of quality and reliability.	Adapted from IBM: Big Data
Chatbot	A computer program designed to simulate conversation with a human, usually over the internet, especially one used to provide information or assistance to the user as part of an automated service.	Generative AI Outlook Report (2025)
Circular economy model	A system where products and materials are shared, leased, reused, repaired, refurbished and recycled instead of being thrown away.	European Parliament: Circular Economy Explained (2025)
Clickbait	A text or a thumbnail link that is designed to attract attention and to entice users to click on that link and view, read, stream or listen to the linked piece of online content. The content is typically deceptive, sensationalised, or otherwise misleading. *Also referred to as linkbait.*	Adapted from Cambridge English Dictionary and Wikipedia: Clickbait
Cloud services	Infrastructure, platforms, or software that are hosted by third-party providers and made available to users through the internet. All infrastructure, platforms, software, or technologies that users access through the internet without requiring additional software downloads can be considered cloud computing services.	Redhat: What are cloud services? (2022)
Competence statement	In DigComp 3.0, competence statements are short, concrete and technology-neutral descriptions of the kinds of capabilities that individuals at Basic, Intermediate, Advanced and Highly advanced levels could be expected to know or apply, for each of the 21 competences. These are shown in Section 3 of the DigComp 3.0 framework. Competence statements are based on the DigComp 3.0 learning outcomes in Annex 2 of the DigComp 3.0 framework and contain all of the key content in the learning outcomes.	Own elaboration.
Complex (task)	In DigComp 3.0, the term 'complex' is used in reference to proficiency levels and learning outcomes. In these contexts, a complex task is one which is not well-defined and consists of many different and inter-connected parts, and hence is intricate and not easy to understand or complete. Complexity of a task is often described on the basis of task characteristics - however, the experience and characteristics of an individual undertaking a task is also relevant.	Adapted from Cambridge Dictionary (Complex); see also Chen et al. (2023)
Computable and non-computable problems	The distinction between computable and non-computable problems relates to computability, i.e. the ability to determine if a specific problem can be solved by a computer, considering factors such as resources, machines, and solvability within practical limits. If a problem can be solved by a computer, it is computable. If it cannot, it is non-computable.	Adapted from Meijers (2009)

Term	Explanation	Source(s)
Computational thinking	Computational thinking in DigComp 3.0 is consistent with the definition of the International Computer and Information Literacy Study (ICILS): an individual's ability to recognise aspects of real-world problems which are appropriate for computational formulation and to evaluate and develop algorithmic solutions to those problems so that the solutions could be operationalised with a computer. In DigComp 3.0, computational thinking is considered a transversal competence, i.e. it relates to and facilitates many of the other DigComp competences such as problem solving, information and data management, and content creation.	Duckworth and Fraillon (2025)
Computer program	A sequence or set of instructions in a programming language for a computer to execute.	Adapted from Cambridge English Dictionary
Constructive alignment	An interactive system in which teaching and learning activities and assessment tasks are both aligned to intended learning outcomes and reinforce each other.	Adapted from Biggs & Tang (2011)
Copyright	A type of intellectual property that protects original works of authorship as soon as an author fixes the work in a tangible form of expression.	Generative AI Outlook Report (2025)
Creative Commons (licences)	A standardised way to grant permission to use creative work under copyright law. Depending on what the creative work is and how it is to be shared, the creator, whether an individual or an organisation, can choose from among six kinds of Creative Commons licences.	Creativecommons.org (2019)
Cyber threat	Any malicious activity aimed at compromising the integrity, confidentiality or availability of digital systems, networks or data.	European Parliament: Cyber threats in the EU – facts and figures (2025)
Cyberattack	An unauthorised action against computer infrastructure that compromises the confidentiality, integrity, or availability of its content.	Wikipedia: Cyberattack
Cyberbullying	Currently (2025), the most widely-cited definition of cyberbullying is *an aggressive, intentional act carried out by a group or individual, using electronic forms of contact, repeatedly and over time against a victim who cannot easily defend him or herself.*	Smith et al. (2008)
Cybercrime	The use of digital technologies to perpetrate or facilitate a crime. Cybercrime can be categorised as cyber-dependent (one which may only be committed using digital technologies), or cyber-enabled (one which is facilitated by digital technologies).	Adapted from European Parliament (2024): Understanding Cybercrime
Cybersecurity	Actions, processes and tools designed to protect a person, organisation, or country and their digital devices against crime or attacks carried out using the internet.	Adapted from Generative AI Outlook Report (2025)
Data	Any digital representation of acts, facts or information and any compilation of such acts, facts or information, including in the form of sound, visual or audiovisual recording.	Data Act (2023)

Term	Explanation	Source(s)
Data analysis	The systematic process of collecting, cleaning, transforming and interpreting data to discover useful information, identify patterns and support decision-making.	GeeksforGeeks
Data backup	The process of duplicating data and storing it in a separate location to ensure availability in the event of data loss due to corruption or disaster.	Cloudian.com
Data centre	A physical room, building or facility that houses digital technological infrastructure for building, running and delivering applications and services. It also stores and manages the data associated with those applications and services. A data centre usually includes backup components and infrastructure for power supply, data communication connections, environmental controls (e.g., air conditioning, fire suppression), and various security devices.	Adapted from IBM: Data centre and Wikipedia: Data center
Data collection tool	Digital technologies that are designed to perform data collection – the gathering and measurement of information on targeted variables within an established system.	Adapted from Wikipedia: Data collection
Data processing	The collection and manipulation of digital data to produce meaningful information.	Wikipedia: Data processing
Data protection	Refers to both the security and privacy of an individual's personal information (such as name, data of birth, home address, email address or phone number) and personal property (such as emails, files, and accounts owned or managed by the individual). Data protection can also refer to data management and storage practices that protect data from loss, theft, or corruption.	Adapted from Webopedia: Data protection
Data removal rights	In the General Data Protection Regulation (GDPR, 2018), data removal rights are referred to as 'right to erasure' or 'right to be forgotten'. These rights allow individuals to ask for their data to be deleted, and the entity holding that data has an obligation to do so, with some exceptions (i.e. if the data is needed to exercise the right of freedom of expression; there is a legal obligation to keep that data; or if it is in the public interest).	Adapted from European Commission: Do we always have to delete personal data if a person asks?
Data restoration	A process of retrieving deleted, inaccessible, lost, corrupted, damaged, or overwritten data from secondary storage, removable media or files, when the data stored in them cannot be accessed in a usual way. *Also referred to as data recovery.*	Wikipedia: Data recovery
De-bunking	The process of exposing inaccuracies, false information or myths in various theories, beliefs, or claims. It involves analysing evidence critically, disproving misconceptions, and revealing the truth or factual information about a certain topic or subject.	Definitions.net: De-bunking
Deceptive patterns	Unfair practices deployed through the structure, design or functionalities of digital interfaces or system architecture that can influence individuals to make decisions they would not have taken otherwise. *Also (and formerly) referred to as dark patterns.*	Adapted from Digital Fairness Fitness Check and Regulating dark patterns in the EU (2025); see also Types of deceptive design

Term	Explanation	Source(s)
Deep-fake	Generated or manipulated image, audio or video content that resembles existing persons, objects, places, entities or events and would falsely appear to a person to be authentic or truthful.	Generative AI Outlook Report (2025)
Design thinking	An approach to problem-solving and innovation focused on human-centered design, involving four phases (clarify, ideate, develop, and implement).	Adapted from Harvard Business School: What is design thinking? (2022)
Digital assistance tool	Digital technology that assists or supports an individual with the implementation of a task. In DigComp 3.0, digital assistance tools refer to functionalities embedded within software; platforms or services (such as automatic translation of online content, meeting note-taking functionality, voice-to-text and text-to-voice functionality); software or services that perform an assistive function (such as machine translation of text documents); and digital assistants (virtual assistants) (which answer users questions and perform simple tasks). Many of these rely on features of AI systems for some or most of their functions.	Own elaboration.
Digital citizenship	the capacity to participate actively, continuously and responsibly in communities online and offline, through competent and positive engagement with digital technologies.	Council of Europe: Digital Citizenship Education Handbook (2022)
Digital collaboration tool	Digital technologies that are designed to help people working on a common task to attain their goals. Such tools include collaborative communication, document collaboration, project management, and knowledge management.	Adapted from Wikipedia: Collaborative software
Digital communication	Communication using digital technologies. Various modes of communication exist, e.g. synchronous communication (real time communication) and asynchronous ones (not concurrent communication) and can be in one-to-one, one-to-many, or many-to-many modes.	Adapted from Generative AI Outlook Report (2025)
Digital communication tool	Digital technologies that are designed to facilitate digital communication. They include instant messaging, video conferencing, email, communication functions in social media and digital collaboration tools, and communication functions in digital platforms and services such as in e-learning and online customer support.	Adapted from the Knowledge Academy: Digital Communication Explained (2025)
Digital content	A wide range of information and data (which can include, for example, computer programs, apps, games, music, videos or texts) that can be created, stored, processed, shared and accessed using digital devices. It includes digital blueprints that can result in physical creations of digitally-represented objects, such as 3D printing outputs.	Adapted from the 2019 Directive for the supply of digital content and services to include digital 'blueprints' which link digital and physical objects (Wang, 2022)
Digital content creation tool	Digital technologies that are designed to enable the creation, editing and integration of digital content. These include text, image, video and audio processing and editing software, 3D modelling software, AI systems, particularly generative AI, and content creation online such as in social media, podcasts and websites.	Own elaboration.

Term	Explanation	Source(s)
Digital device	A unit of equipment that contains a computer or microcontroller. Common digital devices include laptop computers, desktop computers, smartphones, tablets, smartwatches and smart TVs.	PCMag: Definition of digital device
Digital environment	A context, or a 'place', that is enabled by technology and digital devices, often transmitted over the internet, or other digital means, e.g. mobile phone network. Records and evidence of an individual's interaction with a digital environment constitute their digital footprint. In DigComp 3.0, the term digital environment is used as a backdrop for digital actions without naming a specific technology or tool.	DigComp 2.2 (2022)
Digital exclusion	Marginalisation of an individual – or of a group – deprived of full access and capacity to use information and communications technologies (ICT), which hinders their participation in the economic, social, and political life of the society. Four main factors lead to digital exclusion: limited access to digital technologies, both physical and financial; lack of motivation, including understanding the benefits of digital technologies; limited digital competence; and lack of confidence or trust, including regarding online security.	Adapted from Cedefop Terminology of European education and training policy
Digital footprint	The history of a person's usage of digital devices, which includes, among others, web pages downloaded, websites logged into, text, chat and social media messages sent, links clicked, and social media pages liked. This information is widely used to target ads to consumers. *Also referred to as a digital fingerprint.*	Adapted from PCMag: Definition of digital footprint
Digital identity	In DigComp 3.0, digital identity refers to the collection of digital information about an individual, covering aspects such as personal details, online account information, username and password credentrials, behavioural and biometric data. Digital identity has several functions, such as access to services, privacy protection, and identity theft protection. Digital identity is verified through a variety of means, such as username and password, biometric verification, digital certificates, and government-issued IDs. Examples of digital identities include social media profile, email address, online banking account data, health records and educational portal credentials. Digital identity is multifaceted and evolving and can overlap with physical identity in its referents to physical realities such as home address or fingerprint data in biometric identification.	Adapted from Geeks for Geeks
Digital inclusion	Process that aims to ensure that an individual – or a group – can access and use information and communication technologies (ICT) to participate fully in economic, social and cultural life. Digital inclusion depends on four main factors: access to digital technologies, both physical and financial; motivation, including understanding the benefits of digital technologies; digital competence; and confidence or trust, including regarding online security.	Adapted from Cedefop Terminology of European education and training policy
Digital interaction	Any type of online activity that happens between people, between a person and a platform, or between platforms. In DigComp 3.0, digital interactions include those between humans and AI systems.	Adapted from Humansecurity.com

Term	Explanation	Source(s)
Digital legislation	Since 2018, several pieces of EU digital legislation have been published. Section 1.2 of the DigComp 3.0 framework includes a description of some of the key digital legislation and regulations that could be relevant to consider in the context of DigComp 3.0.	Own elaboration.
Digital participation	The active involvement of individuals in society through the use of digital technologies.	Adapted from Cedefop Terminology of European education and training policy
Digital platforms and services	Software-based online infrastructures that are designed to facilitate user interactions and transactions. Digital platforms and services can serve a range of functions including government and public services, search engines, banking, buying and selling of products and services, online collaborative communities and social media.	Adapted from Wikipedia: Digital platform; see also OECD (2019). A legal definition is in the Digital Services Act (2024)
Digital reputation	The perception or opinion that others form about a person, organisation or brand based on their online presence and behavior. In DigComp 3.0, digital reputation focuses on perception that others form about a person (rather than an organisation or brand). Digital reputation is shaped by the content individuals share, interactions they engage in, and what others post about them across digital platforms and services. A positive digital reputation can build trust and credibility, while a negative one can have a negative impact on personal relationships, job prospects, or other opportunities.	Adapted from Solove (2007) and the Australian eSafety Commissioner
Digital search tool	A range of digital technologies that are designed to or include functionalities that facilitate the search and retrieval of information. Digital search tools can include but are not limited to *search engines* (both traditional and AI-driven), *searchable databases* (such as a library catalogues or academic databases), *search functions within platforms and services* (such as for searching for and filtering flights, train tickets, accommodation or other products and services), *digital geographic information system platforms* (which facilitate geo-location and route planning), and *large language models*.	Own elaboration.
Digital services	*See Digital platforms and services.*	
Digital stress	The psychological strain resulting from an overexposure to digital environments and systems, often characterised by cognitive overload, burnout, reduced life satisfaction, and emotional disengagement.	Adapted from Argyriadi et al. (2025)
Digital technologies	Devices such as personal computers and tablets, tools such as robots, cameras, calculators and digital toys, systems such as software and apps, augmented and virtual reality, and less tangible forms of technology such as the internet.	Adapted from Generative AI Outlook Report (2025)
Digital tool	A digital technology that is used for a given purpose or for carrying out a particular function.	DigComp 2.2 (2022)

Term	Explanation	Source(s)
Disinformation	False or misleading information intentionally created and disseminated to deceive people, including for economic gain or to cause political or public harm.	Adapted from DigComp 2.2 (2022)
E-commerce	The buying and selling of goods and services over the internet. A variety of business models are used in e-commerce (e.g., business-to-consumer, business-to-business, consumer-to-consumer).	Adapted from Investopedia.com
Emoji	A graphical symbol or image that frequently accompanies text, especially in digital messages and communications. Emoji function to indicate emotional state or clarify tone or intent. They exist in various genres, including facial expressions, activity, food and drink, celebrations, flags, objects, symbols, places, weather, animals, and nature. Specific emoji may take on particular meanings among sub-groups of individuals, and there is cultural variation in the use and interpretation of emoji. *Also (and formerly) referred to as emoticon.*	Adapted from Cambridge English Dictionary and Wikipedia: Emoji
Ethical (usage of digital technologies)	Usage of digital technologies that aligns with values of respect for human dignity, freedom, democracy, equality, the rule of law and respect for human rights, including the rights of persons belonging to minorities. Ethical usage also entails consideration of the natural environment and of other living beings that are part of the human ecosystem, as well as a sustainable approach enabling the flourishing of future generations to come.	Consolidated Treaty on the EU (2025) and Generative AI Outlook Report (2025)
European Qualifications Framework (EQF)	An eight-level learning outcomes-based framework for all types of qualifications. It serves as a translation tool between different national qualifications frameworks. It helps improve transparency, comparability and portability of people's qualifications and makes it possible to compare qualifications from different countries and institutions. It was established in 2008 and revised in 2017.	Europass: EQF
External storage	Data storage space outside a digital device's own internal hardware. External storage may refer to removable media, portable storage devices, network-attached storage or cloud storage.	Adapted from Wikipedia: External storage
Filter bubble	An echo chamber (a bounded, enclosed media space that has the potential to both magnify the messages delivered within it and insulate them from rebuttal) primarily produced by ranking algorithms on digital platforms such as search engines and social media which personalises information without any active choice on the part of an individual.	Adapted from Arguedas et al. (2022)
Gamification	The application of features from gaming in non-game contexts. The goal is to increase user engagement, motivation, competition and participation through the use of game mechanics such as points, badges, leaderboards and rewards.	Adapted from ScienceDirect and Wikipedia: Gamification
Generative AI	A subset of AI that uses specialised machine learning models designed to produce a wide and general variety of outputs, capable of a range of tasks and applications, such as generating text, image or audio.	Generative AI Outlook Report (2025)

Term	Explanation	Source(s)
High-risk AI system	One which is likely to negatively affect health, safety or fundamental rights. High risk, in the AI Act, is placed between unacceptable risk, and hence forbidden, and limited risk, which has some requirements of transparency.	Generative AI Outlook Report (2025)
Human-AI collaboration	Process of one or more humans working with an AI system or systems to achieve a human-defined goal, based on the rationale that humans and AI systems have complementary strengths.	Adapted from Memmert and Bittner (2022)
Human-centric	An approach to developing and using digital technologies which strives to ensure that human values are central, by ensuring respect for fundamental rights, including those set out in the Treaties of the European Union and Charter of Fundamental Rights of the European Union, all of which are united by reference to a common foundation rooted in respect for human dignity, in which the human being enjoy a unique and inalienable moral status. Human-centric also entails consideration of the natural environment and of other living beings that are part of the human ecosystem, as well as a sustainable approach enabling the flourishing of future generations to come.	Adapted from Generative AI Outlook Report (2025)
Identity theft	The act of stealing another person's personal identifying information, such as their name, bank or credit card details, electronic signatures or passwords without their permission to commit fraud or other crimes. The person whose identity has been stolen may suffer adverse consequences, especially if they are falsely held responsible for the perpetrator's actions.	Adapted from LegalDictionary and Wikipedia: Identity theft
Intellectual property	Someone's idea, invention, creation, etc., that can be protected by law from being copied by someone else.	Cambridge Dictionary: Intellectual property
JSON	JavaScript Object Notation, a widely-used, lightweight data-interchange format.	Colantoni et al. (2021)
Learning outcomes	Statements of what an individual knows, understands and is able to do on completion of a learning process, which are defined in terms of knowledge, skills and attitudes. DigComp 3.0 includes intended learning outcomes, i.e. what an individual is *expected* to know, understand or is able to do – rather than achieved learning outcomes – the *demonstration* of what an individual knows, understands or is able to do. Section 2.5 of the DigComp 3.0 framework provides more detail.	Adapted from Cedefop (2014) and Cedefop (2022)
Licence	Grants permission to use a particular software, application, content or service. A licence in digital contexts can take several forms: It may be a serial number to be entered during the installation process, an activation code used to unlock an online service, an electronic file associated with a user account, or a licence key. The main purpose of a licence is to establish the legal rights and restrictions regarding the use of the software, application, content or service. Digital licences may also offer benefits such as easy access to updates and upgrades and facilitating the management of licenses on multiple devices.	Adapted from Onlinemarketingagency.com
Linked open data	Freely accessible and re-usable data that is in a format that can be interlinked with other data.	European Commission, 2022

Term	Explanation	Source(s)
Machine learning	A field of artificial intelligence concerned with the development and study of statistical algorithms that can learn from data and generalise to unseen data, and thus perform tasks without explicit instructions. Advances in deep learning, a sub-discipline of machine learning, have allowed neural networks, a class of statistical algorithms, to surpass many previous machine-learning approaches. Machine learning has many applications, including natural language processing, computer vision, speech recognition, email filtering, agricultural management systems, and diagnostic medicine.	Adapted from IBM: Machine learning and Wikipedia: Machine learning
Malware	Malicious software designed to infiltrate systems, cause damage, disrupt services and/or steal data.	European Parliament: Cyber threats in the EU – facts and figures (2025)
Misinformation	False information regardless of intent to deceive or mislead people.	DigComp 2.2 (2022)
Multi-factor authentication	A digital authentication method in which a user is granted access to a website or application only after successfully presenting two or more distinct types of evidence (or factors) to an authentication mechanism. The purpose of multi-factor authentication is to protect personal data—which may include personal identification or financial assets—from being accessed by an unauthorised third party that may have been able to discover, for example, a single password. Authentication can be made on the basis of something physical the user possesses (e.g. a bank card, a phone), knows (e.g. a PIN), or has as part of their physical identity (biometric identification).	Adapted from Wikipedia: Multi-factor authentication
National Qualifications Framework (NQF)	Instrument for developing, classifying and issuing qualifications in a country according to a set of criteria for specified levels of learning achieved, which integrates and coordinates national qualifications subsystems and improves transparency, access, progression and quality of qualifications.	Adapted from Cedefop Terminology of European education and training policy
Nudging	A term from the behavioural sciences which refers to any attempt at influencing people's judgment, choice or behaviour by making use of knowledge about cognitive boundaries, biases, routines, and habits in individual and social decision-making.	Adapted from Hansen (2016)
Online platform	*See Digital platforms and services.*	
Online service	*See Digital platforms and services.*	
Open data	Data that are openly accessible, exploitable, editable and shareable by anyone for any purpose. Open data are generally licensed under an open license (one which grants permission to access, re-use and redistribute a work with few or no restrictions).	Adapted from DemocracyTechnologies and Wikipedia: Open data
Open educational resources (OER)	Digital materials offered freely and openly for teaching, learning and research. Open educational resources include learning content, software tools to develop, use and distribute content, and implementation resources such as open licences.	Adapted from Cedefop Terminology of European education and training policy

Term	Explanation	Source(s)
Operating system	A digital device's system software that manages computer hardware and software resources to provide common services for computer programs.	Adapted from GeeksforGeeks and Wikipedia: Operating system
Peripheral device	Any hardware device that is not part of a computer device's central processing unit or motherboard. It does not contribute to the primary function of a computer system but rather helps users access and use additional functionalities given by that device's association with the computer. Peripheral devices cover a wide range, including input devices (e.g. keyboard, mouse, microphone), output devices (e.g. screen, headphones, speaker), peripheral storage devices (e.g. external hard drive), internal peripheral devices (e.g. memory card, graphics card) and external devices (e.g. webcam).	Adapted from Digitalworld839.com
Personal data	The data relating to a physical person who with this data can be identified directly or indirectly.	General Data Protection Regulation (GDPR) (2018)
Personalisation	Digital services that are tailored to individual users' interests and preferences, especially through the application of algorithms to the users' online behaviours.	Adapted from Generative AI Outlook Report (2025)
Phishing	*See Social engineering*	
Piracy	A form of copyright infringement which involves downloading and digitally distributing copyrighted works, such as music, films or software, without permission. Despite improvements in digital technologies to protect against piracy and the increase in digital entertainment content platforms, piracy rates have been increasing, possibly due to a combination of cost and the fact that many individuals do not perceive piracy to be an ethical issue. *Also referred to as online piracy, digital piracy or software piracy.*	Adapted from Wikipedia: Online piracy; see also Muso global piracy industry report (2023)
Plagiarism	Using someone else's ideas or work and pretending that it is one's own. The wide diffusion of AI systems, particularly generative AI, has added a layer of complexity to the ethics of plagiarism as well as an increase in plagiarism detection tools, which vary in their effectiveness.	Adapted from Cambridge Dictionary: Plagiarism; see also Kwon (2024)
Platform economy	Digital matching companies that use online platforms to connect service providers with consumers, facilitating peer-to-peer transactions and enabling value-creating interactions within a network. These platforms serve as technological infrastructures for exchanging goods and services among various groups of producers and consumers.	Adapted from ScienceDirect
Pre-bunking	A set of strategies that individuals can employ to build pre-emptive resilience to misinformation, by addressing misinformation sources at a higher level than their specific misinformation claims.	Adapted from Harjani et al. (2022)
Privacy	In the context of legislation such as the General Data Protection Regulation (GDPR, 2018), data privacy refers to the empowerment of users to make their own decisions about who can process their data, and for what purpose.	Adapted from GDPR.eu

Term	Explanation	Source(s)
Privacy tool	A digital technology that protects the privacy of the user, typically working together with internet usage to control or limit the amount of user information that is shared to third parties. There are two main types of privacy tools. The first type is protecting a user's Internet privacy from the World Wide Web. There are software products that will mask or hide a user's IP address from the outside world to protect the user from identity theft. The second type of protection is hiding or deleting a user's internet traces that are on their device as a result of using the internet.	Adapted from Wikipedia: Privacy software
Problem solving	Engaging in cognitive and metacognitive processes individually or with others to achieve a task where the method of solution is not immediately obvious. It includes identifying and defining the problem, searching for information, and testing and applying one or more potential solutions, and is done at least partially in a digital environment.	Concepts drawn from OECD (2017) and OECD (2021)
Proficiency level	In DigComp 3.0, proficiency levels describe the level of acquisition of an individual of a digital competence, according to cognitive challenge, task complexity and level of autonomy. DigComp 3.0 distinguishes between four proficiency levels (Basic, Intermediate, Advanced and Highly Advanced). For existing DigComp users, the relationship between the DigComp 3.0 proficiency levels and previous versions of DigComp is shown in Annex 1 of the DigComp 3.0 framework.	DigComp 2.1 (2017)
Pseudonymisation	In the General Data Protection Regulation (GDPR, 2018), pseudonymisation refers to the processing of personal data in such a manner that the data can no longer be attributed to a specific data subject without the use of additional information, provided that such additional information is kept separately and is subject to technical and organisational measures to ensure that the personal data are not attributed to an identified or identifiable natural person.	GDPR.eu
Responsible use (of digital technologies)	The conscious, ethical, and effective use of digital technologies to maximise their benefits and minimise their risks.	Zamora (2024)
Reality-virtuality (RV) continuum	Originally proposed in the 1990s for visual displays, the reality-virtuality (RV) continuum has a purely real environment at one end, consisting solely of real objects, and at the other end, a purely virtual environment, consisting solely of virtual objects. Any environment which consists of blending real and virtual objects is termed Mixed Reality (MR). Mixed reality environments where the real world is augmented with virtual content are called augmented reality (AR), while those where most of the content is virtual but there is some awareness or inclusion of real-world objects are called augmented virtuality (AV). The concept was updated in 2021 to cover sensory input in addition to visual.	Adapted from Milgram et al. (1995) and Skarbez et al. (2021)
Right to disconnect	Refers to a worker's right to be able to disengage from work and refrain from engaging in work-related digital communication, such as emails or other messages, during non-work hours. This concept has developed as a result of advances in communication technologies and their impact on people's daily lives. While there is currently no comprehensive EU-wide framework defining this right, the European Parliament passed a resolution in 2021 calling for a Directive to support this right.	Adapted from Eurofound (2023)

Term	Explanation	Source(s)
Robot	A machine—especially one programmable by a computer—capable of carrying out a complex series of actions automatically. Robots can operate with varying degrees of autonomy.	Adapted from Cambridge English Dictionary and Wikipedia: Robot
Robotics	The interdisciplinary study and practice of the design, construction, operation, and use of robots, involving aspects of computer science and engineering disciplines (such as mechanical, electrical, electronic and materials).	Adapted from Wikipedia: Robotics
Simple (task)	In DigComp 3.0, the term 'simple' is used in reference to proficiency levels competence statements and learning outcomes. A simple task is one which is well-defined and which consists of few parts, and hence is easy to understand and complete, and is at the opposite end of a continuum which has 'complex' at the other end. Note that task simplicity cannot necessarily be completely described on the basis of task characteristics - the experience and perspective of an individual undertaking a task is also relevant.	Adapted from Cambridge Dictionary (Complex); see also Chen et al. (2023)
Social engineering	The act of manipulating or deceiving individuals, especially using psychological persuasion, to gain access to systems containing data, documents, and information that the social engineer should not have access to obtain. Two common approaches are (i) *phishing*, which uses deceptive emails, websites, or messages to trick users into revealing sensitive information or installing malware; and (ii) *baiting*, which uses attractive advertisements or offers to entice the user into clicking on a link which contains malware or which seeks sensitive or personal data from the user. Social engineering techniques in digital environments are considered an increasingly pervasive and sophisticated threat to cybersecurity, particularly due to the application of AI technologies (e.g. voice cloning, personalising content, automated profiling). Consequences to individuals include identity theft and reputational damage.	Adapted from Hetro Washo (2021) and Bhardwaj (2025)
Social innovation	The process of developing and deploying effective solutions to challenging and often systemic social and environmental issues in support of social progress.	Mulgan et al. (2007)
Social media	A range of digital technologies that facilitate the creation, sharing and aggregation of content (such as ideas, interests, and other forms of expression) amongst virtual communities and networks. Their common features include online platforms which enable users to create and share content and participate in social networking; user-generated content; service-specific profiles; and the connection of individual user profiles to other individuals or groups.	Adapted from Wikipedia: Social media; see also Aichner et al. (2021)
Social media influencer	Online content creators who post content on social media or video-sharing platforms through which they impact society, public opinion and the personal views of their audience, often showcased through their authenticity-based relationship with their audience. Influencers often have a commercial intent and engage with commercial actors through different business models for monetisation purposes.	European Council conclusions on support for influencers as online content creators (2024)

Term	Explanation	Source(s)
Software	Computer programs that instruct the execution of a computer. Software can be categorised into operating systems (which manage hardware resources and provide services for applications) and application software (which performs specific tasks for users). Software development covers several phases (design, programming, testing, release and maintenance).	Adapted from Wikipedia: Software
Specialised (purpose, task)	In DigComp 3.0, particularly in reference to proficiency levels, competence statements and learning outcomes, references are made to specialised purposes and tasks. Here, specialised means related to a particular discipline, field or area.	Adapted from Cambridge Dictionary: Specialised
Task	In DigComp 3.0, particularly in reference to proficiency levels, competence statements and learning outcomes, a task is a specific activity which involves the use of digital technologies that contributes to a goal, in any context – everyday life, work, or learning. Tasks can vary in size, duration and complexity and may be carried out individually or in collaboration with others.	Own elaboration.
Trustworthy AI	Trustworthy AI has three components: (1) it should be lawful, ensuring compliance with all applicable laws and regulations (2) it should be ethical, demonstrating respect for, and ensure adherence to, ethical principles and values and (3) it should be robust, both from a technical and social perspective, since, even with good intentions, AI systems can cause unintentional harm. Trustworthy AI concerns not only the trustworthiness of the AI system but also comprises the trustworthiness of all processes and actors that are part of the AI system's life cycle.	Generative AI Outlook Report (2025)
United Nations (UN) Global Digital Compact (GDC)	The first comprehensive framework for global digital governance agreed by UN Member States in 2024 which aims to foster an inclusive, open, safe and secure digital space that respects, protects and promotes human rights. The UN Office for Digital and Emerging Technologies, set up in January 2025, supports follow-up and implementation of the GDC.	Adapted from the Declaration on digital rights and principles monitoring report (2025)
Universal Meaningful Connectivity (UMC)	The possibility for everyone to enjoy a safe, enriching, productive and affordable online experience, consisting of six interdependent dimensions: quality of the connection, availability for use, affordability, devices, skills and security.	ITU (2022)
'Unplugged' activities	Activities that don't involve screens or electronic devices. They can range from hobbies and exercise to social engagements that require no digital input. In DigComp 3.0, unplugged activities refer primarily to teaching and learning activities which do not require any digital input.	Adapted from Anderson (2024)
User experience (UX) and Customer experience (CX)	UX is how a user interacts with and experiences a product, system or service. It includes a person's perceptions of utility, ease of use, and efficiency. CX refers to the cognitive, affective, sensory, and behavioral responses of a customer during all stages of the consumption process including pre-purchase, consumption, and post-purchase. In DigComp 3.0, CX and UX relate specifically to digital contexts.	Adapted from Wikipedia: User experience and Wikipedia: Customer experience

Term	Explanation	Source(s)
Virtual assistant	Digital technology that can perform a range of tasks or services for a user based on user input such as commands or questions, including verbal ones. Such technologies often incorporate chatbot capabilities to streamline task execution. The interaction may be via text, graphical interface, or voice, as some virtual assistants are able to interpret human speech and respond via synthesised voices. In many cases, users use verbal commands to access information online, control home devices and media playback, and manage other basic tasks such as email, to-do lists, and calendars. Companies in various industries often incorporate some kind of virtual assistant technology into their customer service or support.	Adapted from Wikipedia: Virtual assistant
Virtual reality, realities (VR)	Typically refers to three-dimensional, immersive, fully computer-generated environments to which users access, e.g., through virtual reality headsets. Different concepts such as augmented reality (AR) and mixed reality (MR) are used to refer to various grades along the reality-virtuality continuum. It has been proposed that the term 'extended reality' (XR) covers all of these digital technologies.	Adapted from Next Generation Virtual Worlds (2023)
Wellbeing (in digital environments)	A state of physical, mental and social wellness in relation to an individual's usage of and presence in digital environments. The physical aspect refers to a range of characteristics, such as sleep and rest, balance of physical and sedentary activity, posture and musculoskeletal health and eyesight. The mental aspect also refers to a range of characteristics such as presence or absence of depression, anxiety, low self-esteem or problematic usage of digital technologies affecting mental wellbeing. The social wellbeing aspect refers to a sense of involvement with individuals and communities (e.g. access to and use of social capital; social trust; social connectedness).	Adapted from DigComp 2.2 (2022)

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ANNEXES

Annex 1: Comparison of DigComp 2.2 and DigComp 3.0

Annex 1 compares DigComp 3.0 with the previous version by providing an overview of the changes (**Table A1**); a detailed description of the changes in the wording of the competence areas and competences and their rationale (**Table A2**), and a suggested mapping of the four proficiency levels of DigComp 3.0 to the eight-level version (**Table A3**).

Table A1. A comparison of the components of DigComp 2.2 and DigComp 3.0.

Component	Comparison of DigComp 2.2 and DigComp 3.3
Definition	The definition of digital competence used in DigComp 2.2 continues to be used unchanged in DigComp 3.0.
Competence areas	Referred to as 'Dimension 1' in DigComp 2.2. Titles and descriptors of the competence areas have been updated in DigComp 3.0 to reflect recent digital technological changes and stakeholder and policy priorities, and edited to improve clarity and general framework consistency. The structure in DigComp 3.0 is the same as it was in DigComp 2.2. **Table A2** (this Annex) provides a detailed description of changes and their rationale.
Competences	Referred to as 'Dimension 2' in DigComp 2.2. The titles and descriptors of the competences have been updated in DigComp 3.0 to reflect recent digital technological changes, and stakeholder and policy priorities, and edited to improve clarity and general framework consistency. The structure in DigComp 3.0 is the same as it was in DigComp 2.2. **Table A2** (this Annex) provides a detailed description of changes and their rationale.
Proficiency levels	Referred to as 'Dimension 3' in DigComp 2.2. The underlying meaning of proficiency levels, i.e. reflecting a combination of cognitive demand, task complexity and level of autonomy, remains unchanged. Titles of two proficiency levels have changed (Foundation to Basic; Highly Specialised to Highly Advanced) and new short general descriptions of proficiencies at four levels (Basic, Intermediate, Advanced and Highly Advanced) are provided in **Table 3**. Competence statements in **Section 3**, which show how the proficiency levels look for each of the 21 competences, are new. **Section 2.4.2** (the importance of pre-requisites for Basic-level digital competence) and information in **Box 2** (definitions of task and specialised, and explicit distinction between Highly Advanced in DigComp and ICT specialist skills) are new. **Table A3** (this Annex) shows how the DigComp 3.0 four-level descriptions can be mapped to the eight levels described in DigComp 2.2, as well as to a six-level system used in some cases.
Examples of knowledge, skills and attitudes	Referred to as 'Dimension 4' in DigComp 2.2, not reproduced in DigComp 3.0. DigComp 3.0 uses Dimension 4 as a foundational base from which to build the learning outcomes (see **Annex 3** for more details), adding developments that have occurred since DigComp 2.2 was published in 2022.
Use cases (employment and learning scenarios)	Referred to as 'Dimension 5' in DigComp 2.2, not reproduced in DigComp 3.0.
Competence statements	New to DigComp 3.0 and consisting of short statements for each of the 21 competences at each of the four proficiency levels. **Section 2.4** introduces the competence statements and **Section 3** shows the competence statements for each of the 21 competences. Competence statements are less 'granular' than learning outcomes as they do not distinguish between knowledge, skills and attitudes. However, they nonetheless contain all of the key content of the learning outcomes.
Learning outcomes	New to DigComp 3.0 and consisting of short statements of knowledge, skills and attitudes for each of the 21 competences at each of the four proficiency levels. **Section 2.5** provides an introduction to the learning outcomes. Annex 2 contains the learning outcomes along with information on their features, and practical suggestions for their use.
Glossary	Not a part of the integrated framework as such, the **Glossary** of Terms and Definitions of DigComp 3.0 has been significantly expanded from the Glossary in DigComp 2.2 to include some 120 terms to support consistent interpretation.

Source: JRC own elaboration.

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Table A2 shows all changes to the titles and descriptors of the competence areas and the competences, together with a short rationale for the changes. Deletions are in **~~strikethrough~~**; additions are **underlined**; rationale is in **blue font**. The changes are mainly driven by a need to update the language and content of the framework to reflect digital technological developments and priorities which have emerged since DigComp 2.2. Changes are also made for clarity and overall framework consistency. Changes have been reviewed by experts and were subject to stakeholder consultation.

Table A2. Detailed description of changes made to competence areas and competences in DigComp 3.0 compared with DigComp 2.2, together with rationale - Deletions are in **~~strikethrough~~**; additions are **underlined**; rationale is in **blue font**.

Competence area and description	Competence and descriptor
1. Information search, evaluation and management ~~literacy~~ **Rationale:** The competence area title is re-named to more closely reflect what it covers. To articulate information needs, and to search for, locate and retrieve digital ~~data~~, information and content. To judge the relevance of the source and its content in digital environments. To critically evaluate digital sources, content, and processes used to generate them. To store, manage, and organise and analyse digital ~~data~~, information and ~~content~~ data. **Rationale:** The description is expanded from *judging relevance to critical evaluation of sources, content and information generation processes*, due to proliferation of AI systems and increased range of search options and services in digital environments. *Analysis* is added as a relevant aspect of this competence area.	**1.1 Browsing, searching and filtering ~~data~~, information ~~and digital content~~** **Rationale:** *Data*, *information* and *digital content* is simplified to *information* – information being the umbrella term which also includes data and content. To articulate information needs, to know how and where to search for ~~data~~, information and content in digital environments, and to access ~~them~~ and ~~to~~ navigate between them. To select appropriate digital tools to create, implement and update ~~personal search strategies~~ searches in digital environments and to be able to distinguish between relevant and irrelevant information and content. **Rationale:** *knowing how and where to search* reflects the range of search services/options as well as the application of an appropriate approach. *Selection of appropriate tools* is a relevant aspect of this competence. Search *implementation* is an important aspect of searching. *Personal* is omitted as some searches may be for other purposes. Recognising (and discarding) irrelevant information is a relevant aspect of this competence. **1.2 Evaluating ~~data~~, information ~~and digital content~~** **Rationale:** *Data*, *information* and *digital content* is simplified to *information* – information being the umbrella term which also includes data and content. To ~~analyse~~, assess and compare ~~and critically evaluate~~ the credibility and reliability of sources of ~~data~~, information and ~~digital~~ content in digital environments. To ~~analyse~~, interpret and critically evaluate data, information and ~~digital~~ content in digital environments, and the processes used to generate them. **Rationale:** *assess and compare* replaces *analyse, compare and critically evaluate* to better distinguish between the processes of evaluating the source of information and content (first sentence) and the information and content itself (second sentence). The addition of *processes used* to generate them is consistent with the Area 1 description. *Analyse* is removed to avoid overlap with Competence 1.3. **1.3 Managing ~~data~~, information ~~and digital content~~** **Rationale:** Data, information and digital content is simplified to information – information being the umbrella term which also includes data and content. To organise, store and retrieve ~~data~~, information and ~~content~~ data in digital environments. To collect, ~~organise~~, process and analyse ~~them in a structured environment~~ information and data in structured digital environments. **Rationale:** Minor adjustments are made to wording for clarity and consistency. *Analyse* is added as it is part of this competence (and removed from Competence 1.2).

Competence area and description	Competence and descriptor
2. Communication and collaboration To interact, share, communicate and collaborate ~~through digital technologies~~ in digital environments while being aware of cultural, ~~and~~ generational and other diversity and the features and limitations of digital technologies. To participate in society through ~~public and private digital services and participatory citizenship~~ digital technologies. To assert one's rights and exercise choice in digital environments. To manage one's digital presence, identity and reputation. **Rationale:** *Share* is added to provide a complete description of this competence area. *Features and limitations of digital technologies* is added to convey the importance of informed usage. *Public and private digital services and participatory citizenship* is replaced with simpler wording. *Other* diversity is included as diversity may not solely be related to cultural or generational differences. *Assertion of choice and exercising of rights* are relevant to this competence, particularly in response to algorithmic personalisation and related features of commercial digital platforms and services.	**2.1 Interacting through and with digital technologies** **Rationale:** Individuals interact with one another through digital technologies, as well as with digital technologies themselves, e.g. AI systems. To interact through and with a variety of digital technologies, and to ~~understand~~ use appropriate digital communication means for a given context. **Rationale:** Individuals interact with one another through digital technologies, as well as with digital technologies themselves, e.g. AI systems. *Use* rather than *understand* to convey a greater sense of agency. **2.2 Sharing through digital technologies** To share ~~data~~, information and content ethically and responsibly with others through appropriate digital technologies. ~~To act as an intermediary, to know about referencing and attribution practices~~. **Rationale:** Reference to data is removed to avoid overlap with Competence 4.2. *Ethically and responsibly* is added to signal the importance of ethical and responsible sharing for oneself and others. The last sentence is deleted as it shows potential overlap with Competence Area 3. **2.3 Engaging in citizenship through digital technologies** To participate in society through the ethical and responsible use ~~of public and private~~ digital platforms and services. To seek opportunities for self-empowerment and ~~participatory citizenship~~ participation through appropriate digital technologies. To be aware of and assert one's rights, and to exercise choice, in digital environments. **Rationale:** The reference to *public and private digital services* is replaced with the more general term, *digital platforms and services*. The reference to *participatory citizenship* is replaced with the more concrete term, *participation*. *Assertion of rights* is an important part of digital competence under European digital legislation. *Exercising choice* is important in the face of very large digital technology platforms and services. **2.4 Collaborating through digital technologies** To use digital ~~tools and~~ technologies ethically and responsibly for collaborative ~~processes~~ purposes, and for the co-construction and co-creation of ~~data~~ information, resources and knowledge. **Rationale:** *Ethically and responsibly* is added to signal the importance of ethical and responsible collaboration, particularly in human-AI collaboration. *Purposes* replaces processes to convey that the use of digital technologies, particularly in collaboration, should is purpose-driven (rather than process-driven). *Data* is replaced with *information* as a more generic term for overall framework consistency. **2.5 ~~Netiquette~~ Digital behaviour** **Rationale:** The competence is re-named to reflect more updated terminology. To be aware of behavioural norms, and to ~~know-how~~ know how to behave respectfully while using digital technologies and interacting in digital environments. To adapt communication to ~~the specific audience~~ specific contexts, and to be aware of and respect cultural, generational and other diversity in digital environments. **Rationale:** *Know-how* is replaced by *know how to behave respectfully* for clarity. *Specific contexts* replaces the *specific audience* as a more general term (as communication may vary for reasons other than audience). Being aware of *and respecting* diversity is included to convey agency. *Other* diversity is included as diversity may not solely be related to cultural or generational differences. **2.6 Managing digital identity** To ~~create and~~ manage one or multiple digital identities. To ~~be able to~~ take actions to help protect one's digital reputation ~~and to deal with the data that one produces through several tools, environments and services~~ (how one is perceived based on online presence), and to manage one's digital footprint (the data that is produced through use of and by digital platforms and services). **Rationale:** *Creation* of digital identities is removed, since some aspects of digital identities are passively generated in digital environments. *Taking action to help protect* rather than *being able to protect* is preferred as a more active formulation. The final part of the descriptor is edited to signal the relationship between *digital footprint* and *digital reputation*.

Competence area and descriptor	Competence and descriptor
3. ~~Digital~~ Content creation **Rationale:** *Digital* is removed as it is superfluous To create and edit digital content. To improve and integrate information and content into an existing body of knowledge while understanding how copyright and licences are to be applied, adopting an ethical and responsible approach in the creation, improvement and integration of digital content. To know how to apply computational thinking and programming techniques to give ~~understandable~~ instructions ~~for~~ to a computer system. **Rationale:** Reference to an *ethical and responsible* approach to content creation is added to convey the importance of this aspect, particularly in the use of AI systems. *Computational thinking* is added to the competence area descriptor to align it to changes to Competence 3.4. *Understandable* is removed as it is superfluous.	**3.1 Developing digital content** ~~To create and edit digital content in different formats.~~ To use digital technologies ethically and responsibly to create and edit a variety of content. To express oneself through digital means. **Rationale:** *Ethically and responsibly* is added due to the proliferation of AI systems, particularly generative AI, for content creation Minor re-wording is made for clarification. *Relevant* is removed as it is superfluous. **3.2 Integrating and re-elaborating digital content** To modify, refine and integrate new information and content into an existing body of knowledge and resources to create new and original ~~and relevant~~ content and knowledge. **3.3 Copyright and licences** To understand how copyright and licences, as well as associated legal and ethical issues, apply to digital ~~information and~~ content, and how to correctly apply them. **Rationale:** The competence descriptor is broadened slightly to include *legal and ethical issues* relating to copyright and licences given the impacts of AI systems on this competence. *Information* is removed as it is superfluous. *Correct application*, as well as understanding, is a relevant, and action-oriented, part of this competence. **3.4 Computational thinking and programming** **Rationale:** *Computational thinking* is added at the beginning of the competence title as it is a relevant aspect of digital competence. To understand and implement steps to analyse a problem, recognise sub-problems, and plan and develop a sequence of ~~understandable~~ instructions for a computing system to solve a given problem or to perform a specific task. **Rationale:** The first part of the competence descriptor is an addition to convey computational thinking competence, which is now included. *Understandable* is removed as it is superfluous.

Competence area and descriptor	Competence and descriptor
4. Safety, wellbeing and responsible use **Rationale:** *Wellbeing and responsible use* are added to the competence area title to convey the full range of competences in this competence area. To protect devices, content, personal data and privacy in digital environments. To ~~protect physical and psychological health~~ support physical, mental and social wellbeing of oneself and others, and to be aware of benefits and risks of digital technologies for ~~social~~ wellbeing and social inclusion. To be aware of the environmental impact of digital technologies and their use, to take action to reduce such impact, and to use digital technologies to support sustainability. **Rationale:** The wording is adjusted to refer to wellbeing as consisting of physical, mental and social aspects. *Oneself and others* is added to convey the importance of awareness of others' wellbeing and inclusion, not only one's own. *Taking action* is added regarding environmental impacts and sustainable use of digital technologies to convey agency.	**4.1 Protecting devices** To apply safety and cybersecurity measures in order to protect digital devices and ~~digital~~ content~~, and to understand risks and threats in digital environments. To know about safety and security measures and have a due regard to reliability and privacy~~. To be aware of the evolving nature of risks and threats in digital environments, and to have due regard to security of digital devices and their contents. **Rationale:** The wording is adjusted to bring the competence descriptor more clearly into scope with device protection. For example, the existing reference to *reliability and privacy* could show an overlap with Competence 4.2. The notion of *understanding* risks and threats is replaced by perspectives of *awareness* and *applying protections*, since cyber risks are growing increasingly complex. **4.2 Protecting personal data and privacy** To ~~protect~~ be aware of and exercise one's rights in relation to personal data and privacy in digital environments. ~~To understand how to use and share personally identifiable information while being able to protect oneself and others from damages. To understand that digital services use a "Privacy policy" to inform how personal data is used~~. To evaluate and manage privacy risks and protect personal data and privacy in digital environments. To use and share one's own and others' personal data safely, ethically and responsibly. **Rationale:** *Awareness and exercising of rights* is preferred to *protecting* one's rights. The second part of the competence descriptor is re-formulated to convey a more general and up-to-date description of personal data and privacy protection. **4.3 ~~Protecting health and~~ Supporting wellbeing** **Rationale:** *Protecting* is replaced by *Supporting* to convey a balanced and optimistic (but not naïve) perspective. '*Wellbeing*' is understood in DigComp 3.0 to include physical, mental and social aspects, so *Health* is removed from the title. To use digital technologies in ways that support wellbeing and inclusion. To ~~be able to avoid health risks and threats to physical and psychological wellbeing~~ minimise risks and threats to physical, mental and social wellbeing of oneself and others while using digital technologies. To balance usage of digital technologies with offline activities to support wellbeing. To ~~be able to protect oneself and others~~ take action to help protect oneself and others from possible dangers in digital environments (e.g. cyberbullying, harmful content), and to know how to respond to such dangers. ~~To be aware of digital technologies for social wellbeing and social inclusion~~. **Rationale:** Using *digital technologies in ways that support* (rather than negatively affect) *wellbeing and inclusion* is added to convey the potential benefits of balanced and informed usage. Total *avoidance of risks and threats* to wellbeing may be unrealistic – this is replaced with *minimising risks and threats*, and not only to oneself but to others. Reference to a *balance between online and offline activities* is added as a relevant aspect of this competence. The other changes in the wording convey agency (*to take action* to help to protect; *to use* digital technologies). **4.4 ~~Protecting the environment~~ Environmental impacts of digital technologies** **Rationale:** The competence title is updated to better match the content of the competence. To be aware of the environmental impact of digital technologies ~~and their use~~, including device production, operation, repair, recycling, disposal, data storage infrastructure, energy consumption and usage of tools and applications. To take action to reduce such impact and to use digital technologies to support sustainability. **Rationale:** The descriptor is expanded to include reference to a range of ways in which digital technologies can impact the environment, and reference is added to taking action to convey agency.

Competence area and descriptor	Competence and descriptor
5. Problem identification and solving **Rationale:** *Identification* is added to the title as an important part of the problem-solving process. To identify and assess needs ~~and problems~~, and to use digital technologies and adapt digital environments to meet these needs. To identify and resolve technical and conceptual problems and problem situations in digital environments. To use digital ~~tools~~ technologies to ~~innovate~~ make improvements in, or new solutions for, processes and products. To build capabilities to operate autonomously in digital environments. ~~To keep up-to-date with the digital evolution~~. To stay informed about digital technological developments and their implications. **Rationale:** Changes to the first part of the competence area descriptor are made to better reflect the competences contained within it, i.e. *using and adapting digital environments to meet needs*; *identifying* as well as *resolving technical* as well as *conceptual* problems. *Technologies* replaces *tools* for overall framework consistency. *Building capabilities to operate autonomously* is added as a key aspect of this competence area. The final sentence signals that simply following the digital evolution may not be sufficient – a consideration of *implications* (for oneself, others and wider society) may also be necessary.	**5.1 Identifying and solving technical problems** **Rationale:** *Identification* is added to the title as an important part of the problem-solving process. To identify technical problems when operating digital devices and ~~using~~ in digital environments, and to solve them ~~(from trouble-shooting to solving more complex problems)~~ through a variety of means. **Rationale:** Minor re-wording for simplicity and overall framework consistency. **5.2 Identifying needs and digital technological responses** **Rationale:** *Digital* is added for overall framework consistency. To assess one's own and others' needs and ~~to identify, evaluate, select and use digital tools and possible technological responses and to solve them~~ to evaluate, select, use and adapt digital technologies to meet these needs. To adjust and customise digital environments to ~~personal needs (e.g. accessibility)~~ the contexts, goals and needs (e.g. accessibility) of oneself and others. **Rationale:** The descriptor is re-worded to account for the needs of others as well as oneself and also for overall framework consistency. Purposes of customising environments are extended to *contexts and goals* as well as *needs*, again referring to others as well as oneself. **5.3 ~~Creatively~~ Identifying creative solutions using digital ~~technology~~ technologies** **Rationale:** The competence title is adjusted to better convey the content of the competence. *Technology* is changed to *technologies* for overall framework consistency. To use digital technologies to ~~create knowledge and to innovate processes and products~~ make improvements in or new solutions for processes and products, using a human-centric approach. To engage individually and collectively ~~in cognitive processing~~ critical thinking processes, and the creative and purposeful use of digital technologies, to understand and resolve conceptual problems and problem situations. **Rationale:** The first part of the descriptor has been simplified and clarified (stakeholders queried the meaning of the term 'innovate') and *human-centric approaches* are mentioned to signal their importance. *Cognitive processing* is replaced with an expanded phrasing, referring not only to *critical thinking* but also to *creative and purposeful use*. **5.4 Identifying and addressing digital competence ~~gaps~~ needs** **Rationale:** *Identifying* needs in itself is insufficient, they also need to be *addressed*. *Needs* is preferred to *gaps* to convey a sense of individual agency and choice. To ~~understand~~ recognise where one's own digital competence needs to be improved or updated. To address digital competence needs within a broader process of lifelong learning, building capacity and autonomy. To ~~be able to~~ support others with their digital competence development. ~~To seek opportunities for self-development and keep up-to-date with the digital evolution.~~ To stay informed about digital technological developments and their personal, professional and societal implications. **Rationale:** *Recognise* replaces *understand* as the first step in addressing competence needs. The second sentence is added to convey the active *addressing* of needs, referencing *lifelong learning* to convey that digital competence development is a continual process. The reference to *building capacity and autonomy* signals the purpose of such learning. *Being able to* is deleted from the sentence on supporting others as it is superfluous. The sentence on seeking opportunities is deleted as it is captured in the new second sentence. The last sentence is added to signal the importance of not only *staying informed* about digital technological developments but also considering their *personal, professional and societal implications*.

Source: JRC own elaboration.

Table A3 shows how the DigComp 3.0 proficiency levels can be mapped to the 8 levels of DigComp 2.2 and also to a 6-level mapping that is used in some applications of DigComp. These are **suggested** mappings which of course can be modified and adapted.

Table A3: Relationship between the four proficiency levels of DigComp 3.0 and the eight levels of DigComp 2.2, along with an alternative 6-level mapping.

Proficiency level		6-level suggested mapping	Short description		Purpose
Basic	***1***	**A1**	At basic level, individuals remember and implement simple tasks with guidance as needed.	*At the bottom of the Basic level, individuals require guidance to recognise and implement many or most simple tasks.*	To support personal, learning and/or working goals and participate in society.
	2	**A2**		*At the top of the Basic level, individuals remember and implement simple tasks with little or no guidance.*	
Intermediate	***3***	**B1**	At intermediate level, individuals identify and implement well-defined tasks and solve well-defined problems autonomously.	*At the bottom of the Intermediate level, individuals show some autonomy to identify and implement well-defined tasks and solve well-defined problems.*	To support personal, learning and/or working goals and participate autonomously in society.
	4	**B2**		*At the top of the Intermediate level, individuals confidently and autonomously identify and implement well-defined tasks and solve well-defined problems.*	
Advanced	***5***	**C1**	At advanced level, individuals assess and apply solutions to a variety of complex tasks autonomously and adapt to a variety of contexts to evaluate and execute tasks appropriately, guiding others if and as required.	*At the bottom of the Advanced level, individuals assess and apply solutions to a variety of well-defined tasks and engage with some complex tasks. They identify situations where approaches may need to be adapted, and guide others on well-defined tasks if and as required.*	To support personal, learning and/or working goals, participate effectively in society, and manage or support others in achieving their goals.
	6			*At the top of the Advanced level, individuals work confidently on a variety of complex tasks, respond effectively to challenges in changing contexts, and lead or manage complex projects, guiding others on complex tasks if and as required.*	
Highly advanced	***7***	**C2**	At highly advanced level, individuals assess, evaluate and resolve highly complex or specialised problems to create new solutions or adapt existing ones, leading and guiding others if and as required.	*At the bottom of the Highly Advanced level, individuals assess highly complex or specialised problems and may contribute to new solutions or adapt existing ones, leading and guiding others if and as required.*	To support personal, learning and/or working goals, help others to participate effectively in society, lead or support others to achieve complex goals, and/or lead or contribute to improvements in or new solutions for highly complex problems.
	8			*At the top of the Highly Advanced level, individuals lead and guide others on the creation of solutions to highly complex or specialised problems.*	

Source: JRC own elaboration.

Annex 2: DigComp 3.0 learning outcomes

A2.1 FEATURES

Each DigComp 3.0 learning outcome statement follows the same structure, *verb(s)* followed by *object*. See **Table A4** for some examples.

Table A4: Examples of learning outcome statements.

Aspect	Purpose	Example		
		Competence	*Proficiency level*	*Learning outcome statement*
Knowledge	Describe information or concepts that an individual needs to comprehend and apply.	2.6 Managing digital identity	Basic	*Identify common forms and uses of digital identity.*
Skills	Describe the processes by which an individual can complete a specific task.	1.1 Browsing, searching and filtering information and content	Intermediate	*Select appropriate digital search tools based on information needs.*
Attitudes	Orient the focus of the individual, to enable confident, critical and responsible use of digital technologies.	3.2 Integrating and re-elaborating digital content	Advanced	*Prioritise transparent and ethical practices in digital content integration and re-elaboration tasks.*

Source: JRC own elaboration.

Table A5 lists examples of verbs for learning outcomes describing knowledge, skills and attitudes at Basic, Intermediate, Advanced and Highly Advanced levels. The choice of verbs is guided by Bloom's taxonomy (Anderson & Krathwohl, 2001), considering also relevant features of other taxonomies (e.g. Irvine, 2021). Some verbs repeat across levels in Table A5. This is intentional, since the content of learning outcomes does not only vary by cognitive demand (which is suggested by the verb) but also varies in level of complexity and autonomy (which are suggested in the object of each learning outcome statement). **Box A1** summarises the main features of the DigComp 3.0 learning outcomes.

No Knowledge-based learning outcomes are included in the Highly Advanced level. Rather, the Attitudinal learning outcomes at Highly Advanced level capture a general disposition to staying informed about developments in relation to that competence, in line with the literature on self-directed learning (e.g. Morris, 2023).

Table A5: Examples of verbs used for learning outcomes describing knowledge, skills and attitudes.[11]

Level	Short Description of proficiency level	Examples of verbs used in learning outcomes statements
Basic	Remember and implement simple tasks with guidance as needed.	**Knowledge:** Recognise, Identify, Distinguish between **Skills:** Use, Apply, Implement **Attitudes**: Acknowledge the importance, Acknowledge the benefits
Intermediate	Identify and implement well-defined tasks and solve well-defined problems autonomously.	**Knowledge:** Recognise, Identify, Distinguish between, Define, Describe **Skills:** Use, Apply, Select, Assess **Attitudes:** Acknowledge the importance, Acknowledge the benefits, Prioritise, Purposefully explore, Participate in
Advanced	Assess and apply solutions to a variety of complex tasks autonomously and adapt to a variety of contexts to evaluate and execute tasks appropriately, guiding others if and as required.	**Knowledge:** Identify, Define, Describe **Skills:** Assess, Apply, Combine, Assist others, Support others **Attitudes:** Acknowledge the importance, Acknowledge the benefits, Take account of, Prioritise, Continually explore
Highly advanced	Assess, evaluate and resolve highly complex or specialised problems to create new solutions or adapt existing ones, leading and guiding others if and as required.	**Knowledge:** *No knowledge learning outcomes are included in Highly Advanced levels: This element is captured under Attitudes (stay informed about).* **Skills:** Assess and evaluate, Develop and implement, Lead or contribute to, Design, Advise, Explain **Attitudes:** Acknowledge the importance, Acknowledge the benefits, Stay informed about, Promote and support

Source: JRC own elaboration.

Box A1: Main features of DigComp 3.0 learning outcomes.

There are **523 learning outcomes in total**. The number of learning outcomes varies across competences.

DigComp 3.0 learning outcomes are each linked to one proficiency level (Basic, Intermediate, Advanced, Highly Advanced), and are grouped by Competence and whether they refer to Knowledge, Skill or Attitude. They are each labelled as AI-explicit, AI-implicit, or neither AI-explicit or AI-implicit, which is intended as a **general** guide only. See **Section 2.6** for more information on how to interpret the AI labels.

There are more learning outcomes at the lower two proficiency levels: **29%** (151) are **Basic, 32%** (170) are **Intermediate, 23%** (119) are **Advanced** and **16%** (83) are **Highly Advanced**. As digital competence becomes more advanced, the complexity of tasks and range of digital tools (and how these may be combined) increase. Therefore, the approach taken is to use a somewhat more general wording for learning outcomes at Advanced and Highly Advanced levels than learning outcomes at the Basic and Intermediate levels. This is in line with stakeholders' and experts' recommendations to focus more on the lower proficiency levels.

The learning outcomes are relatively balanced across **Knowledge** (**42%**, 217) and **Skills** (**38%**, 199), with a lower percentage related to **Attitudes** (**20%**, 107).[12]

Each learning outcome has a **unique ID**. The ID starts with 'LO' to distinguish it from competence statements in **Section 3** (those ones start with 'CS') and includes the competence number. For example, the IDs of the 21 learning outcomes for **Competence 1.1** are LO**1.1**.01 to LO**1.1**.21.

The numbering of the competence statements (**Section 3**) and the learning outcomes (in **this Annex**) do not correspond, since there are more learning outcomes than competence statements. For example, the content of CS1.1.08 does not correspond to LO1.1.08.

Source: JRC own elaboration.

11. Some notes on the verbs used: The verb 'recognise' is used in DigComp 3.0 to refer to the act of recalling. It implies surface-level knowledge, awareness or familiarity. Also, 'identify' means to establish what something is, while 'recognise' refers to acknowledging something as familiar or previously encountered. While 'assist others' and 'support others' are similar in meaning, 'assist' tends to be practical and task-focused, whereas support has a more holistic, encouraging connotation.

12. Certain attitudes, such as openness to new technologies and ethical and responsible use, tend to have a broad applicability (Tzafilkou et al., 2022; González-Mujico, 2024). The content of attitudinal learning outcomes in DigComp 3.0 focuses on critical, curious, ethical, safe and responsible use of digital technologies (European Commission, 2018, p. 10).

A2.2 PRACTICAL CONSIDERATIONS

Based on experience in applying DigComp (e.g. Castañeda et al., 2023; Kluzer et al., 2020), it is highly advisable to adapt and tailor the DigComp 3.0 learning outcomes – along with the other parts of DigComp 3.0 – to fit a particular purpose. A set of suggested steps for using DigComp 3.0 learning outcomes is shown in **Box A2**.

Box A2: Suggested steps and readings for implementing DigComp 3.0 learning outcomes.

The steps below are **suggestions** that could be adapted for specific uses of DigComp 3.0 learning outcomes.

1. **Identify the purpose** of using the learning outcomes – particularly if the use will require looking at all of them or a subset. For example, if considering the development or revision of a basic digital competence course, users can immediately exclude Advanced and Highly Advanced levels. Or, if using the learning outcomes to develop professional digital profiles or role descriptions for a specific job, one could filter out learning outcomes for competences that are not relevant in order to focus the work on the ones that are.
2. **Identify who needs to be involved**, and at which stages. Experience in of DigComp users and Cedefop's work on learning outcomes show that an initiative involving learning outcomes is more likely to be successful and impactful if all relevant stakeholders are included at the right stages and for the appropriate purposes.
3. Early in the project, **review the DigComp 3.0 framework** so that those involved are familiar with it.
4. **Make a translation** of the learning outcomes and other parts of the framework, as needed, referring to the **Glossary** to ensure that the terms are consistent with local language and use context.
5. **Adapt** the learning outcomes to the particular purpose. The DigComp 3.0 framework – including the learning outcomes – is generic by design, so it is almost certain that adaptations will be needed. Adaptations can take many forms – **re-wording or elaborating** learning outcomes, **removing** irrelevant learning outcomes, or **adding** new learning outcomes to cover topics that are relevant to the initiative. If the use involves the development of teaching and learning activities, **'unplugged'** activities could be considered (e.g. Li et al., 2022).
6. As noted in **Section 2.5**, DigComp 3.0 includes intended, not achieved learning outcomes. If the initiative involves the **development of achieved learning outcomes**, the **approach to measurement** merits consideration. On one hand, if a strictly empirical approach is used, there is a risk that 'softer' or more difficult-to-measure competences would be undervalued or omitted. Learning outcomes that cannot be directly or easily observed or measured are likely to be as important as those that can. A balanced and context-sensitive approach to this issue has been recommended (Cedefop, 2022; Europass Project Group, 2024).
7. It is good practice to **be transparent about how DigComp 3.0 learning outcomes have been used or adapted**. For example, percentage coverage of learning outcomes by competence and proficiency level can give transparency, trust and credibility to an initiative. More generally, it is good practice to document adaptations to suit the particular purpose.
8. Some of the learning outcomes, as well as the competence descriptions for the proficiency levels shown in **Section 3**, are labelled as AI-explicit or AI-implicit (**see Section 2.6**). **It is recommended to consider AI-related learning outcomes holistically** within the overall framework.

Suggested reading:

- *Cedefop's (2022)* Defining, writing and applying learning outcomes – A European Handbook (second edition) is for individuals and institutions involved in defining and writing learning outcomes. It offers concrete examples and provides an overview of existing guidance and research. Cedefop (2024c) has also developed a dataset of guidance material.
- *International Test Commission and Association of Test Publishers' (2022)* Guidelines for technology-based assessment (version 1.1) provides guidance and best practices for the design, delivery, scoring, and use of digital assessments, covering topics such as validity, fairness, accessibility, security, and privacy. It contains a description of foundational measurement concepts; a set of guideline statements; and suggestions for further reading.

Source: JRC own elaboration.

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A2.3 LEARNING OUTCOMES

Learning outcomes are also available in spreadsheet format and as a linked open dataset in JSON format on the JRC-DigComp web space.

COMPETENCE AREA 1: INFORMATION SEARCH, EVALUATION AND MANAGEMENT - Competence **1.1 Browsing, searching and filtering information**

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ID	Learning Outcome	Proficiency level	Knowledge, skill or attitude	AI label
LO1.1.01	Acknowledge the benefits of using different digital search tools and methods, depending on one's purpose.	Basic	Attitude	AI-Implicit
LO1.1.02	Recognise that the results or outputs of a search depend on the digital search tool used and the way that an individual specifies the search.	Basic	Knowledge	AI-Implicit
LO1.1.03	Recognise that search results or outputs can contain information that may not be relevant.	Basic	Knowledge	AI-Implicit
LO1.1.04	Identify the main features of commonly-used AI-driven and traditional digital search tools.	Basic	Knowledge	AI-Explicit
LO1.1.05	Use digital search tools to implement basic information searches.	Basic	Skill	AI-Implicit
LO1.1.06	Use digital search tools to refine or update existing results or outputs.	Basic	Skill	AI-Implicit
LO1.1.07	Purposefully explore new digital search tools and search functionalities.	Intermediate	Attitude	AI-Implicit
LO1.1.08	Identify strategies that provide more relevant digital search results or outputs.	Intermediate	Knowledge	AI-Implicit
LO1.1.09	Distinguish between more and less relevant digital search results or outputs.	Intermediate	Knowledge	AI-Implicit
LO1.1.10	Select appropriate digital search tools based on information needs.	Intermediate	Skill	AI-Implicit
LO1.1.11	Translate information needs into effective digital search queries, commands or statements.	Intermediate	Skill	AI-Implicit
LO1.1.12	Apply appropriate strategies to refine or filter existing digital results or outputs.	Intermediate	Skill	AI-Implicit
LO1.1.13	Continually explore functions and features of familiar and novel digital search tools.	Advanced	Attitude	AI-Implicit
LO1.1.14	Prioritise deepening one's existing search capabilities.	Advanced	Attitude	AI-Implicit
LO1.1.15	Combine a variety of digital search tools and strategies to address complex information needs.	Advanced	Skill	AI-Implicit
LO1.1.16	Assist others in developing their digital search capabilities.	Advanced	Skill	AI-Implicit
LO1.1.17	Stay informed about developments in digital search technologies.	Highly advanced	Attitude	AI-Implicit
LO1.1.18	Assess and evaluate developments in digital search technologies in a given context to support decision-making.	Highly advanced	Skill	AI-Implicit
LO1.1.19	Combine a variety of digital search tools and strategies to address highly complex or specialised information needs.	Highly advanced	Skill	AI-Implicit
LO1.1.20	Assist others to implement and refine complex or specialised searches in digital environments.	Highly advanced	Skill	AI-Implicit
LO1.1.21	Contribute to improvements in or new solutions for complex or specialised searches in digital environments.	Highly advanced	Skill	AI-Implicit

COMPETENCE AREA 1: INFORMATION SEARCH, EVALUATION AND MANAGEMENT - Competence **1.2 Evaluating information**

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ID	Learning Outcome	Proficiency level	Knowledge, skill or attitude	AI label
LO1.2.01	Acknowledge the benefits of a cautious approach in interpreting information and content in digital environments.	Basic	Attitude	AI not Implicit or Explicit
LO1.2.02	Distinguish between the source of digital content, and digital content itself.	Basic	Knowledge	AI-Implicit
LO1.2.03	Recognise that some digital information sources and systems may not be trustworthy.	Basic	Knowledge	AI-Implicit
LO1.2.04	Recognise that it can be difficult to distinguish between information and content generated by humans and AI systems.	Basic	Knowledge	AI-Explicit
LO1.2.05	Recognise examples of misinformation, disinformation, and sources of bias.	Basic	Knowledge	AI-Implicit
LO1.2.06	Recognise examples of social media influencing and filter bubbles.	Basic	Knowledge	AI-Implicit
LO1.2.07	Make a basic assessment of the reliability and credibility of digital information sources and content.	Basic	Skill	AI-Implicit
LO1.2.08	Acknowledge the benefits of questioning the credibility and reliability of information and content and their sources in digital environments.	Intermediate	Attitude	AI-Implicit
LO1.2.09	Recognise potential consequences of misinformation and disinformation in digital environments for oneself and others.	Intermediate	Knowledge	AI-Implicit
LO1.2.10	Describe methods to identify the source of information found online.	Intermediate	Knowledge	AI-Implicit
LO1.2.11	Define the purposes of fact-checking services.	Intermediate	Knowledge	AI-Implicit
LO1.2.12	Recognise the concepts and purposes of pre-bunking and de-bunking in digital contexts.	Intermediate	Knowledge	AI-Implicit
LO1.2.13	Recognise that the data used to train AI systems and how they are trained affects the reliability of the information they provide.	Intermediate	Knowledge	AI-Explicit
LO1.2.14	Recognise that some digital technologies, such as AI systems, may function like a 'black box', making it difficult to explain why or how an output has been produced.	Intermediate	Knowledge	AI-Explicit
LO1.2.15	Identify examples of human (cognitive, affective) bias and AI system (data, training) bias in relation to the generation and interpretation of information.	Intermediate	Knowledge	AI-Explicit
LO1.2.16	Recognise that AI systems may produce output which is inaccurate, even if it may seem plausible.	Intermediate	Knowledge	AI-Explicit
LO1.2.17	Recognise that the humans using an AI system are responsible for checking the quality and validity of information and content generated.	Intermediate	Knowledge	AI-Explicit
LO1.2.18	Recognise the presence of user-directing strategies in digital environments such as clickbait, nudging and gamification.	Intermediate	Knowledge	AI-Implicit
LO1.2.19	Apply pre-bunking and de-bunking strategies to discard or discredit unreliable sources and content in digital environments.	Intermediate	Skill	AI-Implicit
LO1.2.20	Respond effectively to user-directing strategies in digital environments such as clickbait, nudging and gamification.	Intermediate	Skill	AI-Implicit

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L01.2.21	Critically assess the reliability of sources, information and content in digital environments, considering the role of AI systems, personalisation effects, and commercial or other interests.	Intermediate	Skill	AI-Explicit
L01.2.22	Continually scrutinise how AI systems, biases, and various interests shape generation, presentation and interpretation of information and content in digital environments.	Advanced	Attitude	AI-Explicit
L01.2.23	Describe personal, social and political consequences of misinformation, disinformation, sources of bias, social media influencing and filter bubbles.	Advanced	Knowledge	AI-Implicit
L01.2.24	Describe features of trustworthy digital technologies, such as AI systems.	Advanced	Knowledge	AI-Explicit
L01.2.25	Describe methods that can be used to identify deep-fakes.	Advanced	Knowledge	AI-Explicit
L01.2.26	Thoroughly assess the reliability and accuracy of a diversity of sources, information and content in digital environments, considering a range of potential influencing factors.	Advanced	Skill	AI-Implicit
L01.2.27	Support others to develop their capabilities to assess the reliability of sources, information and content in digital environments.	Advanced	Skill	AI-Implicit
L01.2.28	Promote and support the development of resilience to misinformation and disinformation in digital environments among individuals and/or groups.	Highly advanced	Attitude	AI-Implicit
L01.2.29	Systematically assess and evaluate sources, information and content in digital environments to support complex decision-making.	Highly advanced	Skill	AI-Implicit
L01.2.30	Help others to develop capabilities to critically evaluate information and content in digital environments.	Highly advanced	Skill	AI-Implicit
L01.2.31	Lead or contribute to initiatives that support accurate interpretation of data, information, and content in digital environments.	Highly advanced	Skill	AI-Implicit

COMPETENCE AREA 1: INFORMATION SEARCH, EVALUATION AND MANAGEMENT - Competence **1.3 Managing information**

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ID	Learning Outcome	Proficiency level	Knowledge, skill or attitude	AI label
L01.3.01	Acknowledge the benefits of managing and organising information in digital environments.	Basic	Attitude	AI not Implicit or Explicit
L01.3.02	Recognise functions of data removal, restoration and backup.	Basic	Knowledge	AI not Implicit or Explicit
L01.3.03	Identify main properties of digital files and folders.	Basic	Knowledge	AI not Implicit or Explicit
L01.3.04	Recognise, in general terms, the concept of data.	Basic	Knowledge	AI not Implicit or Explicit
L01.3.05	Download, save, retrieve, move and delete digital files.	Basic	Skill	AI not Implicit or Explicit
L01.3.06	Organise and format simple data in a structured digital environment, such as in spreadsheets.	Basic	Skill	AI not Implicit or Explicit
L01.3.07	Update one's contacts, such as on phone, email or social media.	Basic	Skill	AI not Implicit or Explicit
L01.3.08	Acknowledge the importance of careful and ethical management of data and information in digital environments.	Intermediate	Attitude	AI-Implicit
L01.3.09	Recognise that digital files and folders can be (re-)named and organised in a manner desired by the user.	Intermediate	Knowledge	AI not Implicit or Explicit

LO1.3.10	Recognise that digital files can be saved to different locations (devices, external storage and cloud services) and transferred from one location to another.	Intermediate	Knowledge	AI not Implicit or Explicit
LO1.3.11	Identify common data collection tools and their main functions.	Intermediate	Knowledge	AI-Implicit
LO1.3.12	Define responsibilities associated with using data collection tools.	Intermediate	Knowledge	AI not Implicit or Explicit
LO1.3.13	Identify common types of data and their formats.	Intermediate	Knowledge	AI not Implicit or Explicit
LO1.3.14	Apply naming conventions to digital files and hierarchies to digital folders.	Intermediate	Skill	AI not Implicit or Explicit
LO1.3.15	Manage, save and delete files on digital devices, external storage, and cloud services.	Intermediate	Skill	AI not Implicit or Explicit
LO1.3.16	Manage information in one's digital accounts, such as email.	Intermediate	Skill	AI not Implicit or Explicit
LO1.3.17	Use data collection tools for simple processing of data and information such as quizzes, polls or surveys.	Intermediate	Skill	AI-Implicit
LO1.3.18	Organise and format data in a structured digital environment, such as in spreadsheets.	Intermediate	Skill	AI not Implicit or Explicit
LO1.3.19	Apply basic formulas to data in a structured digital environment, such as in spreadsheets.	Intermediate	Skill	AI not Implicit or Explicit
LO1.3.20	Prioritise ethical and transparent management and processing of data and information in digital environments.	Advanced	Attitude	AI-Implicit
LO1.3.21	Take account of potential sources of error or inaccuracy in management and processing of data and information in digital environments.	Advanced	Attitude	AI-Implicit
LO1.3.22	Identify possible sources of error or inaccuracy in information or data in digital environments.	Advanced	Knowledge	AI-Implicit
LO1.3.23	Describe the main steps in managing, processing and analysing information and data in digital environments.	Advanced	Knowledge	AI-Implicit
LO1.3.24	Describe features of open data (examples, applications, benefits and limitations).	Advanced	Knowledge	AI-Implicit
LO1.3.25	Describe features of big data (examples, applications, benefits and limitations).	Advanced	Knowledge	AI-Implicit
LO1.3.26	Apply a variety of functions to transfer and manage data and information in digital environments.	Advanced	Skill	AI-Implicit
LO1.3.27	Use a range of digital tools and methods to collect and process a variety of data and information.	Advanced	Skill	AI-Implicit
LO1.3.28	Apply appropriate analysis of information and data in digital environments to contribute to complex decision-making.	Advanced	Skill	AI-Implicit
LO1.3.29	Assist others with data and information management, processing and analysis in digital environments.	Advanced	Skill	AI-Implicit
LO1.3.30	Acknowledge the importance of structuring and documenting data and information in digital environments for the benefit of others.	Highly advanced	Attitude	AI not Implicit or Explicit
LO1.3.31	Stay informed about digital technological developments in data and information management and analysis.	Highly advanced	Attitude	AI-Implicit
LO1.3.32	Develop and implement strategies for complex or specialised data and information management, processing and analysis in digital environments.	Highly advanced	Skill	AI-Implicit
LO1.3.33	Use a variety of tools and methods such as big data techniques or simulations to process, manage or analyse complex data or large volumes of information.	Highly advanced	Skill	AI-Implicit
LO1.3.34	Lead or contribute to initiatives that support others in advanced information and data management, processing and analysis in digital environments.	Highly advanced	Skill	AI-Implicit
LO1.3.35	Contribute to improvements in or new solutions for complex data management, processing or analysis in digital environments.	Highly advanced	Skill	AI-Implicit

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COMPETENCE AREA 2: COMMUNICATION AND COLLABORATION - Competence **2.1 Interacting through and with digital technologies**

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ID	Learning Outcome	Proficiency level	Knowledge, skill or attitude	AI label
LO2.1.01	Acknowledge the importance of taking others' preferences into account in digital communication.	Basic	Attitude	AI not Implicit or Explicit
LO2.1.02	Distinguish between synchronous and asynchronous forms of digital communication.	Basic	Knowledge	AI not Implicit or Explicit
LO2.1.03	Identify differences between digital and non-digital interactions.	Basic	Knowledge	AI-Implicit
LO2.1.04	Distinguish between physical and virtual realities.	Basic	Knowledge	AI-Implicit
LO2.1.05	Identify basic features and functions of digital communication tools.	Basic	Knowledge	AI-Implicit
LO2.1.06	Identify basic features of virtual assistants (chatbots) and AI systems used in communication contexts.	Basic	Knowledge	AI-Explicit
LO2.1.07	Recognise key differences between human-to-machine and human-to-human interactions.	Basic	Knowledge	AI-Implicit
LO2.1.08	Recognise in general terms what a robot is, including their non-human nature.	Basic	Knowledge	AI not Implicit or Explicit
LO2.1.09	Recognise that humans interact with robots in order to carry out tasks.	Basic	Knowledge	AI not Implicit or Explicit
LO2.1.10	Use basic features of digital communication tools to interact with individuals and groups.	Basic	Skill	AI-Implicit
LO2.1.11	Acknowledge the importance of tailoring one's digital communication to specific contexts.	Intermediate	Attitude	AI not Implicit or Explicit
LO2.1.12	Recognise that there is a reality-virtuality continuum in digital environments.	Intermediate	Knowledge	AI-Implicit
LO2.1.13	Describe main features and functions of a range of digital communication tools.	Intermediate	Knowledge	AI-Implicit
LO2.1.14	Describe benefits and limitations of virtual assistants (chatbots) and AI systems in digital communication contexts.	Intermediate	Knowledge	AI-Explicit
LO2.1.15	Identify contexts in which asynchronous or synchronous digital communication, or non-digital communication, may work best.	Intermediate	Knowledge	AI not Implicit or Explicit
LO2.1.16	Identify key features of robots (such as sensors, software, motion controls and human interface).	Intermediate	Knowledge	AI-Implicit
LO2.1.17	Define examples of how humans can interact with robots.	Intermediate	Knowledge	AI-Implicit
LO2.1.18	Recognise that robots can operate with varying degrees of autonomy.	Intermediate	Knowledge	AI-Implicit
LO2.1.19	Select suitable communication means and tools, considering digital and non-digital options, for a given context or purpose.	Intermediate	Skill	AI-Implicit
LO2.1.20	Develop and refine questions, commands or statements (prompts) for virtual assistants (chatbots) and AI systems to support non-complex digital interactions.	Intermediate	Skill	AI-Explicit
LO2.1.21	Use multiple features of a variety of digital communication tools to interact with and manage individuals, groups and channels.	Intermediate	Skill	AI-Implicit
LO2.1.22	Continually adapt communication in digital environments in response to a variety of contexts.	Advanced	Attitude	AI not Implicit or Explicit
LO2.1.23	Combine digital communication tools and methods for complex communication tasks.	Advanced	Skill	AI-Implicit

L02.1.24	Systematically develop and progressively refine questions, commands or statements (prompts) for AI systems to handle complex digital interactions.	Advanced	Skill	AI-Explicit
L02.1.25	Assess benefits and disadvantages of robotic applications in a specific context.	Advanced	Skill	AI-Implicit
L02.1.26	Assist others to assess and select suitable digital communication tools for a given purpose.	Advanced	Skill	AI-Implicit
L02.1.27	Organise and/or moderate complex digital events.	Advanced	Skill	AI-Implicit
L02.1.28	Stay informed about developments in digital communication and interaction tools and methods.	Highly advanced	Attitude	AI-Implicit
L02.1.29	Assess and combine digital communication and interaction tools for highly complex or novel tasks.	Highly advanced	Skill	AI-Implicit
L02.1.30	Provide guidance, support or leadership in the advanced use of digital communication and interaction tools.	Highly advanced	Skill	AI-Implicit
L02.1.31	Lead or contribute to improvements in or new solutions for digital communication or human-machine interaction.	Highly advanced	Skill	AI-Implicit

COMPETENCE AREA 2: COMMUNICATION AND COLLABORATION - Competence **2.2 Sharing through digital technologies**

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ID	Learning Outcome	Proficiency level	Knowledge, skill or attitude	AI label
L02.2.01	Acknowledge the importance of ethical and responsible sharing of information and content in digital environments.	Basic	Attitude	AI-Implicit
L02.2.02	Recognise benefits and risks of sharing information and content in digital environments.	Basic	Knowledge	AI-Implicit
L02.2.03	Identify functions and uses of social media, and examples of common social media platforms.	Basic	Knowledge	AI-Implicit
L02.2.04	Recognise that individuals can choose how and what they would like to share through digital technologies.	Basic	Knowledge	AI not Implicit or Explicit
L02.2.05	Recognise that information and content - not all of which is true or accurate - can be shared in a variety of ways by AI systems as well as humans.	Basic	Knowledge	AI-Explicit
L02.2.06	Identify purpose and target audience of information and content to be shared in digital environments.	Basic	Knowledge	AI not Implicit or Explicit
L02.2.07	Use simple processes to share information and content in digital environments appropriately and in accordance with goals.	Basic	Skill	AI not Implicit or Explicit
L02.2.08	Acknowledge the importance of assessing the value and accuracy of information and content prior to sharing it in digital environments.	Intermediate	Attitude	AI not Implicit or Explicit
L02.2.09	Define responsibilities associated with sharing information and content in digital environments.	Intermediate	Knowledge	AI-Implicit
L02.2.10	Describe effective and ethical ways to share information and content in a variety of digital environments.	Intermediate	Knowledge	AI-Implicit
L02.2.11	Assess potential risks, benefits and ethical con siderations of sharing information and content in a variety of digital environments.	Intermediate	Skill	AI-Implicit
L02.2.12	Effectively and ethically share information and content in a variety of digital environments.	Intermediate	Skill	AI-Implicit
L02.2.13	Report or flag misinformation and disinformation that has been shared in digital environments.	Intermediate	Skill	AI-Implicit

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L02.2.14	Acknowledge the value of sharing digital information and content to assist others, such as through Open Educational Resources (OER).	Advanced	Attitude	AI not Implicit or Explicit
L02.2.15	Effectively and ethically share information and content in digital environments to support personal, learning or professional goals of oneself and others.	Advanced	Skill	AI-Implicit
L02.2.16	Advise others on effective and ethical ways to share information and content in digital environments.	Advanced	Skill	AI-Implicit
L02.2.17	Explore new and alternative means for complex sharing information and content in digital environments.	Highly advanced	Attitude	AI-Implicit
L02.2.18	Facilitate complex sharing of information and content across a variety of digital technologies.	Highly advanced	Skill	AI-Implicit
L02.2.19	Contribute to complex or specialised initiatives for sharing information and content in digital environments.	Highly advanced	Skill	AI-Implicit
L02.2.20	Lead or contribute to improvements in or new solutions for sharing complex information and content in digital environments.	Highly advanced	Skill	AI-Implicit

COMPETENCE AREA 2: COMMUNICATION AND COLLABORATION - Competence **2.3 Engaging in citizenship through digital technologies**

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ID	Learning Outcome	Proficiency level	Knowledge, skill or attitude	AI label
L02.3.01	Acknowledge the potential benefits of digital technologies for one's own and others empowerment and participation.	Basic	Attitude	AI not Implicit or Explicit
L02.3.02	Recognise digital citizenship as the ability to participate actively and responsibly in communities through engagement with digital technologies.	Basic	Knowledge	AI not Implicit or Explicit
L02.3.03	Identify examples of civic participation in digital environments.	Basic	Knowledge	AI not Implicit or Explicit
L02.3.04	Recognise that digital technologies - including difficulties in accessing them - can exclude certain groups or individuals.	Basic	Knowledge	AI-Implicit
L02.3.05	Recognise that there are laws and regulations to protect the rights of users of digital platforms and services.	Basic	Knowledge	AI-Implicit
L02.3.06	Identify main purposes and functions of (personally relevant) digital platforms and services.	Basic	Knowledge	AI-Implicit
L02.3.07	Recognise that individuals can play an active role in reviewing or improving online products and services.	Basic	Knowledge	AI not Implicit or Explicit
L02.3.08	Use digital tools to search for and find communities for civic participation on issues of interest.	Basic	Skill	AI-Implicit
L02.3.09	Use (personally relevant) digital platforms and services, seeking assistance as needed.	Basic	Skill	AI-Implicit
L02.3.10	Prioritise the exploration of ways that digital technologies can enhance one's civic and societal participation.	Intermediate	Attitude	AI-Implicit
L02.3.11	Acknowledge the importance of identifying excluded or marginalised people and groups in digital environments.	Intermediate	Attitude	AI-Implicit
L02.3.12	Participate in discussions on digital citizenship topics.	Intermediate	Attitude	AI-Implicit
L02.3.13	Recognise that digital participation is the active involvement in society through the use of digital technologies.	Intermediate	Knowledge	AI not Implicit or Explicit
L02.3.14	Recognise that civic participation occurs along a continuum.	Intermediate	Knowledge	AI not Implicit or Explicit

L02.3.15	Recognise key freedoms, rights and responsibilities of individuals under relevant digital laws and regulations.	Intermediate	Knowledge	AI-Implicit
L02.3.16	Define how to exercise key rights in digital environments.	Intermediate	Knowledge	AI-Implicit
L02.3.17	Describe the concept of the platform economy, including opportunities, risks, social and ethical implications.	Intermediate	Knowledge	AI-Implicit
L02.3.18	Describe the concept and functions of civic monitoring.	Intermediate	Knowledge	AI not Implicit or Explicit
L02.3.19	Describe the concept and functions of e-Government.	Intermediate	Knowledge	AI not Implicit or Explicit
L02.3.20	Describe how digital technologies such as social media platforms can influence some aspects of basic democracy (for example, distortion of the electoral process).	Intermediate	Knowledge	AI-Implicit
L02.3.21	Interact autonomously and effectively with digital platforms and services.	Intermediate	Skill	AI-Implicit
L02.3.22	Assess opportunities, risks, social and ethical implications of the platform economy.	Intermediate	Skill	AI-Implicit
L02.3.23	Prioritise the continual exploration of ways in which digital technologies can support empowerment or civic participation.	Advanced	Attitude	AI-Implicit
L02.3.24	Participate in discussions on digital technologies' ethical, political and social implications.	Advanced	Attitude	AI-Implicit
L02.3.25	Distinguish between high-risk and prohibited AI systems (according to legislation).	Advanced	Knowledge	AI-Explicit
L02.3.26	Describe potential societal, political or economic impacts of prohibited and high-risk AI systems.	Advanced	Knowledge	AI-Explicit
L02.3.27	Assess the potential of digital technologies for inclusion, exclusion, and civic intervention in a given context.	Advanced	Skill	AI-Implicit
L02.3.28	Assess a range of ways in which digital technologies such as social media platforms can influence democratic processes.	Advanced	Skill	AI-Implicit
L02.3.29	Assist others to identify opportunities and participate in digital environments for (self or community) empowerment and participation.	Advanced	Skill	AI not Implicit or Explicit
L02.3.30	Support others to inform themselves about and exercise their rights under digital legislation.	Advanced	Skill	AI-Implicit
L02.3.31	Stay informed about individuals' freedoms, rights and responsibilities with evolving digital technologies and legislative developments.	Highly advanced	Attitude	AI-Implicit
L02.3.32	Evaluate multiple impacts of digital technologies on society, political processes or the economy from a range of perspectives.	Highly advanced	Skill	AI-Implicit
L02.3.33	Assist others to comprehend the main provisions of digital legislation, given a specific context.	Highly advanced	Skill	AI-Implicit
L02.3.34	Lead or design digital citizenship initiatives, for example to promote participation, inclusion or empowerment.	Highly advanced	Skill	AI-Implicit

COMPETENCE AREA 2: COMMUNICATION AND COLLABORATION - Competence **2.4 Collaborating through digital technologies**

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ID	Learning Outcome	Proficiency level	Knowledge, skill or attitude	AI label
L02.4.01	Acknowledge the importance of effective communication skills for successful collaboration in digital environments.	Basic	Attitude	AI not Implicit or Explicit
L02.4.02	Recognise main benefits and limitations of digital collaboration tools.	Basic	Knowledge	AI-Implicit

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L02.4.03	Recognise the presence of AI systems in digital collaboration tools.	Basic	Knowledge	AI-Explicit
L02.4.04	Participate in collaborative groups via digital collaboration tools.	Basic	Skill	AI-Implicit
L02.4.05	Take account of different perspectives to help achieve a common goal in digital environments.	Intermediate	Attitude	AI not Implicit or Explicit
L02.4.06	Identify main features and functions of a variety of digital collaboration tools.	Intermediate	Knowledge	AI-Implicit
L02.4.07	Recognise the functions, benefits and limitations of AI system functionalities in some digital collaboration tools.	Intermediate	Knowledge	AI-Explicit
L02.4.08	Identify examples of ethical, responsible and effective human-AI collaboration.	Intermediate	Knowledge	AI-Explicit
L02.4.09	Select digital collaboration tools that meet collaboration goals.	Intermediate	Skill	AI-Implicit
L02.4.10	Create and manage simple collaborative tasks using digital collaboration tools.	Intermediate	Skill	AI-Implicit
L02.4.11	Contribute effectively to simple collaborative tasks in digital environments.	Intermediate	Skill	AI-Implicit
L02.4.12	Prioritise a good fit between how digital collaboration tools are used and the preferences of individuals involved in collaboration.	Advanced	Attitude	AI-Implicit
L02.4.13	Ensure appropriate and ethical use of digital technologies including AI systems for collaborative tasks.	Advanced	Attitude	AI-Explicit
L02.4.14	Use and combine a variety of digital collaboration tools that meet the needs of projects, tasks and groups.	Advanced	Skill	AI-Implicit
L02.4.15	Help others to develop their capabilities to collaborate in digital environments.	Advanced	Skill	AI-Implicit
L02.4.16	Assess ethical and practical aspects of human-AI collaboration techniques for a given purpose.	Advanced	Skill	AI-Explicit
L02.4.17	Lead collaboration in digital environments.	Advanced	Skill	AI-Implicit
L02.4.18	Stay informed about developments in collaborative practices in digital environments.	Highly advanced	Attitude	AI-Implicit
L02.4.19	Promote and support proportionate, ethical and effective use of digital technologies, including AI systems, in collaborations.	Highly advanced	Attitude	AI-Explicit
L02.4.20	Design complex or specialised strategies for collaboration in digital environments.	Highly advanced	Skill	AI-Implicit
L02.4.21	Assist others to develop capabilities to lead collaboration in digital environments.	Highly advanced	Skill	AI-Implicit
L02.4.22	Lead or contribute to improvements in or new solutions for human-AI collaboration.	Highly advanced	Skill	AI-Explicit

COMPETENCE AREA 2: COMMUNICATION AND COLLABORATION - Competence **2.5 Digital behaviour**

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ID	Learning Outcome	Proficiency level	Knowledge, skill or attitude	AI label
L02.5.01	Acknowledge the importance of giving space to the opinions of others in digital environments.	Basic	Attitude	AI not Implicit or Explicit
L02.5.02	Identify differences in verbal and non-verbal behaviours in digital and non-digital environments.	Basic	Knowledge	AI not Implicit or Explicit
L02.5.03	Recognise that there are cultural and contextual differences in verbal and non-verbal communication in digital environments.	Basic	Knowledge	AI not Implicit or Explicit
L02.5.04	Recognise that some behaviour in digital environments may not be acceptable to others, and/or may have legal consequences.	Basic	Knowledge	AI-Implicit

L02.5.05	Use appropriate tone and visual expression such as emoji in formal and non-formal digital environments.	Basic	Skill	AI not Implicit or Explicit
L02.5.06	Prioritise digital behaviours that support inclusion and a positive digital reputation of oneself and others.	Intermediate	Attitude	AI not Implicit or Explicit
L02.5.07	Identify key rights and responsibilities of children and adults in relation to digital behaviour.	Intermediate	Knowledge	AI-Implicit
L02.5.08	Describe the relationship between digital behaviour and digital reputation.	Intermediate	Knowledge	AI not Implicit or Explicit
L02.5.09	Identify key rights and responsibilities of children and adults in relation to digital behaviour.	Intermediate	Knowledge	AI-Implicit
L02.5.10	Use respectful and inclusive tone and visual expression such as emoji in formal and non-formal digital environments.	Intermediate	Skill	AI not Implicit or Explicit
L02.5.11	Promote and support inclusive and respectful behaviour in digital environments.	Advanced	Attitude	AI not Implicit or Explicit
L02.5.12	Distinguish between ethical, legal and illegal behaviours in digital environments, recognising that these distinctions may be complex.	Advanced	Knowledge	AI-Implicit
L02.5.13	Identify types of abuse that can occur in digital environments, including affected groups and potential impacts.	Advanced	Knowledge	AI-Implicit
L02.5.14	Describe ways in which abuse in digital environments can be reported and tackled.	Advanced	Knowledge	AI-Implicit
L02.5.15	Respond with effective and respective communication and behaviour to difficult or complex situations in digital environments.	Advanced	Skill	AI not Implicit or Explicit
L02.5.16	Assess ethical and legal/illegal aspects of behaviour in digital environments in a specific context.	Advanced	Skill	AI-Implicit
L02.5.17	Analyse patterns and potential impacts of abuse of specific groups in digital environments.	Advanced	Skill	AI-Implicit
L02.5.18	Support others to develop their capacities for inclusive and respectful behaviour in digital environments.	Advanced	Skill	AI not Implicit or Explicit
L02.5.19	Stay informed about developments in policies and legislation relating to behaviour in digital environments.	Highly advanced	Attitude	AI-Implicit
L02.5.20	Assist others to understand key rights and responsibilities under policies and legislation relating to digital behaviour in a given context.	Highly advanced	Skill	AI-Implicit
L02.5.21	Lead or contribute to digital behaviour policies or initiatives.	Highly advanced	Skill	AI-Implicit

COMPETENCE AREA 2: COMMUNICATION AND COLLABORATION - Competence **2.6 Managing digital identity**

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ID	Learning Outcome	Proficiency level	Knowledge, skill or attitude	AI label
L02.6.01	Acknowledge the benefits of implementing measures to help manage one's digital identity.	Basic	Attitude	AI not Implicit or Explicit
L02.6.02	Recognise features of physical and digital identities.	Basic	Knowledge	AI not Implicit or Explicit
L02.6.03	Identify aspects of physical identity that can be linked to digital identity.	Basic	Knowledge	AI not Implicit or Explicit
L02.6.04	Recognise digital identity as both a method to authenticate (verify) an individual and the data generated by an individual's online activities.	Basic	Knowledge	AI-Implicit
L02.6.05	Identify common forms and uses of digital identity.	Basic	Knowledge	AI-Implicit

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L02.6.06	Recognise that information on the internet can persist over time.	Basic	Knowledge	AI-Implicit
L02.6.07	Recognise the concept and components of a digital footprint.	Basic	Knowledge	AI-Implicit
L02.6.08	Recognise that digital identity protection laws protect individuals' data and privacy.	Basic	Knowledge	AI-Implicit
L02.6.09	Identify simple measures such as limiting tracking and deleting browsing history to manage digital identity.	Basic	Knowledge	AI not Implicit or Explicit
L02.6.10	Implement simple measures such as limiting tracking and deleting browsing history to manage digital identity.	Basic	Skill	AI not Implicit or Explicit
L02.6.11	Acknowledge the importance of one's own role and rights in the management of digital identity.	Intermediate	Attitude	AI-Implicit
L02.6.12	Describe the relationships between digital footprint, digital reputation and digital identity.	Intermediate	Knowledge	AI-Implicit
L02.6.13	Identify examples of actively and passively generated information in relation to digital identity.	Intermediate	Knowledge	AI-Implicit
L02.6.14	Describe ways in which the scope of one's digital identity can be analysed.	Intermediate	Knowledge	AI-Implicit
L02.6.15	Identify features and functions used to manage digital identity, such as settings on devices and apps, online accounts, activity tracking and social media platforms.	Intermediate	Knowledge	AI-Implicit
L02.6.16	Use information on the scope of one's own digital identity to guide actions on digital identity management.	Intermediate	Skill	AI-Implicit
L02.6.17	Adjust settings on devices and apps, online accounts and activity tracking to help manage one's digital identity.	Intermediate	Skill	AI-Implicit
L02.6.18	Curate and manage one or more digital identities using a variety of features and functionalities on digital platform(s) or service(s).	Intermediate	Skill	AI-Implicit
L02.6.19	Prioritise the assessment of one's digital identity on an ongoing basis.	Advanced	Attitude	AI-Implicit
L02.6.20	Recognise the relationship between digital technological developments and digital identity management.	Advanced	Knowledge	AI-Implicit
L02.6.21	Describe ways to exercise rights on issues relating to digital identity.	Advanced	Knowledge	AI-Implicit
L02.6.22	Describe ways in which AI systems are used in digital identity management.	Advanced	Knowledge	AI-Explicit
L02.6.23	Implement a variety of processes to manage digital identity across a range of digital environments.	Advanced	Skill	AI-Implicit
L02.6.24	Assess benefits, social and ethical implications of the use of AI systems in digital identity management.	Advanced	Skill	AI-Explicit
L02.6.25	Curate and manage digital identities for personal, professional and/or organisational purposes across a variety of platforms and services.	Advanced	Skill	AI-Implicit
L02.6.26	Assist others with basic digital identity management.	Advanced	Skill	AI-Implicit
L02.6.27	Stay informed about developments in digital technologies in relation digital identity management.	Highly advanced	Attitude	AI-Implicit
L02.6.28	Support others to deepen their capabilities in the management and curation of digital identities.	Highly advanced	Skill	AI-Implicit
L02.6.29	Advise others on complex aspects of digital identity management and rights.	Highly advanced	Skill	AI-Implicit

COMPETENCE AREA 3: CONTENT CREATION - Competence **3.1 Developing digital content**

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ID	Learning Outcome	Proficiency level	Knowledge, skill or attitude	AI label
L03.1.01	Acknowledge the benefits of exploring a variety of digital content creation tools to support content creation goals.	Basic	Attitude	AI-Implicit
L03.1.02	Acknowledge the importance of digital content that is accessible and inclusive.	Basic	Attitude	AI not Implicit or Explicit
L03.1.03	Identify common types of digital content and their associated file formats.	Basic	Knowledge	AI not Implicit or Explicit
L03.1.04	Identify common operational functions across digital content creation tools.	Basic	Knowledge	AI-Implicit
L03.1.05	Distinguish between accessible digital content and inclusive digital content.	Basic	Knowledge	AI not Implicit or Explicit
L03.1.06	Recognise that while AI systems can generate and integrate digital content, humans are essential to ensure ethical, responsible, and context-appropriate outputs.	Basic	Knowledge	AI-Explicit
L03.1.07	Recognise that generative AI is a particular type of AI and is one of various digital technologies that can be used to support content creation.	Basic	Knowledge	AI-Explicit
L03.1.08	Use basic features of digital content creation tools to create and edit digital content (text, image, video and/or audio).	Basic	Skill	AI-Implicit
L03.1.09	Purposefully explore features and functions of digital content creation tools to deepen content creation capabilities.	Intermediate	Attitude	AI-Implicit
L03.1.10	Describe benefits, limitations and ethical considerations in the use of digital technologies such as AI systems for content creation.	Intermediate	Knowledge	AI-Explicit
L03.1.11	Define strategies such as templates or appropriate sequencing of steps that enable efficient digital content creation.	Intermediate	Knowledge	AI-Implicit
L03.1.12	Use a variety of digital content creation tools to create and edit digital content (text, image, video and/or audio).	Intermediate	Skill	AI-Implicit
L03.1.13	Assess inclusivity and/or accessibility needs of the audience for which digital content is being created.	Intermediate	Skill	AI not Implicit or Explicit
L03.1.14	Edit digital content to enhance accessibility and meet audience needs.	Intermediate	Skill	AI-Implicit
L03.1.15	Apply strategies such as templates or appropriate sequencing of steps that enable efficient digital content creation.	Intermediate	Skill	AI-Implicit
L03.1.16	Interact with AI systems purposefully, selectively and ethically to support digital content creation.	Intermediate	Skill	AI-Explicit
L03.1.17	Acknowledge the importance of assessing capabilities, constraints and ethical aspects of digital content creation tools to ensure appropriate selection and use.	Advanced	Attitude	AI-Implicit
L03.1.18	Select and combine digital content creation tools and methods to meet complex content creation task and audience requirements.	Advanced	Skill	AI-Implicit
L03.1.19	Create and edit a variety of complex or specialised digital content, tailored appropriately to goals and audience.	Advanced	Skill	AI-Implicit

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L03.1.20	Support others to develop their capabilities in digital content creation using ethical and responsible approaches.	Advanced	Skill	AI-Implicit
L03.1.21	Promote and support accessibility and inclusivity in digital content creation initiatives.	Highly advanced	Attitude	AI-Implicit
L03.1.22	Promote and support the selective and ethical use of AI systems in content creation.	Highly advanced	Attitude	AI-Explicit
L03.1.23	Help others to develop advanced digital content creation capabilities.	Highly advanced	Skill	AI-Implicit
L03.1.24	Lead or contribute to complex or specialised digital content creation initiatives.	Highly advanced	Skill	AI-Implicit
L03.1.25	Lead or contribute to improvements in or new solutions for complex or specialised digital content.	Highly advanced	Skill	AI-Implicit

COMPETENCE AREA 3: CONTENT CREATION - Competence **3.2 Integrating and re-elaborating digital content**

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ID	Learning Outcome	Proficiency level	Knowledge, skill or attitude	AI label
L03.2.01	Acknowledge the importance of ethical and transparent practices when re-using or elaborating existing digital content.	Basic	Attitude	AI-Implicit
L03.2.02	Acknowledge the benefits of exploring digital content integration and elaboration tools and techniques.	Basic	Attitude	AI-Implicit
L03.2.03	Recognise the concept of acknowledgement in re-using existing digital content.	Basic	Knowledge	AI-Implicit
L03.2.04	Recognise the concept of transparent use of AI systems (particularly generative AI) in digital content integration and re-elaboration.	Basic	Knowledge	AI-Explicit
L03.2.05	Distinguish between editable and uneditable digital content.	Basic	Knowledge	AI not Implicit or Explicit
L03.2.06	Identify main functions of content creation tools for editing and integrating digital content (text, image, audio, video).	Basic	Knowledge	AI-Implicit
L03.2.07	Make changes to existing digital content using basic editing, formatting and integration functions.	Basic	Skill	AI-Implicit
L03.2.08	Purposefully explore a variety of ways to integrate and re-elaborate digital content to deepen digital content integration and re-elaboration capabilities.	Intermediate	Attitude	AI-Implicit
L03.2.09	Identify structure, format and audience requirements of a digital content integration or re-elaboration task.	Intermediate	Knowledge	AI not Implicit or Explicit
L03.2.10	Describe ways in which to acknowledge digital content that is being re-used.	Intermediate	Knowledge	AI not Implicit or Explicit
L03.2.11	Describe ethical and transparent practices in the use of AI systems (particularly generative AI) in digital content integration and elaboration.	Intermediate	Knowledge	AI-Explicit
L03.2.12	Adjust or integrate digital content to meet format, structure and audience requirements.	Intermediate	Skill	AI-Implicit
L03.2.13	Modify or transform digital textual, numeric or visual representations to effectively and accurately convey the meaning of data and information.	Intermediate	Skill	AI-Implicit
L03.2.14	Use digital technologies in a selective, ethical and transparent way to make enhancements or integrations to existing digital content.	Intermediate	Skill	AI-Implicit
L03.2.15	Prioritise transparent and ethical practices in digital content integration and re-elaboration tasks.	Advanced	Attitude	AI-Implicit

L03.2.16	Describe a range of methods for complex digital content integration and re-elaboration.	Advanced	Knowledge	AI-Implicit
L03.2.17	Describe appropriate and inappropriate uses of AI systems to enhance digital content integration or re-elaboration of complex tasks.	Advanced	Knowledge	AI-Explicit
L03.2.18	Adjust or integrate a variety of digital content to meet complex format, structure, and audience requirements.	Advanced	Skill	AI-Implicit
L03.2.19	Apply digital technologies in a selective, ethical and transparent way to apply complex integration or re-elaboration to digital content.	Advanced	Skill	AI-Implicit
L03.2.20	Support others to develop their capabilities in digital content integration and re-elaboration.	Advanced	Skill	AI-Implicit
L03.2.21	Promote and support ethical and transparent practices in digital content integration and re-elaboration.	Highly advanced	Attitude	AI-Implicit
L03.2.22	Stay informed about digital technological developments in digital content integration and re-elaboration, including their technical and ethical implications.	Highly advanced	Attitude	AI-Implicit
L03.2.23	Evaluate and apply advanced design and data visualisation techniques to complex or specialised digital content integration and re-elaboration.	Highly advanced	Skill	AI-Implicit
L03.2.24	Assist others with complex digital content integration and re-elaboration tasks.	Highly advanced	Skill	AI-Implicit
L03.2.25	Lead or contribute to complex digital content integration or re-elaboration initiatives.	Highly advanced	Skill	AI-Implicit
L03.2.26	Lead or contribute to improvements in or new solutions for digital complex content integration or re-elaboration.	Highly advanced	Skill	AI-Implicit

COMPETENCE AREA 3: CONTENT CREATION - Competence **3.3 Copyright and licences**

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ID	Learning Outcome	Proficiency level	Knowledge, skill or attitude	AI label
L03.3.01	Recognise that the internet is not a fully free space: individuals' data can be monetised, and individuals may need permission to use content found.	Basic	Knowledge	AI-Implicit
L03.3.02	Recognise, in general terms, the concepts of copyright and licence in digital contexts.	Basic	Knowledge	AI not Implicit or Explicit
L03.3.03	Recognise that an individual's original digital content is automatically copyrighted.	Basic	Knowledge	AI not Implicit or Explicit
L03.3.04	Recognise that different kinds of copyright and licences apply to digital content, including AI-generated content, and that these determine how content can be used and shared.	Basic	Knowledge	AI-Explicit
L03.3.05	Recognise that AI-generated content should be labelled as such to help others understand its origin and possibilities for further use.	Basic	Knowledge	AI-Explicit
L03.3.06	Identify digital content that can be used free of charge.	Basic	Knowledge	AI not Implicit or Explicit
L03.3.07	Use and share digital content in compliance with basic legal and ethical guidelines.	Basic	Skill	AI-Implicit
L03.3.08	Prioritise a cautious approach to digital content (check before using or sharing).	Intermediate	Attitude	AI-Implicit
L03.3.09	Acknowledge the complex nature of copyright and licensing of digital content.	Intermediate	Attitude	AI-Implicit
L03.3.10	Define, with examples from digital contexts, the concept of intellectual property.	Intermediate	Knowledge	AI-Implicit

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L03.3.11	Distinguish, with examples from digital contexts, between copyright, trademark, design and patent.	Intermediate	Knowledge	AI-Implicit
L03.3.12	Identify common types and purposes of licences in digital contexts, including Creative Commons.	Intermediate	Knowledge	AI not Implicit or Explicit
L03.3.13	Identify examples of piracy and plagiarism in digital contexts.	Intermediate	Knowledge	AI-Implicit
L03.3.14	Identify examples of where copyright applies and does not apply in digital contexts.	Intermediate	Knowledge	AI-Implicit
L03.3.15	Describe legal, ethical and commercial consequences of intellectual property violations in digital contexts, including piracy and plagiarism.	Intermediate	Knowledge	AI-Implicit
L03.3.16	Identify examples of legal and ethical challenges relating to copyright in the training of AI models.	Intermediate	Knowledge	AI-Explicit
L03.3.17	Apply legal and ethical guidelines appropriately when using and sharing digital content.	Intermediate	Skill	AI-Implicit
L03.3.18	Prioritise a consideration of ethical and legal aspects, such as transparency and copyright, when using and sharing digital content.	Advanced	Attitude	AI-Implicit
L03.3.19	Describe key features of current legislation in relation to digital copyright and licences.	Advanced	Knowledge	AI-Implicit
L03.3.20	Describe examples of where copyright applies and does not apply in digital contexts.	Advanced	Knowledge	AI-Implicit
L03.3.21	Identify differences in how ethical and copyright issues apply to training data for AI systems and AI-generated content (output).	Advanced	Knowledge	AI-Explicit
L03.3.22	Assess and correctly apply legal and ethical guidelines for using and sharing of digital content in complex contexts, including different software licensing models and the renewal requirements of licences.	Advanced	Skill	AI-Implicit
L03.3.23	Assist others to use and share digital content in compliance with legal and ethical guidelines.	Advanced	Skill	AI-Implicit
L03.3.24	Stay informed about developments in copyright and licensing regulations in digital contexts.	Highly advanced	Attitude	AI-Implicit
L03.3.25	Promote and support awareness and understanding of legal and ethical copyright and licensing practices in digital contexts.	Highly advanced	Attitude	AI-Implicit
L03.3.26	Apply advanced knowledge of intellectual property rights, copyright and licensing concepts in digital contexts to inform decision-making.	Highly advanced	Skill	AI-Implicit
L03.3.27	Lead or contribute to policies or guidelines on copyright and licensing in digital contexts.	Highly advanced	Skill	AI-Implicit

COMPETENCE AREA 3: CONTENT CREATION - Competence **3.4 Computational thinking and programming**

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ID	Learning Outcome	Proficiency level	Knowledge, skill or attitude	AI label
L03.4.01	Acknowledge the essential role of humans in determining how computer programs and AI systems are used.	Basic	Attitude	AI-Explicit
L03.4.02	Identify common uses of computer programs and applications.	Basic	Knowledge	AI-Implicit
L03.4.03	Recognise computational thinking as a human activity which involves the identification of steps that can be performed by a computer to solve a problem or task.	Basic	Knowledge	AI not Implicit or Explicit
L03.4.04	Recognise what AI is in general terms.	Basic	knowledge	AI-Explicit

L03.4.05	Identify, in a general way, what is and what is not an AI system.	Basic	Knowledge	AI-Explicit
L03.4.06	Identify common examples of applications of AI systems.	Basic	Knowledge	AI-Explicit
L03.4.07	Give basic instructions to a computer to perform simple tasks.	Basic	Skill	AI-Implicit
L03.4.08	Represent simple sequences symbolically, and interpret simple symbolic sequences.	Basic	Skill	AI not Implicit or Explicit
L03.4.09	Acknowledge the relevance of computational thinking, algorithmic representation and programming in everyday contexts.	Intermediate	Attitude	AI-Implicit
L03.4.10	Acknowledge the importance of ethics and accessibility in programming contexts.	Intermediate	Attitude	AI-Implicit
L03.4.11	Distinguish between a computational model of reality and reality itself.	Intermediate	Knowledge	AI-Implicit
L03.4.12	Recognise, with examples from computational thinking or programming, the concept of algorithm.	Intermediate	Knowledge	AI not Implicit or Explicit
L03.4.13	Define differences between a computable problem and a non-computable problem.	Intermediate	Knowledge	AI not Implicit or Explicit
L03.4.14	Define general steps in computational thinking.	Intermediate	Knowledge	AI not Implicit or Explicit
L03.4.15	Recognise that there are a variety of programming languages, each with a range of potential uses.	Intermediate	Knowledge	AI not Implicit or Explicit
L03.4.16	Define foundational programming concepts and general steps in programming.	Intermediate	Knowledge	AI not Implicit or Explicit
L03.4.17	Recognise the role of programming in robotics.	Intermediate	Knowledge	AI not Implicit or Explicit
L03.4.18	Recognise that machine learning is a branch of AI that enables algorithms to learn from data and make predictions.	Intermediate	Knowledge	AI-Explicit
L03.4.19	Recognise that there are steps that should be followed to develop, validate and deploy a computer program or an AI system.	Intermediate	Knowledge	AI-Explicit
L03.4.20	Describe examples of machine learning applications.	Intermediate	Knowledge	AI-Explicit
L03.4.21	Describe examples of AI system applications from a range of sectors of society.	Intermediate	Knowledge	AI-Explicit
L03.4.22	Translate basic information into logical operations.	Intermediate	Skill	AI-Implicit
L03.4.23	Develop basic programs with control structures.	Intermediate	Skill	AI-Implicit
L03.4.24	Create visual representations such as flow diagrams to illustrate basic algorithms.	Intermediate	Skill	AI-Implicit
L03.4.25	Acknowledge the importance of human oversight and human-centric approaches in the development and deployment of computer programs and AI systems.	Advanced	Attitude	AI-Explicit
L03.4.26	Define the concepts and role of human-centric approaches and human oversight in the context of programming and AI systems.	Advanced	Knowledge	AI-Explicit
L03.4.27	Describe the main steps in developing, validating and deploying a computer program or an AI system.	Advanced	Knowledge	AI-Explicit
L03.4.28	Distinguish between main types of machine learning.	Advanced	Knowledge	AI-Explicit
L03.4.29	Identify the main features and purposes of commonly-used machine learning algorithms.	Advanced	Knowledge	AI-Explicit
L03.4.30	Describe the role of user experience (UX) and customer experience (CX) in programming.	Advanced	Knowledge	AI not Implicit or Explicit
L03.4.31	Describe examples of the application of computational thinking and programming in robotics.	Advanced	Knowledge	AI-Implicit
L03.4.32	Identify routine tasks which could be (partially or fully) automated through programming tools or AI systems.	Advanced	Knowledge	AI-Explicit

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L03.4.33	Assess ethical and practical aspects of the development and deployment of computer programs and AI systems.	Advanced	Skill	AI-Explicit
L03.4.34	Apply computational thinking, knowledge of programming and/or AI systems to (partially or fully) automate routine tasks.	Advanced	Skill	AI-Explicit
L03.4.35	Apply programming tools or AI systems to complex computational thinking tasks.	Advanced	Skill	AI-Explicit
L03.4.36	Promote and support ethical programming and/or AI systems development practices.	Highly advanced	Attitude	AI-Explicit
L03.4.37	Stay informed about current developments in programming techniques and related applications of AI systems, such as robotics.	Highly advanced	Attitude	AI-Explicit
L03.4.38	Lead or contribute to complex projects focused on applications of computational thinking, programming or AI systems, including developing, validating and deploying computer programs or AI systems.	Highly advanced	Skill	AI-Explicit
L03.4.39	Assist others to develop basic programming capabilities and/or or capabilities in the application of AI systems to computational thinking tasks.	Highly advanced	Skill	AI-Explicit

COMPETENCE AREA 4: SAFETY, WELLBEING AND RESPONSIBLE USE - Competence **4.1 Protecting devices**

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ID	Learning Outcome	Proficiency level	Knowledge, skill or attitude	AI label
L04.1.01	Acknowledge the importance of one's individual role in protecting digital devices and their contents.	Basic	Attitude	AI not Implicit or Explicit
L04.1.02	Recognise the concepts of cybersecurity, cyber threat and cyberattack.	Basic	Knowledge	AI not Implicit or Explicit
L04.1.03	Recognise that individuals' actions and cybersecurity tools work together to help keep devices and their contents secure.	Basic	Knowledge	AI not Implicit or Explicit
L04.1.04	Recognise that there is cybersecurity legislation that helps to ensure the security of products and services.	Basic	Knowledge	AI not Implicit or Explicit
L04.1.05	Identify basic device protection measures and practices, such as antivirus software, screen locking, strong passwords, and multi-factor authentication.	Basic	Knowledge	AI not Implicit or Explicit
L04.1.06	Apply basic device protection measures and practices, such as antivirus software, screen locking, strong passwords, and multi-factor authentication.	Basic	Skill	AI not Implicit or Explicit
L04.1.07	Acknowledge the importance of remaining vigilant to and up-to-date with cybersecurity practices.	Intermediate	Attitude	AI-Implicit
L04.1.08	Describe main features of malware.	Intermediate	Knowledge	AI-Implicit
L04.1.09	Recognise that AI systems can be used for both cyberattacks and cybersecurity.	Intermediate	Knowledge	AI-Explicit
L04.1.10	Apply a variety of malware prevention techniques and practices to protect devices and their contents.	Intermediate	Skill	AI-Implicit
L04.1.11	Prioritise regular checking and updating of cybersecurity measures that are in place on one's devices.	Advanced	Attitude	AI not Implicit or Explicit
L04.1.12	Describe key rights of individuals under current cybersecurity legislation.	Advanced	Knowledge	AI-Implicit
L04.1.13	Identify examples of how recent and emerging technologies such as AI systems are used in cyberattacks and cybersecurity.	Advanced	Knowledge	AI-Explicit

L04.1.14	Update cybersecurity measures to protect devices and their contents in response to evolving digital threats.	Advanced	Skill	AI-Implicit
L04.1.15	Assist others in implementing basic device protection measures, such as antivirus software, screen locking, strong passwords and multi-factor authentication.	Advanced	Skill	AI not Implicit or Explicit
L04.1.16	Stay informed about digital technological and legislative developments in relation to cybersecurity.	Highly advanced	Attitude	AI-Implicit
L04.1.17	Assess rights of individuals under relevant provisions of current cybersecurity legislation.	Highly advanced	Skill	AI-Implicit
L04.1.18	Lead or contribute to citizen-focused cybersecurity initiatives.	Highly advanced	Skill	AI-Implicit
L04.1.19	Support others to build their capabilities in protecting their devices and their contents against digital threats.	Highly advanced	Skill	AI-Implicit

COMPETENCE AREA 4: SAFETY, WELLBEING AND RESPONSIBLE USE - Competence **4.2 Protecting personal data and privacy**

Back to Section 3

ID	Learning Outcome	Proficiency level	Knowledge, skill or attitude	AI label
L04.2.01	Acknowledge the importance of a cautious approach to the sharing of personal data in digital environments.	Basic	Attitude	AI not Implicit or Explicit
L04.2.02	Recognise that personal data is collected and generated through a large variety of digital sources and processes.	Basic	Knowledge	AI-Implicit
L04.2.03	Identify risks of sharing personal data in digital environments, including specific risks in relation to AI systems.	Basic	Knowledge	AI-Explicit
L04.2.04	Recognise that individuals have a right to privacy and that their personal data is protected under legislation.	Basic	Knowledge	AI-Implicit
L04.2.05	Recognise that manipulative methods can be used to deceive individuals into providing access to personal data, accounts or other sensitive information.	Basic	Knowledge	AI not Implicit or Explicit
L04.2.06	Recognise signs of identity theft.	Basic	Knowledge	AI not Implicit or Explicit
L04.2.07	Recognise that users of platforms and services can request to block or flag personal information that has been shared inappropriately online.	Basic	Knowledge	AI not Implicit or Explicit
L04.2.08	Implement basic security measures for online payments and transactions.	Basic	Skill	AI not Implicit or Explicit
L04.2.09	Respond appropriately to signs of identity theft.	Basic	Skill	AI not Implicit or Explicit
L04.2.10	Block or flag personal information that has been inappropriately shared online.	Basic	Skill	AI not Implicit or Explicit
L04.2.11	Acknowledge the importance of careful handling of personal data of oneself and others, especially vulnerable individuals and children.	Intermediate	Attitude	AI not Implicit or Explicit
L04.2.12	Recognise key concepts of data protection and privacy legislation including privacy, anonymisation, pseudonymisation and data removal rights.	Intermediate	Knowledge	AI-Implicit
L04.2.13	Identify the purpose of privacy statements.	Intermediate	Knowledge	AI not Implicit or Explicit
L04.2.14	Define main privacy statement concepts such as data subject, retention period, data transfer, and automated decision-making system.	Intermediate	Knowledge	AI not Implicit or Explicit
L04.2.15	Describe techniques related to social engineering in digital environments, such as phishing or baiting.	Intermediate	Knowledge	AI not Implicit or Explicit

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L04.2.16	Define personal data breach under current data protection and privacy legislation.	Intermediate	Knowledge	AI not Implicit or Explicit
L04.2.17	Recognise that regulation of personal data ownership in AI systems is complex.	Intermediate	Knowledge	AI-Explicit
L04.2.18	Describe privacy implications associated with the use of content shared online, such as to train AI systems.	Intermediate	Knowledge	AI-Explicit
L04.2.19	Define main features and functions of privacy tools.	Intermediate	Knowledge	AI-Implicit
L04.2.20	Manage personal data and privacy across a variety of digital environments, including use of privacy tools.	Intermediate	Skill	AI-Implicit
L04.2.21	Continually explore data ownership and privacy issues in relation to digital technological developments.	Advanced	Attitude	AI-Implicit
L04.2.22	Support others to understand their rights under current data protection and privacy legislation.	Advanced	Skill	AI-Implicit
L04.2.23	Assist others to implement basic strategies to protect personal data and manage privacy in digital environments.	Advanced	Skill	AI-Implicit
L04.2.24	Stay informed about digital technological and legislative developments in relation to personal data, data ownership and privacy.	Highly advanced	Attitude	AI-Implicit
L04.2.25	Advise on policy or regulatory aspects of data protection and privacy in digital contexts.	Highly advanced	Skill	AI-Implicit
L04.2.26	Lead or contribute to the design of personal data protection strategies in digital contexts.	Highly advanced	Skill	AI-Implicit

COMPETENCE AREA 4: SAFETY, WELLBEING AND RESPONSIBLE USE - Competence **4.3 Supporting wellbeing**

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ID	Learning Outcome	Proficiency level	Knowledge, skill or attitude	AI label
L04.3.01	Acknowledge the benefits of balancing online and offline activities.	Basic	Attitude	AI not Implicit or Explicit
L04.3.02	Acknowledge the importance of daily routines that minimise digital stress and promote social connection.	Basic	Attitude	AI not Implicit or Explicit
L04.3.03	Identify main risks and benefits to physical, mental and social wellbeing in digital environments.	Basic	Knowledge	AI-Implicit
L04.3.04	Recognise that there is a variety of information, groups and communities in digital environments that can support one's physical, mental and/or social wellbeing.	Basic	Knowledge	AI-Implicit
L04.3.05	Recognise risks and benefits to one's own physical, mental and social wellbeing in digital environments.	Basic	Knowledge	AI-Implicit
L04.3.06	Identify features of digital platforms or services, such as social media, that are designed to capture and maintain individuals' attention.	Basic	Knowledge	AI-Implicit
L04.3.07	Identify limitations and risks of using virtual assistants and AI systems to support human wellbeing.	Basic	Knowledge	AI-Explicit
L04.3.08	Identify strategies to support physical, mental and social wellbeing in digital environments.	Basic	Knowledge	AI not Implicit or Explicit
L04.3.09	Recognise signs and potential effects of problematic usage of digital technologies.	Basic	Knowledge	AI not Implicit or Explicit
L04.3.10	Recognise that there are laws and regulations that help protect the wellbeing of individuals in digital environments.	Basic	Knowledge	AI-Implicit
L04.3.11	Make a basic assessment of one's digital habits in relation to one's physical, mental and social wellbeing.	Basic	Skill	AI not Implicit or Explicit
L04.3.12	Apply personalised strategies to support physical, mental and social wellbeing in digital environments.	Basic	Skill	AI not Implicit or Explicit
L04.3.13	Acknowledge the importance of one's own and others' right to disconnect.	Intermediate	Attitude	AI not Implicit or Explicit

L04.3.14	Acknowledge the physical, mental and social benefits of analysing one's own digital usage patterns.	Intermediate	Attitude	AI not Implicit or Explicit
L04.3.15	Identify reliable sources of information, and inclusive groups and communities in digital environments, that can support one's physical, mental and/or social wellbeing.	Intermediate	Knowledge	AI-Implicit
L04.3.16	Describe examples of harmful content and behaviour in digital environments and their potential impacts on oneself and others.	Intermediate	Knowledge	AI-Implicit
L04.3.17	Describe ways in which some applications of digital technologies, such as social media, augment and perpetuate bias, stereotyping and exclusion.	Intermediate	Knowledge	AI-Implicit
L04.3.18	Describe strategies to help protect against and respond effectively to harmful behaviour and content.	Intermediate	Knowledge	AI-Implicit
L04.3.19	Identify possible ways to flag or intervene if harmful behaviour or content is encountered in digital environments.	Intermediate	Knowledge	AI-Implicit
L04.3.20	Describe impacts of harmful behaviour, content and deceptive design in digital environments on oneself and others.	Intermediate	Knowledge	AI-Implicit
L04.3.21	Analyse and adapt one's own digital usage patterns to support physical, mental and social wellbeing.	Intermediate	Skill	AI not Implicit or Explicit
L04.3.22	Implement strategies to help protect oneself against and respond effectively to harmful behaviour and content.	Intermediate	Skill	AI not Implicit or Explicit
L04.3.23	Adapt to changing digital technological developments and needs to support and maintain one's own and others' physical, mental and social wellbeing.	Advanced	Attitude	AI-Implicit
L04.3.24	Continually scrutinise the role of digital technologies such as social media in augmenting and perpetuating bias, stereotyping and exclusion.	Advanced	Attitude	AI-Implicit
L04.3.25	Assist others to review and adapt their usage of digital technologies to support and maintain their physical, mental and social wellbeing.	Advanced	Skill	AI not Implicit or Explicit
L04.3.26	Flag or intervene effectively in instances of harmful behaviour or content in digital environments.	Advanced	Skill	AI-Implicit
L04.3.27	Help others to build capacity to counteract the role of digital technologies such as social media in augmenting and perpetuating bias, stereotyping and exclusion.	Advanced	Skill	AI-Implicit
L04.3.28	Assist others to understand their rights in relation to wellbeing and/or inclusion in digital environments.	Advanced	Skill	AI-Implicit
L04.3.29	Assist others to develop awareness of harmful behaviour, content and deceptive design in digital environments.	Advanced	Skill	AI-Implicit
L04.3.30	Promote actions that support wellbeing and inclusion in digital environments.	Highly advanced	Attitude	AI-Implicit
L04.3.31	Assess and evaluate evidence on wellbeing and/or inclusion in digital environments to guide decision-making.	Highly advanced	Skill	AI-Implicit
L04.3.32	Lead or contribute to initiatives that support wellbeing and/or inclusion in digital environments.	Highly advanced	Skill	AI-Implicit
L04.3.33	Contribute to legal and regulatory decision-making in relation to individuals' wellbeing and/or inclusion in digital environments.	Highly advanced	Skill	AI-Implicit

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COMPETENCE AREA 4: SAFETY, WELLBEING AND RESPONSIBLE USE - Competence **4.4 Environmental impacts of digital technologies**

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ID	Learning Outcome	Proficiency level	Knowledge, skill or attitude	AI label
L04.4.01	Acknowledge the role that individuals can play to help reduce the environmental impact of digital technologies.	Basic	Attitude	AI not Implicit or Explicit
L04.4.02	Recognise that some digital technologies and infrastructures such as AI systems and data centres have large impacts on the environment.	Basic	Knowledge	AI-Explicit
L04.4.03	Recognise that the full environmental impacts of digital technologies are not immediately apparent to an individual user.	Basic	Knowledge	AI-Implicit
L04.4.04	Recognise that digital technologies can support energy efficiency and sustainability.	Basic	Knowledge	AI-Implicit
L04.4.05	Identify simple strategies to reduce energy and data consumption of digital technologies, such as minimising usage of energy-intensive applications and non-usage of digital technologies when not needed.	Basic	Knowledge	AI-Implicit
L04.4.06	Apply simple strategies to reduce energy and data consumption of digital technologies, such as minimising usage of energy-intensive applications and non-usage of digital technologies when not needed.	Basic	Skill	AI-Implicit
L04.4.07	Continually assess the environmental impacts of one's usage of digital technologies.	Intermediate	Attitude	AI-Implicit
L04.4.08	Identify environmental impacts of digital technologies that occur during manufacturing, usage and disposal.	Intermediate	Knowledge	AI-Implicit
L04.4.09	Describe environmental impacts of data centres and e-commerce.	Intermediate	Knowledge	AI-Implicit
L04.4.10	Describe examples of how digital tools can support sustainable living.	Intermediate	Knowledge	AI-Implicit
L04.4.11	Define the concepts of sharing economy and circular economy, including risks, limitations and potential environmental benefits.	Intermediate	Knowledge	AI not Implicit or Explicit
L04.4.12	Apply a variety of strategies to reduce the environmental impact of one's use of digital technologies and digital devices, such as informed digital device purchasing decisions, device recycling and repair, environmentally conscious e-commerce practices, and environmentally conscious usage patterns.	Intermediate	Skill	AI-Implicit
L04.4.13	Stay informed about the environmental impacts of digital technologies and ways in which digital technologies can support sustainability.	Advanced	Attitude	AI-Implicit
L04.4.14	Evaluate the environmental impacts of digital technologies and infrastructures to support decision-making or advocacy.	Advanced	Skill	AI-Implicit
L04.4.15	Help others to assess their use of digital technologies to identify ways in which to reduce environmental impact.	Advanced	Skill	AI-Implicit
L04.4.16	Stay informed about the environmental and sustainability implications of digital technologies across a range of sectors.	Highly advanced	Attitude	AI-Implicit
L04.4.17	Promote and support actions for environmentally sustainable usage of digital technologies.	Highly advanced	Attitude	AI-Implicit
L04.4.18	Lead or contribute to digital sustainability initiatives.	Highly advanced	Skill	AI-Implicit
L04.4.19	Contribute to improvements in or solutions for digital sustainability.	Highly advanced	Skill	AI-Implicit

COMPETENCE AREA 5: PROBLEM IDENTIFICATION AND SOLVING - Competence **5.1 Identifying and solving technical problems**

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ID	Learning Outcome	Proficiency level	Knowledge, skill or attitude	AI label
LO5.1.01	Acknowledge the commonplace nature of technical problems in digital environments.	Basic	Attitude	AI not Implicit or Explicit
LO5.1.02	Acknowledge the benefits of seeking assistance to help resolve technical problems.	Basic	Attitude	AI not Implicit or Explicit
LO5.1.03	Distinguish between operating systems and software.	Basic	Knowledge	AI not Implicit or Explicit
LO5.1.04	Identify main features of hardware, software, connectivity, and common peripheral devices.	Basic	Knowledge	AI not Implicit or Explicit
LO5.1.05	Recognise signs of common technical problems such as lack of connectivity, forgot password, forgot file location, unsaved document, or error in email or web address.	Basic	Knowledge	AI not Implicit or Explicit
LO5.1.06	Follow instructions to solve common technical problems such as lack of connectivity, forgot password, forgot file location, unsaved document, or error in email or web address.	Basic	Skill	AI not Implicit or Explicit
LO5.1.07	Install and update software and applications, as needed.	Basic	Skill	AI not Implicit or Explicit
LO5.1.08	Acknowledge the benefits of building capacity and autonomy in addressing technical issues.	Intermediate	Attitude	AI not Implicit or Explicit
LO5.1.09	Troubleshoot technical problems in digital environments using a variety of search and problem-solving strategies (whether human-assisted or digital technology-assisted).	Intermediate	Skill	AI-Implicit
LO5.1.10	Update and adjust settings on main and peripheral digital devices to maintain good performance.	Intermediate	Skill	AI not Implicit or Explicit
LO5.1.11	Prioritise the development of one's capacity to diagnose and solve technical issues in digital environments.	Advanced	Attitude	AI not Implicit or Explicit
LO5.1.12	Assist others to diagnose and solve technical problems in digital environments.	Advanced	Skill	AI not Implicit or Explicit
LO5.1.13	Use various solution-finding strategies to troubleshoot complex technical problems in digital environments.	Advanced	Skill	AI-Implicit
LO5.1.14	Help others to develop confidence and autonomy to solve technical problems in digital environments.	Highly advanced	Attitude	AI not Implicit or Explicit
LO5.1.15	Design or deliver training to support the use of digital devices or systems.	Highly advanced	Skill	AI-Implicit

COMPETENCE AREA 5: PROBLEM IDENTIFICATION AND SOLVING - Competence **5.2 Identifying needs and digital technological responses**

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ID	Learning Outcome	Proficiency level	Knowledge, skill or attitude	AI label
LO5.2.01	Acknowledge the importance of individual choice in digital environment configurations.	Basic	Attitude	AI not Implicit or Explicit
LO5.2.02	Recognise common ways in which features of digital environments can be adjusted to meet users' needs and preferences.	Basic	Knowledge	AI not Implicit or Explicit
LO5.2.03	Recognise the concept and purpose of a digital assistance tool.	Basic	Knowledge	AI-Implicit
LO5.2.04	Recognise the presence of AI systems in digital assistance tools.	Basic	Knowledge	AI-Explicit

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L05.2.05	Identify common assistive technologies and their purposes.	Basic	Knowledge	AI-Implicit
L05.2.06	Use assistive technologies, if and as required.	Basic	Skill	AI-Implicit
L05.2.07	Use digital assistance tools to support simple tasks, with awareness of their benefits and limitations.	Basic	Skill	AI-Implicit
L05.2.08	Acknowledge the benefits of exploring adaptations to digital environment configurations and features of digital assistance tools.	Intermediate	Attitude	AI-Implicit
L05.2.09	Adjust features of one's digital environment to suit one's own and others' needs and preferences.	Intermediate	Skill	AI-Implicit
L05.2.10	Make informed use of digital assistance tools to support one's own and others' needs, with awareness of their benefits and limitations.	Intermediate	Skill	AI-Implicit
L05.2.11	Prioritise an ongoing assessment of how digital environmental configurations, digital assistance tools and/or assistive technologies can meet the needs of oneself and others.	Advanced	Attitude	AI-Implicit
L05.2.12	Adjust features of one's digital environment to suit one's own and others' needs and preferences.	Advanced	Skill	AI-Implicit
L05.2.13	Assess the accessibility, inclusivity, fairness and/or rights-sensitivity of digital technologies in a given context.	Advanced	Skill	AI-Implicit
L05.2.14	Support others to make informed use of digital assistance tools, and adjustments to digital environment configurations, to meet their own and others' needs.	Advanced	Skill	AI-Implicit
L05.2.15	Promote and support the use of inclusive and accessible digital technologies.	Highly advanced	Attitude	AI-Implicit
L05.2.16	Assess complex needs of individuals to identify and/or design tailored digital solutions.	Highly advanced	Skill	AI-Implicit
L05.2.17	Contribute to improvements in digital assistance tools, accessible digital environment configurations, and/or assistive technologies.	Highly advanced	Skill	AI-Implicit

COMPETENCE AREA 5: PROBLEM IDENTIFICATION AND SOLVING - Competence **5.3 Creatively using digital technologies**

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ID	Learning Outcome	Proficiency level	Knowledge, skill or attitude	AI label
L05.3.01	Acknowledge that digital technologies can support, but not replace, human creativity.	Basic	Attitude	AI-Implicit
L05.3.02	Identify examples of how digital technologies are used to solve real-world problems and to make improvements to or create new solutions for products and services.	Basic	Knowledge	AI-Implicit
L05.3.03	Identify examples of where digital technologies can support or augment human creativity.	Basic	Knowledge	AI-Implicit
L05.3.04	Acknowledge the importance of placing human rights, values, needs and experiences at the centre of digital technologies design and use.	Intermediate	Attitude	AI-Implicit
L05.3.05	Define the concept of human-centric and its role in digital technologies development and usage.	Intermediate	Knowledge	AI-Implicit
L05.3.06	Identify examples of the interplay between humans and digital technologies in creativity and problem-solving.	Intermediate	Knowledge	AI-Implicit

L05.3.07	Describe strengths, weaknesses and ethical considerations of digital technologies including AI systems in relation to human creativity and problem-solving.	Intermediate	Knowledge	AI-Explicit
L05.3.08	Assess strengths and weaknesses of available digital technologies in relation to a particular problem-solving task.	Intermediate	Skill	AI-Implicit
L05.3.09	Use a variety of digital technologies responsibly and ethically to support problem-solving as an individual or in a group.	Intermediate	Skill	AI-Implicit
L05.3.10	Prioritise human-centric approaches in one's own use of digital technologies for problem-solving.	Advanced	Attitude	AI-Implicit
L05.3.11	Use a variety of digital technologies efficiently, responsibly and ethically to help solve complex problems.	Advanced	Skill	AI-Implicit
L05.3.12	Contribute to initiatives focused on the application of digital technologies to help solve complex problem-solving tasks.	Advanced	Skill	AI-Implicit
L05.3.13	Support others to develop their confidence and capabilities in using digital technologies to help solve real-world problems.	Advanced	Skill	AI-Implicit
L05.3.14	Lead or contribute to initiatives focused on the application of digital technologies for highly complex or specialised problem-solving.	Highly advanced	Skill	AI-Implicit
L05.3.15	Lead or contribute to initiatives that use digital technologies to help make improvements to or find new solutions for real-world problems.	Highly advanced	Skill	AI-Implicit
L05.3.16	Support others to develop their capabilities to use digital technologies for complex or specialised problem-solving tasks.	Highly advanced	Skill	AI-Implicit

COMPETENCE AREA 5: PROBLEM IDENTIFICATION AND SOLVING - Competence **5.4 Identifying and addressing digital competence needs**

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ID	Learning Outcome	Proficiency level	Knowledge, skill or attitude	AI label
L05.4.01	Acknowledge the value of learning about digital technologies in relation to one's own interests and needs.	Basic	Attitude	AI-Implicit
L05.4.02	Acknowledge the benefits and commonplace nature of seeking support in addressing digital competence needs.	Basic	Attitude	AI not Implicit or Explicit
L05.4.03	Recognise that digital competence is much broader than technical skills.	Basic	Knowledge	AI-Implicit
L05.4.04	Recognise that digital competence requires regular updating for daily life, working and learning.	Basic	Knowledge	AI-Implicit
L05.4.05	Identify opportunities to improve one's digital competences.	Basic	Knowledge	AI-Implicit
L05.4.06	Acknowledge the benefits of staying informed about developments in digital technologies.	Intermediate	Attitude	AI-Implicit
L05.4.07	Prioritise the identification of opportunities to learn about digital technologies.	Intermediate	Attitude	AI-Implicit

L05.4.08	Identify relevant learning to meet one's digital competence needs.	Intermediate	Knowledge	AI-Implicit
L05.4.09	Accurately assess one's own digital competences and digital competence needs.	Intermediate	Skill	AI-Implicit
L05.4.10	Participate actively in learning to meet one's digital competence needs.	Intermediate	Attitude	AI-Implicit
L05.4.11	Continually assess digital technological developments and their implications for one's own and others' digital competence needs.	Advanced	Attitude	AI-Implicit
L05.4.12	Engage in ongoing self-development to meet digital competence needs.	Advanced	Attitude	AI-Implicit
L05.4.13	Support others to develop confidence and autonomy in digital environments.	Advanced	Skill	AI-Implicit
L05.4.14	Compile available digital competence learning opportunities for a particular purpose.	Advanced	Skill	AI-Implicit
L05.4.15	Engage in ongoing self-development to meet complex or specialised digital competence needs.	Highly advanced	Attitude	AI-Implicit
L05.4.16	Mentor others in identifying and addressing their digital competence needs.	Highly advanced	Skill	AI-Implicit
L05.4.17	Design learning material to help others to meet complex or specialised digital competence needs.	Highly advanced	Skill	AI-Implicit

Annex 3: Phases in the development of DigComp 3.0

Development work on DigComp 3.0 took place across four phases. Many individuals supported and contributed to the work at each phase, all of whom are listed in the **Acknowledgements**.

PHASE 1: INITIAL SCOPING

Initial scoping work took place during December 2023-June 2024. It consisted of a call for DigComp-related submissions and their analysis, and a scoping literature and policy review. The aims of Phase 1 were to establish an initial set of learning outcomes and to identify general directions for the DigComp 3.0 update for discussion with experts in Phase 2.

PHASE 1.1: DIGCOMP SUBMISSIONS AND ESTABLISHMENT OF 'FOUNDATION SET' OF LEARNING OUTCOMES

The call for submissions was issued across four main channels: the DigComp Community of Practice; the Digital Skills and Jobs Platform; the Digital Education Hub; and via LinkedIn in December 2023, and the submission period closed in March 2024. The call was targeted to existing users of the DigComp framework in formal, informal and non-formal learning contexts, including assessment and certification, in a European, national, regional or local initiative. The call sought information on initiatives that provided examples of learning outcomes (or similar) developed on the basis of DigComp. In all, 50 submissions were received from 16 countries (Austria, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, the Netherlands, Portugal, Spain and Ukraine) and three European-level organisations. The submission were reviewed against the submission criteria (covering three or more of the five competence areas; link competences to proficiency; and developed since 2018), and divided into *Highly relevant (16)*; *Quite relevant (14); Somewhat relevant (11); and Out of scope (9)* categories – giving a higher relevance rating to initiatives based on DigComp 2.2 and which contained learning outcomes or equivalents.

The learning outcome statements were extracted from the 16 *Highly relevant* submissions (which came from nine EU countries and two European-level organisations) and formatted and merged into a single dataset, which we refer to here as the 'learning outcomes dataset'. Where needed, submissions were translated from their source languages to English using the European Commission's eTranslation tool. In all, 2,488 learning outcomes were extracted.

A 'foundation' set of 386 learning outcomes which were compiled from the 304 examples from Dimension 4 and Annexes 2 and 3 of DigComp 2.2 (Vuorikari et al., 2022a) and the 72 items from the DigComp Self-Assessment Tool (DigCompSAT) item bank (Clifford et al., 2020) was then added to the learning outcomes dataset.

The content of the *Quite relevant* and *Somewhat relevant* submissions was then reviewed and checked against the learning outcomes dataset. Where a key concept or skill was not covered in the learning outcomes dataset, but relevant to include, a learning outcome was drafted to cover it. This resulted in the addition of 43 learning outcome statements to the learning outcomes dataset, which at that stage consisted of 2,917 learning outcome statements classified by competence area, competence and proficiency level.

The next step was to ensure that proficiency levels were consistently applied across the dataset. The secure AI system of the JRC (GPT@JRC), model GPT 4.0 Turbo was used to obtain an initial output, with each change recommended in the output subject to (human) review and either implemented or rejected. Then, the learning outcomes dataset was processed, competence by competence, to eliminate duplicates and to 'smooth' variations in writing style and granularity. The secure AI system of the JRC (GPT@JRC), model GPT 4.0 Turbo was again used to obtain a refined output which was extensively reviewed and refined by (humans at) the JRC. Following this, Knowledge, Attitude and Skill classifications were manually assigned to each learning outcome, and further checks were made for consistency across competences. This set was then subjected to a gap analysis using information from the literature and policy review, described next. The process for this work required continual multi-way iterations across competences and proficiency levels, as well as competence areas, to help ensure overall framework coherence.

PHASE 1.2: LITERATURE AND POLICY REVIEW FOR GAP ANALYSIS OF DIGCOMP LEARNING OUTCOMES 'FOUNDATION SET'

In parallel with the DigComp submissions, the JRC researched and compiled information via a scoping review of relevant research and policy. Sources were

identified through the more traditional literature search (prioritising systematic reviews and high-quality sources) as well as through targeted reviews of the grey literature (e.g., ERASMUS+ project documentation, policy reports). The purpose of this review was not to be exhaustive but rather to obtain sufficient relevant and high-quality information to combine with the learning outcomes dataset in preparation for expert review in Phase 2.

Sources were grouped into broad themes, and a gap analysis between their contents and the learning outcomes dataset was carried out. Here, 'gap analysis' refers to an assessment of text that was extracted from the sources in the scoping review (concepts, competences, learning outcomes, etc.). Each text extract was first assessed to see if it fit the broad, transversal nature of DigComp and thematic priorities of DigComp 3.0. If so, it was then reviewed against the learning outcomes dataset to check whether or not the concept or skill represented by each text extract was included. If not, the content was incorporated through the drafting of a new learning outcome statement. Illustrative examples of the 100 or so sources consulted in the scoping review are shown in **Table A6.**

The **output of Phase 1** consisted of a draft set of 565 learning outcomes, accompanied by a paper describing how they had been constructed and some initial proposals for DigComp 3.0 priorities.

Table A6. Illustrative examples of sources consulted during the development of DigComp 3.0.

Authors	Theme	Description and relevance to DigComp
Long & Magerko (2020)	AI Competence/ AI Literacy	Widely cited definition and competences for AI literacy, including descriptions of specific competences, considered in gap analysis.
Ng et al. (2021)	AI Competence/ AI Literacy	Exploratory review of 30 sources from 12 countries, 7 in Europe to identify four common elements and describe a taxonomy based on Bloom, considered in approach to integrating AI competence.
Wang et al. (2022)	AI Competence/ AI Literacy	Definition of AI literacy and 12-item AI literacy scale, considered in gap analysis.
Ehlers et al. (2024)	AI Competence/ AI Literacy	AICOMP study and framework - future skills needed for a living and working environment shaped by AI. 12 competence fields are described, considered in gap analysis.
UNESCO (2022)	AI Competence/ AI Literacy	Mapping of government-endorsed AI curricula. Includes definition of AI literacy and 222 learning outcomes which were mapped to DigComp for gap analysis.
Di Vinadio et al. (2023)	AI Competence/ AI Literacy	AI competences for civil servants: 9 competences were extracted for the gap analysis.
Miao et al. (2024)	AI Competence/ AI Literacy	AI competency framework students. Contains five principles (critical thinking, human-centred collaboration, climate friendly AI design, transferrable AI foundation for lifelong learning, inclusivity in competence development) and four competence aspects (human-centred mindset, ethics of AI, AI techniques and applications, and AI system design). Considered in approach to integrating AI competence.
Mills et al. (2024)	AI Competence/ AI Literacy	AI literacy framework whose components cover AI literacy practices, core values, modes of engagement, and types of use. Also considers how AI literacy is connected to digital citizenship, media literacy, data literacy and computational thinking. Considered in gap analysis and approach to integrating AI competence.
Nárosy et al. (2022)	Basic digital competence	The Austrian adaptation, DigComp 2.3 AT – Area 0 (Foundations, Access and Digital Understanding) – guided the treatment of basic digital competence in DigComp 3.0.
Kluzer et al. (2019)	Basic digital competence	Digital Competence Development System (DCDS) - an ERASMUS+ project focused on developing basic digital competence – guided treatment of basic digital competence in DigComp 3.0. It includes 95 basic-level learning outcomes based on DigComp 2.0/2.1. Used in gap analysis on basic digital competence.

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Authors	Theme	Description and relevance to DigComp
Eurydice (2022)	Computational thinking	A European comparative analysis of informatics education at school. Summarises 40 learning outcomes under 10 areas (Data and information, People–system interface, Algorithms, Design and development, Programming, Modelling and simulation, Computing systems, Awareness and empowerment, Networks, Safety and security). Guided treatment of computational thinking in competence 3.4.
Bocconi et al. (2022)	Computational thinking	A JRC review of computational thinking in compulsory education, including a literature review, definitions and comparative analysis across 22 EU and 8 non-EU countries. Identifies 32 concepts in relation to algorithms, programming and the relationship between the two. Guided treatment of computational thinking in competence 3.4.
OECD (2023)	Computational Thinking	Framework for PISA 2025 - learning in a digital world framework - computational problem-solving competence model. 18 competence statements were extracted for the gap analysis.
Duckworth & Fraillon (2025)	Computational Thinking	ICILS assessment framework - definitions of computer and information literacy, and computational thinking. 25 competence examples were extracted for the gap analysis.
DALI project consortium (2023)	Data Literacy and Digital Citizenship	DALI data literacy framework for citizenship - 37 learning objectives were mapped by the JRC to DigComp as part of the gap analysis.
Gouseti et al. (2021)	Critical Digital Literacies	DETECT project - critical digital literacies framework for educators: competences are organised in a manner consistent with DigComp. Included in the gap analysis.
Ilomäki et al. (2023)	Critical Digital Literacies	Systematic review of critical digital literacies, based on 139 sources: the 10 most often used concepts were digital literacy, cyber bullying, Internet safety, media literacy, information literacy, ICT competence, e-safety, online risks, online safety, and digital competence. Used to guide the content of competences 1.2, 2.5, 2.6, 4.2 and 4.3.
Fernández-Prados et al. (2021)	Digital citizenship	Review of conceptualisation and measurement of digital citizenship. The Appendix to the article contains approximately 80 items from existing scales, included in the gap analysis, particularly for competences 2.3, 1.2, 2.6, 4.2 and 4.3.
Jaeger (2021)	Digital citizenship	Systematic review of digital citizenship, based on 373 publications. Four dimensions are identified (digital rights and privacy; political engagement; digital public services; training and learning). Considered for competence 2.3.
Richardson & Milovidov (2022)	Digital citizenship	Digital citizenship handbook of the Council of Europe. Identifies 10 dimensions of digital citizenship (access and inclusion, learning and creativity, media and information literacy, ethics and empathy, health and well-being, e-presence and communications, active participation, rights and responsibilities, privacy and security, and consumer awareness). Included in the gap analysis.
Limnéll et al. (2023)	Cybersecurity	Part of a broader cyber citizen skills project which aligns to DigComp. Consists of a literature review to determine the current state of cyber citizen skills education and training. Includes definitions that are relevant to the gap analysis, particularly competences 4.1 and 4.2.
CONCORDIA Consortium (2022)	Cybersecurity	Methodology and guidelines for teaching cybersafety and cybersecurity to secondary school students: Includes 24 modules, whose content has been included in the gap analysis for 4.1 and 4.2 as well as 2.6.
Polanco-Levicán & Salvo-Garrido (2022)	Media and Information Literacy	Systematic review of social media literacy concept and competences - 15 articles included - Table A1 in the article lists concepts and competences identified – which were included in the gap analysis, particularly 1.2, 2.1, 2.2, 2.6 and 4.2.
CILIP Information Literacy Group (2021)	Media and Information Literacy	Media and Information Literacy Alliance (MILA) framework - built along five lifelong goals (being informed, empowered, healthy, socially conscious and connected). Guided treatment of 1.2, 2.1, 2.2, 2.6 and 4.2.
HERMMES project consortium (2025)	Wellbeing and Resilience	The HERMMES project, inspired by DigComp, focuses on the mitigation of digital risks and the development of skills to use digital technology for living and learning. The HERMMES curriculum helps children and young people become digitally resilient, media mature adults. The curriculum for ages 12-15 and 15-18 has been used in DigComp 3.0 gap analysis particularly 4.3 and 1.2.

Authors	Theme	Description and relevance to DigComp
Flayelle et al. (2023)	Wellbeing and Resilience	A review and description of design features of digital technologies that promote addictive behaviours. Considered in the gap analysis for 4.3.
Burr et al. (2020)	Wellbeing and Resilience	A thematic review that identifies major issues related to key social domains. It highlights three broader themes: positive computing, personalised human–computer interaction, and autonomy and self-determination. Considered in the gap analysis.
Sun et al. (2022)	Wellbeing and Resilience	A scoping review of the concept of digital resilience, based on 22 articles, which identifies five dimensions of digital resilience (understanding online threats; knowing solutions; learning knowledge and skills; recovering from stress; and moving forward through self-efficacy). Considered in the gap analysis.
Borges et al. (2025)	Wellbeing and Resilience	Rapid review of the latest available evidence on the impact of digital usage patterns and wellbeing in children and adolescents. Ten studies from diverse contexts showed an association between excessive screen time and risks of sedentary lifestyles, sleep disorders, anxiety, depression, attention difficulties, and low academic performance. Guided treatment of competence 4.3.
Sala et al. (2024)	Wellbeing and resilience	Umbrella review of 24 studies examining the mental health and wellbeing impacts of social media usage on adolescents. Analysis confirms the need for a comprehensive consideration of the relationship between social media use and mental health outcomes and wellbeing. That is, individual demographic and psycho-socio characteristics; individual usage patterns (time spent, time of use, motivation to use); and platform content and design are all relevant in considering the relationship between social media use and mental health and wellbeing outcomes. Guided treatment of competence 4.3.
Priftis & Panagiotakos (2023)	Wellbeing and resilience	Systematic review of screen time and health consequences in children and adolescents which included 43 articles. Excessive screen time was associated with increased risk for obesity and other cardiometabolic risk factors, mental health, unhealthy dietary habits and eating disorders, and problems in development and child–parent relationships. Sleep, physical activity, eyesight, headaches, and the musculoskeletal system were negatively affected as well. However, the effects vary by type of media used and the way types of media were used. Guided treatment of competence 4.3.

Source: Compiled by JRC from existing sources.

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PHASE 2: WORK WITH EXPERTS

The objective of Phase 2 (June 2024-June 2025) was to review the proposals emerging from Phase 1 with a diverse set of experts in order to establish materials for DigComp 3.0 for Phase 3 (stakeholder consultation) and Phase 4 (framework validation). Experts were identified such that the combined group represented geographic and stakeholder diversity (i.e. covering stakeholders across Europe from policy, academia, formal and informal education and training, employers, employment intermediaries and industry), as well as a balance by level (European, national, regional) and gender. The work with experts took place in two steps. In Step 1 (June-December 2024), ICF-Europe, supported by Stefano Kluzer, Lidija Kralj and Riina Vuorikari, coordinated two online expert meetings in June and October 2024. Including the aforementioned experts, 29 individuals from 12 EU countries and six European-level organisations and a diversity of sectors (formal education, vocational and adult education, higher education, employment and third sector) took part. In Step 2 (January-June 2025), the JRC worked directly with seven of the 30 experts who participated in Step 1, termed the 'DigComp expert pool'.

PHASE 2.1: STEP 1 (JUNE-DECEMBER 2024)

During the **first meeting** (June 25, 2024), experts reviewed and discussed two internal thematic papers – one on DigComp learning outcomes (by the JRC), which described the development methodology and presented an initial draft of 565 learning outcomes; and the other on emerging trends and their implications for DigComp (by Lidija Kralj), which identified nine emerging trends and their implications for the DigComp competences. In these early discussions, participants strongly favoured the prioritisation of policy concerns such as cybersecurity risk, threats to wellbeing, and threat of misinformation to democratic processes; and noted that data protection concerns are now on a

bigger scale. Discussions on the draft learning outcomes identified improvements to the wording, and varying views were expressed on the level of granularity and their distribution across proficiency levels. Experts recommended a stronger focus in the learning outcomes on ethical and human-centric aspects.

Following this, the JRC compiled feedback from the experts to revise and improve the learning outcomes and to draft a set of proposed updates to the existing DigComp 2.2 framework. These proposals consisted of changing the wording of certain competence areas and competences; updating the proficiency levels and focusing on four rather than eight levels; systematically integrating AI; and a proposal for a new element, learning goals, which would sit mid-way between general proficiency level descriptions and learning outcomes.

During the **second meeting** (October 2, 2024), experts reviewed an internal paper drafted by the JRC with proposals for DigComp 3.0. and the revised learning outcomes They confirmed the added value of both the learning outcomes (which had been reduced from 565 to 537), and the learning goals, but flagged that the term 'learning goals' might be too close in meaning to 'learning outcomes'. Experts also made several specific suggestions on the framework content and identified a small number of gaps (such as e-government and AI systems bias identification). The proposal the proficiency levels was supported, with some suggestions to improve wording. Experts recommended the incorporation of recent and emerging trends in such a way as to recognise their implications (e.g. of generative AI in content creation) while at the same time remaining technology-neutral and sufficiently generic for framework stability. They also made some suggestions on ways to support use of the framework, particularly for assessment, and to help users navigate the new added complexity of the framework.

In the final part of Step 1, ICF-Europe and Riina Vuorikari produced an internal summary report that provided options and recommendations for the next steps of development. Recommendations included:

- Ensuring that all relevant digital technological developments and regulations are included.
- Clarifying the position and purpose of the 'learning goals' in the framework.
- Ensuring that the meaning of 'Basic' is aligned to the previous version of DigComp and further clarifying the distinction between the 'Highly Advanced' proficiency level and ICT specialists.
- Making further refinements to the wording of the competence areas and competences.
- Ensuring that AI is fully represented across the framework (including what is in DigComp 2.2).
- Using terminology that is consistent with previous versions.
- Providing stakeholders an opportunity to review all draft material.
- Developing support or guidance material for DigComp 3.0.

PHASE 2.2: STEP 2 (JANUARY-JUNE 2025)

In Step 2, the JRC worked with a subset of seven experts who had participated in Step 1 of Phase 2. This phase overlapped with Phases 3 and 4, since the experts were centrally involved in the stakeholder consultation and the validation workshop. One expert, Luis Pereira, was assigned the role of Chair of the DigComp expert pool and ensured that all expert observations and feedback were synthesised effectively. A second, Stefano Kluzer, had specific tasks in Phase 3 as Stakeholder Expert. The other five experts were Ulrike Domany-Funtan, Māra Jākobsone, Lidija Kralj, Attila Rausch and Roland Stürz.

Step 2 was an intensive phase of the development of DigComp 3.0, and included seven meetings between the experts and the JRC. The first task of experts was to make an in-depth review of the draft DigComp 3.0 components, which had been revised by the JRC following the feedback and recommendations from Step 1 of Phase 2. At this stage, the 'learning objectives' of the draft framework were re-shaped to become competence statements at each proficiency level. The experts' review of this enabled the JRC to prepare the materials for the DigComp 3.0 stakeholder consultation sessions in April 2025. Experts each attended one of the two stakeholder sessions and provided their observations to the Chair, who made a synthesis of them. The Stakeholder Expert collaborated with the JRC to design and co-ordinate the consultation sessions and worked with the JRC to produce an internal stakeholder consultation report that considered all stakeholder and experts' feedback. Experts also supported the JRC's preparations for the DigComp 3.0 validation workshop in June 2025 and supported the group discussions. A week after the validation workshop, the experts met with the JRC

to discuss and agree, concretely, on how the validation workshop feedback would be reflected in the final version of the framework. During this phase, the draft AI Literacy Framework developed in an OECD-European Commission collaboration (OECD, 2025) was reviewed to ensure that the competences of AI literacy were adequately and appropriately present in DigComp 3.0. This was completed via an internal mapping exercise by Lidija Kralj in collaboration with the JRC, which confirmed that all AI Literacy framework competences were adequately and appropriately covered in the DigComp 3.0 draft material.

PHASE 3: STAKEHOLDER CONSULTATION

The success of DigComp relies on meaningful engagement with a broad range of stakeholders, as well as ensuring that their perspectives and feedback are incorporated into the published version. Phase 3, which ran from March-May 2025, entailed a broad and structured consultation process. In addition to the stakeholder consultation described here, the JRC liaised with various European Commission Policy Directorates to ensure policy alignment of DigComp 3.0. The Policy Directorates involved are listed in the **Acknowledgements.**

AIMS, FORMAT AND PARTICIPANTS

An external stakeholder consultation process was carried out in April 2025, aimed at reaching a wide and balanced range of stakeholders (by sector, country, and DigComp experience), and designed to permit efficient and detailed stakeholder feedback to be gathered and synthesised. The consultation process was set up under three streams:

- Two **90-minute online consultation sessions,** which took place on April 10 and 11. A short background document with the proposed changes for DigComp 3.0 was sent in advance to registered participants. Each online session had the same format, covering rationale, priorities, and proposed changes to DigComp 3.0; and asking stakeholders to provide feedback through open- and closed-format polling questions and the meeting chat function. The DigComp expert pool members each attended one of the two sessions and provided their observations to the Chair, who provided a summary to the JRC. The DigComp Stakeholder Expert designed and coordinated the stakeholder consultation with the JRC, and moderated the sessions.
- An optional online **feedback survey** structured on the same themes of the online consultation, consisting of both open (text) and closed (numeric) responses. A link to this survey was sent to all registered participants (including those who could not attend the online sessions) along with the background document and left open for responses until April 30.
- An optional **in-depth review** of the competence-specific proficiency levels, the proposed way of conveying AI for each competence, and the learning outcomes, again sent to all registered participants, and open until April 30.

In total, 527 stakeholders registered to take part in the consultation. Of these, approximately 260 attended one of the online stakeholder consultation sessions in April. A total of 174 stakeholders submitted a response to the feedback survey, and 40 completed the in-depth review.

Participants from all Member States except for Luxembourg registered to participate, and stakeholder feedback was received by 24 of 27 Member States (i.e. except Cyprus, Luxembourg and Malta). One-seventh (14%) of registered stakeholders were from outside the EU (either from another European country, 6%, or a non-European one, 8%). Participation across countries was uneven: proportionally more stakeholders from Belgium, Italy and Spain registered to take part. However, stakeholders in Italy and Spain have already made extensive use of DigComp, so high participation was expected. Also, 63% of registered stakeholders in Belgium represented organisations at international or European levels.

About two-fifths of stakeholders represented national perspectives (37%), while 44% were working at European (22%) or international (22%) levels. The remainder were working at regional (11%) or local levels (8%).

The four most common stakeholder groups were higher education leaders, educators and researchers (25%); governmental authorities (including public administration and public organisations) (18%); third sector organisations (12%) and primary and secondary education leaders and educators (11%). Adult and lifelong learning providers (9%), business sector organisations (9%) and VET leaders and educators (5%), accounted for a further 23% of all registered stakeholders. Public and private employment services (2%) and skills certification providers (2.5%) were less frequent, and the remaining 7% of respondents classified themselves as ‘other stakeholder type’.

Most stakeholders (70%) had used DigComp previously, and 15% had participated in the DigComp 2.2 update.

FEEDBACK

Below is a summary of the key findings from the stakeholder feedback analysis. The detailed feedback provided, particularly in the survey and in-depth review, was analysed in depth by the DigComp Stakeholder Expert and the JRC and incorporated into the revisions to the framework for Phase 4.

Overall, stakeholder feedback provided strong support for the identified priority themes, the approach to AI competence, the proficiency levels, and the JRC's plans for publication. There was also strong support for the new learning outcomes – with 90% of stakeholders agreeing that they added value.

Priority themes: Stakeholders expressed strong support for the five priority themes. Some other themes consistently emerged: (Below-) Basic skills, ethics, inclusion, and the action-oriented (as opposed to passive) wording. These other themes were further considered Phase 4.

AI competence in DigComp 3.0: The integrated, transversal approach to AI competence was, in general, strongly supported. However, a minority suggested that AI competence should be considered as a separate area. Given the importance of maintaining continuity between DigComp 2.2 and DigComp 3.0, having a separate 'module' on AI competence was not seen as a practical option. Stakeholders suggested that the presentation and illustration of AI in DigComp 3.0 needed to be refined. This issue was considered in detail in Phase 4.

Proficiency levels: Overall support for the proposed new proficiency levels was high. However, the proposed change in focus from 8 to 4 levels caused difficulties for stakeholders who currently use the 8-level approach. Additionally, some stakeholders used a 6-level interpretation of the proficiency levels. A proposal for a backwards mapping of DigComp 3.0 to the eight levels in previous iterations of the framework was established by the JRC in response to stakeholder feedback and considered in Phase 4.

Supports for implementation: A large majority of stakeholders considered the following supports for implementation as very useful or essential: A PDF version of the framework; a Glossary of terms and definitions; a machine-readable supplement of the tabular content; updates to the DigComp webspace (currently managed by the JRC); framework accessibility; and guidance documentation. There was low interest in a hardcopy version of the framework. Discussions at the validation workshop (Phase 4) reinforced these views.

Tailoring and adapting and maintaining relevance: External stakeholders' commentary frequently touched on the need to tailor and adapt the framework. For example, there were requests for child-friendly and educator versions of the framework. While it would not be feasible for the JRC to make multiple versions of DigComp 3.0 tailored to specific groups, the availability of the framework in multiple formats enables its tailoring and adaptation to a wide variety of purposes.

PHASE 4: FRAMEWORK VALIDATION

Phase 4 ran from May – September 2025. The main activity of Phase 4 consisted of a face-to-face validation workshop in Seville, Spain on June 17 (afternoon) and June 18 (all day). The objectives of the workshop were to achieve broad consensus on the draft DigComp 3.0 framework, and to identify final steps that were needed prior to its publication.

AIMS, FORMAT AND PARTICIPANTS

The workshop was attended by 34 external participants from 18 countries (17 EU countries and the USA) from a range of sectors (policymaking, employer representatives, adult learning and VET, compulsory education, and academia/research); and 12 internal (European Commission) participants, from the JRC, DG EMPL, DG CNECT and SG REFORM. Similar to the experts involved in Phase 1, the participants in the validation workshop were identified to represent geographic and stakeholder diversity, as well as a balance across genders and European, national and regional perspectives. The participants included both experts who had participated in Phase 2 as well as individuals who had not been part of the process and who were less familiar with DigComp.

On the afternoon of June 17, participants were presented with an overview of the proposals for the DigComp 3.0 update and a description of the how stakeholder feedback had been incorporated.

On June 18, in the morning, the participants split into four working groups and participated in two 90-minute discussions as follows:

- **Session 1:** Participants discussed the proficiency levels; validated the proposed updates to the competence areas and competences; and reviewed the proposed learning outcomes for four of the 21 competences (1.2, 2.3, 3.4 and 4.3). These four competences selected on the basis of being quite complex or significantly updated compared with DigComp 2.2.
- **Session 2:** Participants discussed the proposed approach to the integration of AI and identified priorities for making the framework clear and usable. Regarding the integration of AI, this included a discussion of the proposal for distinguishing between AI-explicit [AI-E] and AI-implicit [AI-I] competence statements and learning outcomes, and the gathering of suggestions from participants on ways in which to make the published framework clear and easy to use, given the complexities introduced by the changes and the addition of the learning outcomes.

In the afternoon of June 18, working groups reported in plenary on the discussions. Representatives from the Policy Directorates and the DigComp expert pool also provided comments in plenary.

POST-VALIDATION ACTIVITIES

A week after the validation workshop, the JRC team met with the DigComp expert pool to discuss observations from the DigComp 3.0 validation workshop and to agree on priorities for finalising the framework. Feedback and observations were provided by the DigComp expert pool following guidance provided by the JRC, and synthesised by the expert pool Chair. In the feedback, experts were positive about the diversity of perspectives brought by the participants and praised the level of engagement and quality and depth of discussion. Specific suggestions were systematically categorised by the main themes of competence areas and competences; proficiency levels; learning outcomes; integration of AI competence; and communication/dissemination aspects. Under each theme, specific actions to address the feedback were identified and implemented during the finalisation of DigComp 3.0.

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