Table 1- Reference framework for the development of data literacy for educators.

C.D	Descriptor	Description
PROFESSIONAL ENGAGEMENT	Research data practices	Over the full cycle of scientific information, to be actively engaged in open science and advanced critical data practices that are transferrable to teaching, (particularly in Higher Education teaching).
	Organizational communication	To use available data to enhance organizational communication with colleagues, students and third parties. To contribute to collaboratively developing and improving organizational communication strategies and policies driven by data (learning and academic analytics, statistical reports, social media data, etc.).
	Professional collaboration	To use open data approaches in science and educational activities to engage with other scholars, sharing and exchanging knowledge and experience, and collaboratively innovating pedagogic practices.
	Reflective practice	To individually and collectively reflect on, critically assess and actively develop one's own data-driven practices within teaching. To reflect on the connections between the advancement of one's own research discipline and data procedures and those of data procedures and activities embedded into teaching.
	CPD	Continous Professional Learning to cultivate learning ecologies supporting data literacy in pedagogical practices.
DATA AS A RESOURCE FOR LEARNING	Selecting data as a resource for learning	To identify, assess and select data or data approaches as resources for teaching and learning. To consider specific learning objectives, contexts, pedagogical approaches and learner groups when designing data approaches and planning their use.
	Collecting, extracting data as a resource for learning	To modify and build on existing openly-licensed data or data extraction approaches where this is permitted. To collect new data as a resource for learning. To consider the specific learning objectives, contexts, pedagogical approaches and learner groups when designing data approaches and planning their use.
	Managing, protecting and sharing data	To organize data as educational content and make it available to learners and eventually to other stakeholders. To effectively protect sensitive data. To respect and correctly apply privacy and copyright rules to open data. To understand the use and creation of open licences and open data as open educational resources, including their proper attribution.
TEACHING AND LEARNING	Teaching	To plan for and implement data-driven activities and visualizations in the teaching and learning process, so as to enhance the effectiveness of teaching interventions.
	Guidance	To integrate data-driven guidance (based on students' logs, assessments, course evaluations, monitoring processes, dashboards) to offer timely and targeted guidance and assistance. To experiment with and develop new forms and formats for offering data-driven guidance and support.
	Collaborative learning	To use data-driven approaches to foster and enhance learner collaboration. To enable learners to use their own data as part of collaborative assignments and as a means of enhancing communication and collaboration and collaborative knowledge creation.
	Self-regulated learning	To use data-driven approaches (based on students' logs, assessments, course evaluations, monitoring processes, dashboards) to support learners' self-regulated learning, i.e., to enable learners to plan, monitor and reflect on their own learning, provide evidence of progress, share insights and come up with creative solutions.
ASSESSMENT	Assessment strategies	To integrate the data produced throughout the learning process for formative and summative assessment purposes.
	Analysing evidence	To generate, select, critically analyse and interpret data as evidence of learner activity, performance and progress, in order to inform teaching and learning.
	Feedback and planning	To use the data produced throughout the learning process to provide targeted and timely feedback to learners. To adapt teaching strategies and to provide targeted support based on the evidence generated by the digital technologies used. To enable learners and other stakeholders to understand the data as a form of evidence provided by digital technologies.
EMPOWERING LEARNERS	Accessibility and inclusion	To ensure accessibility to the data generated and used during learning activities, of all learners, including those with special needs. To consider and respond to learners' expectations, abilities, uses and misconceptions on data.
	Differentiation and personalization	To use digital technologies to address learners' diverse learning needs, allowing learners to advance at different levels and speeds and to follow individual learning pathways and objectives.
	Actively engaging learners	To use digital technologies (like data storytelling and the generation of infographics) to foster learners' active creative and critical engagement with data as learning content. To open up learning with data to new, real-world contexts of data usage, involving learners themselves, in hands-on activities, scientific investigation or complex problem solving.

FACILITATING LEARNERS' DATA LITERACY	Learners' data literacy	To incorporate learning activities, assignments and assessments that require learners to articulate the need for data; to support students in finding and extracting raw data in digital environments; to support learners in their organization, processing, analysis and interpretation of data and to compare and critically evaluate the credibility and reliability of available data in the context of their sources.
	Learners' use of data in communication and collaboration	To incorporate learning activities, assignments and assessments which require learners to effectively and responsibly use digital tools to share data.
	Learners abilities of data storytelling	To incorporate learning activities, assignments and assessments which promote learners in the generation of visualizations, representations and stories using data. To teach learners how copyright and licences apply to data as digital content and how to reference sources and attribute licenses.
	Learners' responsible use of data	To empower learners to acknowledge and manage the risks of using personal, social and generally open data safely and responsibly.
	Learners' use of data in problem solving	To incorporate learning activities, assignments and assessments that help learners identify and solve technical problems and data extraction, elaboration and presentation

Table 2- Levels of proficiency for the development of educators' data literacy.

Level / Description	PROFESSIONAL ENGAGEMENT	DIGITAL RESOURCES	TEACHING AND LEARNING	ASSESSMENT	EMPOWERING LEARNERS	FACILITATING LEARNERS' DATA LITERACY
C2 Pioneer	Innovating towards a critical perspective of data-driven professional practices	Promoting innovative ways of exploring and using data	Innovating in ways of understanding and using data in teaching and learning	Innovating in ways of understanding and using data assessment	Innovating learner involvement in data-driven practices	Using innovative formats to foster learners' personal, professional and social data literacy
C1 Leader	Discussing and renewing data-driven professional practices	Comprehensively using advanced strategies and resources for exploring and using data	Strategically and purposefully renewing teaching practice by understanding and using data	Critically reflecting on ways of understanding and using data in assessment and evaluation	Holistically empowering learners in data-driven practices	Comprehensively and critically fostering learners' data literacy
B2 Expert	Enhancing data within professional practices	Strategically using interactive strategies and resources	Enhancing teaching and learning activities through data	Strategic and effective use of data-driven assessment and evaluation	Strategically using a range of tools to empower learners in data-driven practices	Strategically fostering learners' data literacy
B1 Integrator	Expanding professional practice through the use of data	Fitting data as a resource to the learning context	Meaningfully integrating data into teaching	Enhancing traditional assessment on the basis of available data	Addressing learner empowerment in data-driven practices	Implementing activities to foster learners' data literacy
A2 Explorer	Exploring data-driven professional practices	Exploring data as a resource for learning	Exploring teaching and learning activities using data	Exploring the meaning of data on traditional assessment	Exploring learner-centred strategies to promote data-driven practices	Encouraging learners to understand data in the taught discipline

A1 Newcomer	Awareness of data-driven practices, uncertainty, basic use	Awareness of data as a possible resource, uncertainty, basic use	Awareness of the problem of data within teaching and learning, uncertainty, basic use	Awareness of the problem of data in assessment, uncertainty, basic use	Awareness on the need to empower learners to understand and use data beyond the discipline, uncertainty, basic use	Awareness of the need to understand data in the taught discipline, uncertainty, basic use

Source. Adapted from Table 8 (DigCompEdu proficiency progression by area), European Framework for the Digital Competence of Educators, 31 [25]*.*