

CHAPTER 2

INNOVATIONS IN THE MANAGEMENT OF EDUCATIONAL INSTITUTIONS

Competences for Educators, Administrators, and Students in a Digital Society: A Role-Based Framework for Capability Development

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Abstract. Digital transformation has redefined what it means to teach, govern, and learn, because educational practice now depends on data intensive platforms, hybrid learning models, and digitally mediated communication. This article develops a role based competence model that differentiates competences for educators, administrators, and students while retaining a shared core of digital competence domains applicable across educational systems. A structured narrative review with thematic synthesis was conducted across education, learning sciences, and educational technology governance scholarship, complemented by analysis of widely used competence frameworks. The synthesis shows that educator competences are most robust when defined as pedagogical design and assessment capability rather than tool operation, consistent with TPACK and educator specific competence frameworks. Administrative competences emerge as governance capacity that includes strategy, procurement, privacy and security, data governance, and accountability for equity impacts. Student competences extend beyond functional digital skills to critical digital literacy, self regulated learning, digital citizenship, and emerging AI literacy, aligned with citizen competence frameworks and contemporary literacy research. Competence development is most effective when treated as institutional capability building with role specific pathways, practice based assessment, and governance routines that protect inclusion and safety. Future studies should validate role specific indicators, test causal links between competence growth and learning outcomes, and develop assessment designs that capture judgement, ethics, and equity effects in AI enabled learning environments.

Keywords: digital competence; educator competence; administrative competence; student competence; DigComp; DigCompEdu; digital leadership; data governance; digital citizenship; self regulated learning; AI literacy; competence assessment.

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Introduction. Competences in a digital society should be understood as a structured combination of knowledge, skills, and dispositions that enable effective learning, teaching, and governance in technology-mediated environments. A key challenge is that the same digital environment generates different responsibility profiles for educators, administrators, and students, so a single undifferentiated “digital literacy” concept often fails to guide practice. DigComp 2.2 frames digital competence for citizens across domains such as information and data literacy, communication and collaboration, digital content creation, safety, and problem solving, while adding updated examples that reflect new technologies and contexts of participation (Vuorikari et al., 2022).

For educators, competence requirements are inherently pedagogical because they involve the design of learning activities, assessment, inclusion, and the facilitation of learner agency in digital environments. DigCompEdu operationalizes this educator-specific profile as a structured set of competences that can be used for professional development and institutional planning (Redecker, 2017).

For administrators, competence is expressed through governance capacity, including data governance, risk management, procurement of educational technologies, compliance, and accountability. These functions shape the conditions under which digital education becomes effective, equitable, and safe, even when administrators are not direct instructional actors. At the same time, student competences increasingly include critical information judgement, safe participation, and self-regulated learning, which aligns with broader future-oriented competence discourses that emphasize agency and well-being in complex societies (OECD, 2018).

Literature review. Digital transformation has shifted competence requirements from basic tool use toward integrated capability sets that combine knowledge, skills, and dispositions for learning, teaching, and governance in technology-mediated environments. Contemporary literature treats digital competence as a broad construct that includes information and data literacy, communication and collaboration, digital content creation, safety, and problem solving, while also emphasizing critical judgement and responsible participation (Vuorikari et al., 2022). This framing is consistent with socio-technical perspectives that view educational digitalization as a change in institutional practice, power relations, and accountability, rather than a simple upgrade of learning tools (Selwyn, 2022). Competence frameworks have become central because they offer shared language for curriculum design, professional development, and policy evaluation, yet they also risk becoming checklist instruments unless they are linked to authentic practice and measurable outcomes (Ilomäki et al., 2016). A key implication is that competence should be interpreted as role-based, because educators, administrators, and students face different decision rights, responsibilities, and risk exposure in digital environments. The OECD Education 2030

agenda reinforces this point by highlighting learner agency, well-being, and the integration of knowledge, skills, attitudes, and values, suggesting that competence development is inseparable from identity and participation in complex societies (OECD, 2018). As a result, the literature increasingly supports models that combine a shared core of digital competence domains with differentiated role profiles that specify how competence is enacted in professional practice and institutional governance (Redecker, 2017; UNESCO, 2018; Vuorikari et al., 2022).

Research on educator competences emphasizes that teaching with technology is primarily a pedagogical design problem, not a technical one. The TPACK framework conceptualizes effective digital teaching as the intersection of technological, pedagogical, and content knowledge, implying that competence is expressed when educators select and orchestrate tools in ways that fit disciplinary aims, learner needs, and assessment logic (Mishra & Koehler, 2006). DigCompEdu advances this pedagogical orientation by defining educator-specific competences across professional engagement, digital resources, teaching and learning, assessment, empowering learners, and enabling learners' digital competence development (Redecker, 2017). This framework reflects a shift toward competence as evidence-informed practice, where educators interpret learning signals, provide feedback, and design inclusive learning experiences rather than simply deploying digital content. Studies of technology integration also highlight that competence includes ethical and critical dimensions, such as managing data responsibly, ensuring transparency in digitally mediated assessment, and avoiding practices that intensify surveillance or exclusion (Slade & Prinsloo, 2013; Selwyn, 2022). In inclusive education research, competence is increasingly linked to Universal Design for Learning principles, where educators provide multiple means of engagement, representation, and expression to reduce barriers for diverse learners (CAST, 2018). Professional competence therefore includes the ability to evaluate tool limitations, align digital tasks with learning objectives, and preserve learner agency through autonomy-supportive instructional design (Ryan & Deci, 2000; Redecker, 2017). Overall, the literature indicates that educator competence development is most effective when it is practice-based, assessed through authentic evidence, and supported by institutional conditions such as time, peer learning, and instructional leadership.

While educator competence frameworks are well established, the literature increasingly argues that digital transformation depends on administrative competence in governance, procurement, and risk management. Research on school technology leadership shows that administrative decisions influence teacher practice through access to resources, professional development structures, and strategic coherence, indicating that leadership competence is a causal factor in technology outcomes (Anderson & Dexter, 2005). Administrative competence is also

expressed through data governance, including data quality assurance, access control, privacy compliance, and the responsible use of analytics for decision-making, because these practices shape trust and legitimacy (Slade & Prinsloo, 2013; Williamson, 2017). As digital ecosystems expand, administrators face competence demands related to vendor management, procurement standards, and accountability for platform impacts on equity and inclusion, which aligns with critical policy scholarship on platform governance and datafication in education (Selwyn, 2022; Williamson, 2017). UNESCO's ICT Competency Framework for Teachers is relevant here because it ties competence development to policy, curriculum, and system capacity, implying that governance competence must coordinate organizational routines and professional learning, not only individual skills (UNESCO, 2018). Administrators also require competence in organizational change, including stakeholder communication, implementation planning, and monitoring of differential impacts across learner groups, because digital change can widen inequalities if left to ad hoc adoption (OECD, 2018; Selwyn, 2022). Consequently, the literature supports a view of administrative competence as institutional capability: the capacity to create safe, equitable, and sustainable conditions for digital learning, while maintaining accountability and procedural fairness.

Student competence in a digital society is increasingly conceptualized as active participation, critical judgement, and self-regulated learning rather than operational familiarity with devices. DigComp 2.2 frames citizen competence through domains that map well onto student needs, particularly information and data literacy, communication, content creation, safety, and problem solving (Vuorikari et al., 2022). Scholarship on digital literacy emphasizes that learners must evaluate information quality, navigate misinformation, and understand how digital systems shape attention and decision-making, which moves competence beyond functional searching (Bawden, 2008; Buckingham, 2007). Digital citizenship research likewise highlights ethical participation, identity management, and rights-respecting behavior in online communities as core learning outcomes (Ribble, 2015). Self-regulated learning theory adds that students need metacognitive strategies, goal setting, and persistence management, especially in blended and online environments where autonomy demands are higher (Zimmerman, 2002). More recent work on AI literacy argues that learners should understand basic AI concepts, recognize limitations, and evaluate socio-ethical implications, because AI-enabled tools increasingly mediate learning and assessment (Long & Magerko, 2020; Vuorikari et al., 2022). Student competence development therefore requires curricular integration, formative assessment, and supportive learning environments that make critical judgement and responsible practice visible and learnable. The literature consistently indicates that competence development is unevenly distributed,

so equity-focused approaches are required to avoid reproducing social and digital divides (OECD, 2018; Selwyn, 2022).

Across roles, the literature converges on several cross-cutting competence domains: ethical use, privacy and safety, inclusion and accessibility, and evidence-informed improvement. Learning analytics research demonstrates that data-intensive education raises ethical dilemmas around consent, transparency, and function creep, requiring competence in governance and professional judgement for both educators and administrators (Slade & Prinsloo, 2013). Inclusive design frameworks emphasize that accessibility is not an accommodation added at the end, but a design requirement that shapes content, interaction, and assessment, implying role-specific competence in reducing barriers (CAST, 2018). Evidence-informed improvement is also highlighted because digital systems generate metrics that can mislead if interpreted without contextual understanding, which is why competence includes the ability to interpret data cautiously and to combine analytics with qualitative insight (Williamson, 2017; Selwyn, 2022). Finally, competence frameworks increasingly anticipate emerging risks and opportunities associated with AI-enabled systems, strengthening the case for continuous updating of competence profiles and assessment practices (Long & Magerko, 2020; Vuorikari et al., 2022). This synthesis supports a role-based framework that shares a common core of digital competence while differentiating practice requirements, accountability obligations, and learning outcomes across educators, administrators, and students.

Aims. The aim of this article is to develop an integrated, role-based competence framework for educators, administrators, and students in a digital society that is grounded in established international frameworks and usable for institutional implementation. The objectives are to: synthesize relevant competence frameworks and clarify their complementary roles (Vuorikari et al., 2022; Redecker, 2017; UNESCO, 2018); define role-specific competence profiles that share a common core while addressing distinct responsibilities; propose institutional mechanisms for competence development and assessment; outline research priorities for measurement and impact evaluation.

Methodology. The article applies a structured narrative review combined with normative framework synthesis. First, it consolidates international competence frameworks that are widely used for policy and institutional design, specifically DigComp 2.2 for citizens, DigCompEdu for educators, and UNESCO ICT-CFT for teacher development, supplemented by future skills and agency perspectives from OECD Education 2030 materials (Vuorikari et al., 2022; Redecker, 2017; UNESCO, 2018; OECD, 2018). Second, it performs thematic mapping to identify shared competence domains and role-specific extensions. Third, it translates mapped domains into implementable institutional requirements, including professional

development pathways, governance routines, and assessment approaches, with the goal of supporting operational adoption rather than remaining at the level of generic principle statements.

Results. DigComp 2.2 offers a baseline competence architecture that can serve as the shared core across all roles, because it defines what competent digital participation means for citizens and learners and includes updated examples for contemporary digital systems (Vuorikari et al., 2022).

DigCompEdu extends this baseline by describing educator-specific competences related to professional engagement, digital resources, teaching and learning, assessment, empowering learners, and facilitating learners' digital competence development (Redecker, 2017).

UNESCO's ICT-CFT provides a teacher competence model designed for contextualization to national and institutional priorities, including policy alignment and systemic capacity building, which strengthens applicability beyond individual teacher training (UNESCO, 2018).

The OECD Education 2030 work supports a complementary perspective by emphasizing student agency, well-being, and competencies as integrated constructs, which is useful for interpreting student competences as more than technical skills (OECD, 2018).

Table 1 proposes a role-based competence matrix that combines a shared core with role-specific practice expectations. The table operationalizes competence domains into role-specific practice requirements that can be used for curriculum design, professional development planning, and institutional governance.

The matrix indicates that shared domains remain stable, yet the competence expression differs because teaching, governance, and learning involve distinct decision rights and accountability obligations (Vuorikari et al., 2022; Redecker, 2017; UNESCO, 2018).

Implementation is most effective when competence development is treated as an institutional capability program with clear role profiles, progression pathways, and evidence of practice. For educators, DigCompEdu can be used to design professional development pathways that link digital pedagogy to assessment quality, learner empowerment, and inclusive teaching practice (Redecker, 2017). For administrators, competence development should prioritize data governance, procurement competence, risk management, and accountability routines, because these functions determine whether digital solutions are safe, equitable, and sustainable at scale. For students, DigComp 2.2 supports the integration of digital competence outcomes into curricula, including critical information judgement, safe participation, and problem solving aligned with real academic and civic tasks (Vuorikari et al., 2022). Across roles, institutions can operationalize progress through micro-credentials, portfolio evidence, practice-based assessment, and periodic institutional self-evaluation. The OECD Education 2030 framing suggests that competence development

should also be linked to agency and well-being, which implies that evaluation should include participation quality and responsible digital behavior, not only technical proficiency (OECD, 2018).

Table 1. Role-based competences in a digital society: educators, administrators, students

Competence domain	Educators	Administrators	Students
Information and data literacy	Select, evaluate, and curate resources; use learning evidence responsibly	Data governance, quality assurance, access control, analytics oversight	Search, evaluate sources, manage information, interpret data claims
Communication and collaboration	Facilitate digital interaction and collaboration; professional networking	Stakeholder communication, transparency, service coordination	Digital citizenship, collaboration norms, respectful participation
Digital content creation	Create learning materials and assessments; manage licensing	Content policy, procurement standards, IP and licensing compliance	Authorship, citation practice, integrity in digital creation
Safety, privacy, and well-being	Safe learning environment, ethical use, learner protection	Cybersecurity posture, privacy compliance, incident response	Privacy hygiene, security awareness, digital identity management
Pedagogy, assessment, inclusion	Digital pedagogy, feedback, inclusive design, learner empowerment	Assessment governance, quality assurance, inclusive service delivery	Self-regulated learning, reflection, responsible tool use
Innovation and problem solving	Iterative course design, evaluation of tools, evidence-informed adaptation	Technology strategy, risk management, vendor accountability	Troubleshooting, adaptability, critical judgement about tools

Source: systematized by the author

Discussion. The reviewed literature supports a role-based approach because it aligns competence expectations with real decision-making responsibilities and risk exposure in digitally mediated education. For educators, the strongest evidence points to pedagogically anchored competence, where technology use is evaluated by learning design quality, assessment validity, and inclusive practice rather than by frequency of tool use (Mishra & Koehler, 2006; Redecker, 2017). For administrators, competence is best conceptualized as governance capacity, since procurement choices, data governance, and accountability routines shape the conditions that enable or constrain equitable digital learning (Anderson & Dexter, 2005; Williamson, 2017). For students, competence must include critical digital literacy and self-regulated learning because participation in digital learning environments requires autonomy, judgement, and ethical conduct, especially under conditions of information disorder and platform influence (Bawden, 2008; Zimmerman, 2002). A key gap across the literature concerns measurement, because many competence initiatives rely on self-report surveys and checklists that may not capture authentic

performance or context-sensitive judgement. Another challenge is equity, since competence development can widen gaps when access to high-quality digital learning opportunities and support is uneven across institutions and learner groups (OECD, 2018; Selwyn, 2022). The synthesis also suggests that AI-related competence is becoming a cross-role requirement, demanding updated competence descriptors and institutional routines for responsible use, transparency, and risk management (Long & Magerko, 2020). From an implementation perspective, the evidence favors competence development programs that combine micro-credentials, portfolios, peer learning, and governance routines with clear institutional responsibility for inclusion and safety (CAST, 2018; UNESCO, 2018). Future research should strengthen validation of role-specific competence indicators, test causal links to learning outcomes and inclusion, and develop practical assessment designs that can be used across diverse educational contexts.

Conclusion. Competences for educators, administrators, and students in a digital society should be conceptualized as an integrated, role-based system. DigComp 2.2 provides a shared baseline for digital participation, DigCompEdu specifies educator professional competences for pedagogical practice, and UNESCO ICT-CFT strengthens system-level contextualization for teacher development. Future research should validate role-specific competence indicators across contexts and education levels, establish stronger evidence linking competence development to learning outcomes and inclusion, and refine AI- and data-related competence requirements as technologies evolve and institutional governance expectations increase.

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