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Teaching for the Future: 21st-Century Skills in Open and Distance Education

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Διδασκαλία για το Μέλλον: Δεξιότητες του 21ου αιώνα στην Ανοιχτή και Εξ Αποστάσεως Εκπαίδευση

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Abstract

This paper investigates how Open and Distance Education (ODE) can effectively support the cultivation of 21st-century skills, (including creativity, critical thinking, collaboration, communication, and digital literacy), through purposeful pedagogical design, inclusive learning environments, and ethically integrated technology. Drawing on recent global research and frameworks, it outlines instructional approaches that foster learner autonomy, reflective engagement, and social-emotional growth across flexible educational settings.

The study highlights how adaptive digital tools, personalized learning paths, and collaborative projects promote active participation and meaningful skill development. It emphasizes the evolving role of the educator as a relational facilitator and the importance of emotional presence in virtual contexts. Attention is also given to systemic barriers such as unequal access, digital literacy gaps, linguistic exclusion, and cultural misrepresentation, proposing inclusive design principles and equity-oriented pedagogical strategies.

In addition, the paper explores how ODE supports lifelong learning and professional identity transformation, enabling learners to realign educational trajectories with evolving goals and personal aspirations. It argues that ODE is not merely a delivery model, but a dynamic space for empowerment and human-centered growth. The study concludes with practical recommendations for educational policy, technological

integration, and pedagogical innovation that promote sustainable, inclusive, and future-ready learning ecosystems for the 21st century.

Keywords

open learning, 21st-century skills, distance education, online teaching, digital literacy

Περίληψη

Η παρούσα εργασία διερευνά τον τρόπο με τον οποίο η Ανοιχτή και Εξ Αποστάσεως Εκπαίδευση (ΑεξΑΕ) μπορεί να συμβάλει ουσιαστικά στην ανάπτυξη των δεξιοτήτων του 21ου αιώνα, όπως η δημιουργικότητα, η κριτική σκέψη, η συνεργασία, η επικοινωνία και ο ψηφιακός γραμματισμός. Μέσα από κριτική ανάλυση πρόσφατων διεθνών ερευνητικών πηγών και θεσμικών πλαισίων, μελετώνται οι διδακτικές πρακτικές που υποστηρίζουν τη μαθητοκεντρική προσέγγιση, την αυτενέργεια των εκπαιδευομένων, καθώς και την ενσυνείδητη ένταξη της τεχνολογίας στα εκπαιδευτικά περιβάλλοντα.

Εξετάζεται η συμβολή των ψηφιακών εργαλείων στη διαμόρφωση εξατομικευμένων διαδρομών μάθησης και στη συνεργατική δημιουργία, όπως και η σημασία της συναισθηματικής παρουσίας του εκπαιδευτικού για την ενίσχυση της εμπλοκής. Παράλληλα, αναλύονται εμπόδια που σχετίζονται με την πρόσβαση, την ισότητα, τη γλωσσική πολυμορφία και την πολιτισμική αναγνώριση, αναδεικνύοντας πρακτικές που προάγουν τη συμπερίληψη και τη δικαιοσύνη.

Η εργασία εστιάζει επίσης στη δια βίου μάθηση και στη σταδιακή εξέλιξη της επαγγελματικής ταυτότητας του εκπαιδευόμενου, μέσω ευέλικτων και προσαρμοστικών μορφών ΑεξΑΕ. Καταλήγει σε προτάσεις για τον παιδαγωγικό σχεδιασμό, την τεχνολογική ενσωμάτωση και τη θεσμική ενίσχυση της εκπαίδευσης με γνώμονα τη βιωσιμότητα, την ενσυναίσθηση και τον ανθρωποκεντρικό προσανατολισμό του 21ου αιώνα.

Λέξεις-κλειδιά

ανοιχτή μάθηση, δεξιότητες του 21ου αιώνα, εξ αποστάσεως εκπαίδευση, διαδικτυακή διδασκαλία, ψηφιακός γραμματισμός

Introduction

In an era defined by digital acceleration, social complexity, and global interconnectedness, education must extend beyond the transfer of knowledge to cultivate deeper competencies that equip individuals for lifelong adaptation and contribution. The development of 21st-century skills, such as critical thinking, creativity, collaboration, communication, and digital literacy, is increasingly recognized as fundamental across educational levels and professional domains (Almazroa & Alotaibi, 2023; OECD, 2021).

Open and Distance Education (ODE) emerges as a flexible, inclusive, and responsive format for promoting these competencies. By transcending geographical, institutional, and temporal barriers, ODE facilitates learning opportunities for diverse populations, including adult learners, marginalized communities, and those engaged in lifelong development (Bozkurt et al., 2022; UNESCO, 2022). However, effective skill cultivation through ODE requires more than technological access. It calls for intentional pedagogical design, equitable infrastructure, and thoughtful integration of digital tools.

This paper examines how ODE environments can support the development of future-ready competencies through learner-centered instruction, inclusive practices, and ethical technology use. Drawing from recent research and frameworks (Redecker, 2017; Philipsen et al., 2019; Brown & Mhichíl, 2021), the study analyzes strategies that promote engagement, autonomy, and professional identity transformation. Attention is also given to barriers affecting access, participation, and equity, acknowledging that openness alone does not guarantee inclusion.

By exploring these dimensions, the paper contributes to the ongoing dialogue around innovative educational design and offers recommendations for creating learning ecosystems that are sustainable, inclusive, and empowering in a rapidly changing world.

Framing the Educational Context

As education adapts to shifting societal demands, traditional models based on knowledge transmission and standardization increasingly fall short in cultivating the flexibility, creativity, and responsiveness learners require. 21st-century education

must prepare individuals not only to acquire information but to navigate complexity, collaborate meaningfully, and engage ethically in changing environments (Redecker, 2017; OECD, 2021).

Defining 21st-Century Skills

Contemporary skill frameworks converge around a core set of competencies, (including critical thinking, communication, creativity, collaboration, and digital literacy), often conceptualized as the "5Cs" (Almazroa & Alotaibi, 2023; Brown & Mhichíl, 2021). These are not merely add-ons to content knowledge; they underpin adaptability, civic engagement, and lifelong learning.

Voogt and Roblin's taxonomy (2012), as revisited in Philipsen et al. (2019), organizes these competencies into four clusters: ways of thinking, ways of working, tools for working, and living in the world. Such classifications underscore that competence includes both cognitive and socio-emotional dimensions.

Effective skill development requires pedagogies that emphasize exploration, reflection, and authentic application (Gulikers et al., 2018). Learners must engage in tasks that encourage inquiry and iteration, with educators offering scaffolding and feedback to support metacognitive growth (Nicol, 2020).

Context matters. Creativity in STEM differs from creativity in the arts; collaboration in healthcare carries different demands than in civic organizing. Instructional design must be responsive and flexible, fostering transferability while honoring disciplinary nuance (Birru, 2024).

The urgency of these skills arises from global challenges, like climate instability, automation, and shifting labor patterns, that require ethical reasoning, technological fluency, and systems thinking. Education must therefore cultivate competence beyond curricula, preparing learners to contribute meaningfully and responsibly (OECD, 2023; Steffens, 2023).

Principles and Scope of Open and Distance Education

ODE offers a platform for reimagining access and participation. By breaking down spatial and temporal barriers, it supports lifelong learning and inclusion across diverse

contexts, such as rural learners, working adults, displaced populations, and those seeking alternative educational trajectories (Boztaş et al., 2025; UNESCO, 2022).

Its foundational principles include flexibility, autonomy, and modularity. Learners can control pace, choose paths, and engage asynchronously, fostering ownership and self-regulation (Martin et al., 2020). Technology, via Learning Management Systems, mobile tools, or collaboration platforms, enables multimodal interaction and personalized experiences (Xie et al., 2021).

However, openness alone does not ensure equity. Learners may face barriers including limited infrastructure, digital literacy, or social isolation. Access must be complemented by inclusive design and support mechanisms (Gottschalk & Weise, 2023; CAST, 2018).

Educators play expanded roles in ODE: as facilitators, mentors, and community builders. Emotional presence, clarity, and responsiveness become vital in sustaining engagement (Ferguson et al., 2019; Philipsen et al., 2019). Training must equip instructors for this complexity, integrating digital pedagogy with equity literacy.

Finally, ODE supports lifelong learning by offering stackable credentials, microlearning opportunities, and open content. Learners return to education throughout life, engaging with shifting goals and identities (Brown & Mhichíl, 2021; Jardinez & Natividad, 2024).

ODE is therefore not merely a delivery mode, but is a space for educational renewal, professional transformation, and inclusive innovation.

Designing Learning for Skill Development in ODE

Translating 21st-century competencies into practice requires pedagogical strategies that foster autonomy, engagement, and reflection. In Open and Distance Education (ODE), where learners and instructors are separated in space or time, the instructional approach must be intentionally crafted to activate critical thinking, creativity, collaboration, and self-regulation (Bond et al., 2021; Redecker, 2017).

Learner-Centered Design and Engagement

Learner-centered pedagogy situates students as active participants in the learning process. In ODE, this involves interactive tasks, reflection opportunities, and flexible

pathways tailored to diverse needs (Martin et al., 2020). Adaptive learning platforms personalize content delivery, enabling students to monitor their progress and make choices aligned with their goals (Floridi, 2019; OECD, 2021).

Problem-Based and Project-Based Learning (PBL/PjBL) are effective frameworks for developing transferable skills. Learners tackle real-world challenges, co-create digital artifacts, and iterate through feedback cycles, like fostering creativity and collaboration (Chen et al., 2021). When integrated into ODE, such approaches sustain motivation and contextualize abstract concepts (Gulikers et al., 2018).

Asynchronous activities, such as discussion forums, digital portfolios, micro-reflections, offer metacognitive benefits, allowing learners to process and articulate insights over time (Xie et al., 2021). Feedback mechanisms are crucial: timely, formative, and dialogic responses support skill refinement and learner confidence (Nicol, 2020).

Universal Design for Learning principles advocate multimodal participation. Offering varied assessment formats, (written, visual, audio), allows learners to express understanding in ways that honor difference (CAST, 2018). Emotional presence matters too: empathy in facilitation strengthens belonging and persistence (Ferguson et al., 2019; Philipsen et al., 2019).

A well-designed ODE environment fosters engagement not through proximity, but through purpose, responsiveness, and inclusive options for learners to thrive.

Facilitation and Educator Roles

In ODE, educators are no longer content transmitters. They are designers of experience, facilitators of meaning, and anchors of socio-emotional continuity (Bond et al., 2021). Their visibility, clarity, and feedback shape learners' perception of support and influence persistence.

Effective facilitation begins with structured design: clearly stated goals, scaffolded tasks, and coherent pacing reduce ambiguity and cognitive overload (Martin et al., 2020). Instructors should establish presence through personal introductions, weekly prompts, and direct engagement in discussions (Ferguson et al., 2019).

Guiding collaborative tasks is another key role. Group formation, communication norms, and peer review systems foster equitable teamwork and collective learning.

Studies highlight that when educators monitor and guide group dynamics, collaboration enhances skill development (Chen et al., 2021; Philipsen et al., 2019).

Educators must also attend to emotional dynamics, such as validating effort, responding to challenges, and recognizing progress. Affirmations and reflective questioning build trust, motivation, and self-efficacy (Jardinez & Natividad, 2024). Technology supports facilitation, but human relational presence remains the catalyst for transformative learning (Floridi, 2019).

Professional development for educators is essential. They need training in digital pedagogy, inclusive practice, and feedback strategies to navigate ODE effectively (Bozkurt et al., 2022; Steffens, 2023). Supporting facilitators enables them to support others, by creating sustainable ecosystems for skill-rich education.

Integrating Technology to Enhance Skill Development

In Open and Distance Education (ODE), technology plays a central role not only in content delivery but also in shaping learners' experiences and skill acquisition. When thoughtfully integrated, digital tools can foster collaboration, personalization, inclusivity, and ethical awareness—attributes critical for cultivating 21st-century competencies such as autonomy, creativity, and digital fluency (Xie et al., 2021; Bozkurt et al., 2022).

Personalization, Collaboration, and Inclusive Technology Use

Digital platforms empower learners to engage through flexible formats and adaptive pathways. Learning Management Systems, mobile learning apps, and collaborative spaces offer personalized pacing, multimodal interaction, and tools for reflection (Martin et al., 2020). Adaptive software provides individualized support, while dashboards help both learners and educators monitor progress (Philipsen et al., 2019).

Collaboration thrives through cloud-based tools and shared digital environments. Project-based tasks, like co-authoring reports, building multimedia content, or analyzing case studies, cultivate teamwork, negotiation, and creativity (Chen et al., 2021). Asynchronous discussions and peer feedback systems expand communicative competence and allow learners to critically reflect across time (Floridi, 2019).

Inclusion remains a pedagogical imperative. Accessible features, such as captioning, screen reader compatibility, varied font displays, enable participation from learners with diverse profiles. Universal Design for Learning (CAST, 2018) and inclusive content selection promote equity across cognitive styles, language backgrounds, and abilities. Culturally responsive tools and multilingual interfaces foster relevance and learner identity (UNESCO, 2022; Gottschalk & Weise, 2023).

Instructor awareness and intentional tool selection ensure that technology serves diverse learners, not just tech-savvy or privileged groups. When design supports authentic tasks, dialogic exchange, and flexibility, digital tools become extensions of pedagogy rather than barriers to engagement (Brown & Mhichíl, 2021).

Ethical Dimensions of Digital Integration

Digital education raises complex ethical questions around data use, privacy, authorship, and equity. ODE platforms often track behavior to personalize content, but this must be accompanied by transparency and informed consent. Learners should understand how their data is used and retain agency over their digital footprint (OECD, 2021).

Algorithmic bias in AI-powered education tools can reproduce social inequities if datasets and systems are not critically examined. Inclusive design and participatory development must guide innovation (Boztaş et al., 2025). UNESCO (2022) emphasizes that educational technology must embody justice, not merely efficiency.

Digital authorship and intellectual property also require attention. Learners often create, remix, and publish multimodal content in ODE. Teaching ethical reuse, citation practices, and licensing cultivates digital citizenship and respect (Floridi, 2019; Redecker, 2017).

Professional development for educators must include training in ethical digital practice, privacy regulation, and inclusive technology design. The presence of compassionate and critically literate instructors shapes whether digital environments empower or alienate (Philipsen et al., 2019; Jardinez & Natividad, 2024).

In short, technology in ODE must be integrated with human-centered values. It is not neutral: it must be intentionally selected, examined, and continually reimagined to promote equitable, skill-rich, and ethically grounded learning.

Equity, Access, and Inclusion in ODE

Although Open and Distance Education (ODE) is often praised for expanding access, true equity demands more than availability. It requires intentional design that accommodates diversity and fosters belonging. This section explores key barriers to participation and outlines practices that promote inclusion across digital learning environments.

Systemic Barriers and Responsive Design

Access disparities remain prevalent. Learners may lack adequate devices, stable internet, or quiet study spaces, particularly in underserved regions or low-income households (Gottschalk & Weise, 2023; OECD, 2023). Digital literacy gaps compound the challenge, especially for adult learners re-entering education or for those with disabilities navigating inaccessible platforms (CAST, 2018).

Language can be another obstacle. Courses often default to dominant languages, marginalizing non-native speakers. Multilingual interfaces and culturally relevant content are essential for engaging broader populations and affirming learner identity (UNESCO, 2022; Jardinez & Natividad, 2024).

Psychosocial factors such as isolation and low self-efficacy also affect engagement. Without emotional scaffolding and social presence, ODE environments risk alienating vulnerable learners. Flexible formats, low-bandwidth resources, and asynchronous options help reduce barriers (Bozkurt et al., 2022).

System-level strategies, like scholarships, digital access initiatives, and policy reforms, must accompany instructional design to support truly inclusive education. Institutions must recognize that equity is not incidental; it must be embedded across delivery, content, and support systems (OECD, 2021).

Inclusive Pedagogy and Facilitator Presence

Inclusivity begins with representation. When curricula reflect diverse cultures, perspectives, and voices, learners feel acknowledged and empowered. Content must

go beyond neutrality to embrace lived experiences and global relevance (UNESCO, 2022; Jardinez & Natividad, 2024).

Instructional flexibility further supports inclusion. Providing alternative formats for assignments, (oral, visual, written), allows learners to demonstrate understanding in ways that match their strengths. Universal Design for Learning encourages this multiplicity, enhancing both access and creativity (CAST, 2018).

Peer collaboration, when guided and structured, creates relational spaces that reduce isolation. Digital group projects, interactive forums, and shared reflections support social and cognitive integration (Chen et al., 2021). Facilitators must actively monitor group dynamics to ensure equitable participation and trust.

Instructor presence is pivotal. Empathetic communication, personalized feedback, and availability for dialogue affirm learners' value and progress (Ferguson et al., 2019). Even brief check-ins can reinforce connection and persistence.

Educator development is key. Training in inclusive pedagogy, accessibility awareness, and equity-oriented feedback ensures that facilitators can create safe, responsive environments (Philipsen et al., 2019; Ainscow, 2020).

Ultimately, inclusion in ODE is not achieved through tools alone. It emerges from relationships, empathy, and critical reflection in the learning process.

Lifelong Learning and the Evolution of Professional Identity through ODE

As education transcends formal institutions and fixed timelines, lifelong learning emerges as a foundation for personal and professional development. In a world marked by continual transformation, technological, cultural, and economic, the ability to learn, unlearn, and relearn becomes essential. Open and Distance Education (ODE), with its flexibility and learner-centered ethos, provides fertile ground for cultivating lifelong learning mindsets and supporting the evolving narratives of professional identity (OECD, 2021; Brown & Mhichíl, 2021).

Lifelong Learning as a Transformative Process

Lifelong learning encompasses formal, informal, and non-formal education undertaken voluntarily throughout life. It empowers individuals to adapt to change,

pursue interests, and strengthen civic engagement. Modular learning formats like micro-credentials, MOOCs, open resources, enable learners to study at their own pace, often alongside work or family responsibilities (Redecker, 2017; Philipsen et al., 2019).

Autonomy is central. Learners in ODE manage their own schedules, set goals, and self-assess progress. These metacognitive habits support perseverance and reflective growth (Nicol, 2020). When instruction offers choice, relevance, and feedback, learners develop the resilience needed for long-term engagement.

Lifelong learning is not purely instrumental. It contributes to well-being, personal meaning, and identity evolution. UNESCO (2022) emphasizes its role in fostering self-realization and collective participation, while Steffens (2023) connects it to shifts in learning theory and social discourse.

However, access and recognition remain uneven. Learners from marginalized backgrounds may lack infrastructure, support, or opportunities to convert learning into advancement. Policy frameworks must validate diverse trajectories and expand recognition of learning beyond degrees (Gottschalk & Weise, 2023; OECD, 2023).

ODE, when designed for inclusivity and relevance, becomes a tool not just for education, but also for empowerment.

Professional Identity Development through ODE

Professional identity refers to how individuals see themselves in relation to their work, values, and contributions. In an age of non-linear careers and interdisciplinary demands, identity becomes fluid, shaped by ongoing learning and reflection (Almazroa & Alotaibi, 2023; Bozkurt et al., 2022).

ODE supports identity work by offering space for exploration, reskilling, and reinvention. Learners return to study after years in the workforce, pivot careers, or engage with passions previously deferred (Brown & Mhichíl, 2021). Through digital projects, collaborative forums, and reflective writing, they articulate and expand their evolving roles (Chen et al., 2021).

Feedback is formative. Affirmation, constructive critique, and goal-setting build learner confidence and affirm capacity for transformation (Nicol, 2020). Emotional

presence and relational guidance from facilitators reinforce self-efficacy and persistence (Ferguson et al., 2019; Jardinez & Natividad, 2024).

Credentials—digital badges, e-portfolios, certificates—make growth visible. They allow learners to narrate progress and position themselves in shifting professional landscapes (Birru, 2024). Recognition of informal learning validates lived experience and empowers upward mobility.

Ultimately, ODE enables individuals to align education with evolving goals, not only acquiring skills but reconstructing their sense of self. As Zembylas (2025) notes, lifelong learning invites transformation that is both personal and collective—building identities rooted in growth, care, and contribution.

Conclusions and Recommendations

The preceding analysis affirms that Open and Distance Education (ODE) holds transformative potential for nurturing 21st-century competencies in a diverse and dynamic world. By aligning learner-centered pedagogy, digital collaboration, inclusive design, and ethical technology integration, ODE can support not only academic success but also personal empowerment and professional evolution.

As global challenges demand adaptive, reflective, and socially conscious citizens, competencies such as creativity, critical thinking, and digital literacy become foundational. ODE environments, when thoughtfully structured, can scaffold these abilities through flexible formats, authentic tasks, and meaningful interaction (Redecker, 2017; Almazroa & Alotaibi, 2023; Martin et al., 2020).

However, realizing this potential requires intentional action. Access inequities, algorithmic bias, and disengagement remain real risks, particularly for marginalized learners. Technology must be used to extend opportunity and not to reinforce exclusion. Institutions must design for diversity, empower facilitators, and recognize varied learning trajectories (UNESCO, 2022; OECD, 2023; Gottschalk & Weise, 2023).

Lifelong learning emerges as a guiding principle. ODE supports learners at every stage, facilitating skill renewal and identity transformation across time. Professional development, credentialing, and reflective learning cultivate confidence and adaptability (Brown & Mhichíl, 2021; Zembylas, 2025).

Based on these insights, the following recommendations are offered:

Pedagogical Practices

- Design learning around authentic tasks that activate inquiry, creativity, and collaboration.
- Provide multiple formats for engagement and assessment to accommodate learner diversity (CAST, 2018).
- Embed feedback mechanisms that support reflection, revision, and emotional connection (Nicol, 2020).
- Center social presence and community-building through intentional facilitation (Ferguson et al., 2019).

Technology Integration

- Select tools that support accessibility, multilingualism, and ethical data use (UNESCO, 2022).
- Evaluate AI features for transparency and fairness, avoiding biased design (Boztaş et al., 2025).
- Teach digital citizenship, emphasizing authorship, attribution, and responsible sharing (Floridi, 2019).

Policy and Systemic Action

- Invest in educator training focused on digital pedagogy, inclusion, and empathy (Philipsen et al., 2019).
- Expand modular learning and credentialing to recognize informal and lifelong education (Birru, 2024).
- Align institutional practices with equity goals—ensuring flexibility, representation, and learner agency (OECD, 2023).

ODE is not simply an alternative to traditional formats. It is a powerful model for preparing individuals to live, learn, and lead in a world defined by change. When implemented with care and creativity, it enables education to fulfill its highest promise: inclusion, transformation, and collective growth.

References

Ainscow, M. (2020). Inclusion and equity in education: Making sense of global challenges. *Prospects*, 49(2), 123–134. https://doi.org/10.1007/s11125-020-09506-w

Almazroa, H., & Alotaibi, W. (2023). Teaching 21st-century skills: Understanding the challenges to shape proactive teacher education programmes. *Sustainability*, 15(9), 7365. https://doi.org/10.3390/su15097365

Birru, Y. T. (2024). The integration of 21st-century skills into the higher education curriculum: Practices and perspectives. *Teacher Education and Curriculum Studies*, 9(3), 60–68. https://doi.org/10.11648/j.tecs.20240903.12

Bond, M., Bedenlier, S., Marín, V. I., & Händel, M. (2021). Emergency remote teaching in higher education: Mapping the first global online semester. *International Journal of Educational Technology in Higher Education*, 18(1), 50. https://doi.org/10.1186/s41239-021-00282-x

Boztaş, G. D., Berigel, M., Altınay, F., & Altınay, Z. (2025). Learning modalities shaped by digital transformation in distance education: A bibliometric analysis. *Open Praxis*, 17(2), 349–362. https://doi.org/10.55982/openpraxis.17.2.837

Bozkurt, A., Zawacki-Richter, O., & Jung, I. (Eds.). (2022). *Handbook of Open, Distance and Digital Education*. Springer. https://doi.org/10.1007/978-981-19-0351-9

Brown, M., & Mhichíl, M. N. G. (2021). Micro-credentials and digital badges in higher education: A global overview. *International Journal of Educational Technology in Higher Education*, 18(1), 26. https://doi.org/10.1186/s41239-021-00219-5

CAST. (2018). *Universal Design for Learning guidelines version 2.2*. http://udlguidelines.cast.org

Chen, W., Wang, Y., & Kirschner, P. A. (2021). The impact of structured collaborative learning on academic performance in online education. *Computers & Education*, 172, 104251. https://doi.org/10.1016/j.compedu.2021.104251

Ferguson, R., Coughlan, T., Egelandsdal, K., Gaved, M., Scanlon, E., & Sharples, M. (2019*). Innovating pedagogy 2019: Open University innovation report.* The Open University. https://iet.open.ac.uk/file/innovating-pedagogy-2019.pdf

Floridi, L. (2019). *The logic of information: A theory of philosophy as conceptual design*. Oxford University Press. https://doi.org/10.1093/oso/9780198832126.001.0001

Gottschalk, F., & Weise, C. (2023). Digital equity and inclusion in education: An overview of practice and policy in OECD countries. *OECD Education Working Papers*, No. 299. https://doi.org/10.1787/3020c5c4-en

Gulikers, J. T., Bastiaens, T. J., & Kirschner, P. A. (2018). Authentic learning: A framework for stimulating meaningful skills in vocational education. *Education + Training*, 60(1), 20–35. https://doi.org/10.1108/ET-02-2017-0023

Jardinez, M. J., & Natividad, L. R. (2024). The advantages and challenges of inclusive education: Striving for equity in the classroom. *International Journal of Lifelong Education*, 42(6), 588–602. https://doi.org/10.1080/02601370.2023.2267770

Martin, F., Sun, T., & Westine, C. (2020). A systematic review of research on online teaching and learning from 2009 to 2018. *Computers & Education*, 159, 104009. https://doi.org/10.1016/j.compedu.2020.104009

Nicol, D. (2020). The power of internal feedback: Exploiting natural comparison processes. *Assessment & Evaluation in Higher Education*, 45(5), 625–640. https://doi.org/10.1080/02602938.2019.1667948

OECD. (2021). *OECD Skills Outlook 2021: Learning for Life*. https://doi.org/10.1787/0ae365b4-en

OECD. (2023). *Equity and inclusion in education*. https://www.oecd.org/en/publications/equity-and-inclusion-in-education_e9072e21-en.html

Philipsen, B., Tondeur, J., Pareja Roblin, N., Vanslambrouck, S., & Zhu, C. (2019). Improving teacher professional development for online and blended learning: A systematic meta-aggregative review. *Educational Technology Research and Development*, 67(5), 1145–1174. https://doi.org/10.1007/s11423-019-09675-1

Redecker, C. (2017). *European framework for the digital competence of educators: DigCompEdu*. Publications Office of the European Union. https://doi.org/10.2760/159770

Steffens, K. (2023). Competences, learning theories and MOOCs: Recent developments in lifelong learning. *European Journal of Education*, 58(1), 5–18. https://doi.org/10.1111/ejed.12102

UNESCO. (2022). *Reimagining our futures together: A new social contract for education*. Paris: UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000379707.locale=en

Voogt, J., & Roblin, N. P. (2012). A comparative analysis of international frameworks for 21st-century competences: Implications for national curriculum policies. *Journal of Curriculum Studies*, 44(3), 299–321. https://doi.org/10.1080/00220272.2012.668938

Xie, H., Chu, H. C., Hwang, G. J., & Wang, C. C. (2021). Trends and development in technology-enhanced learning systems: A review of recent research. *Computers & Education*, 157, 103944. https://doi.org/10.1016/j.compedu.2020.103944