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Romania

Teacher Competences for Sustainable Digital Literacy:
National Context, Policies, and Professional Development

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Content

Purpose and Scope of this Report.....	Errore. Il segnalibro non è definito.
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Practice and Implementation Evidence	Errore. Il segnalibro non è definito.
1. National Policy Framework for Digital and Sustainable Education.....	5
1.1 Digital Education Strategy and Teacher Competences	5
1.2 Sustainability in Education Policy	5
1.3 AI in Education Policy	6
1.4. Open Educational Resources (OER) in Education Policy	6
1.5 Gap Analysis: Sustainable Digital Literacy.....	7
2. Teacher competence frameworks in use	8
2.1 National teacher competence standards.....	8
2.2 Adoption of European frameworks.....	9
2.3 Gaps in current competence frameworks.....	10
3. Initial Teacher Education (ITE) and Continuous Professional Development (CPD) and its Certification.....	11
3.1 Initial Teacher Education (ITE) provision	11
3.2 Continuous Professional Development (CPD) opportunities	12
3.3 Certification and recognition	13
3.4 Gaps in current ITE/CDP	14
4. Analysis of the Four DigiSET Thematic Areas.....	15
4.1 Gender-unbiased AI in teaching	15
4.2 Systems thinking for sustainability in education	16
4.3 AI for adaptive learning.....	17
4.4 Inclusive teaching practices and learning difficulties	18
5. Innovative practices and case studies.....	119
5.1 Case Study 1: EduShift: Digital pedagogy for pre-university teachers.....	19
5.2 Case Study 2: Digital Technologies in Language Teaching	19
6. Conclusions and Implications.....	21
6.1 Competence Implications for the Digitally Sustainable Teacher	21
6.1.1 Emerging Competence Areas	21
6.1.2 Underdeveloped Competences	22
6.2 Recommendations and Implications for DigiSET Framework Development.....	23
6.2.1 Implications for the Competence Framework	23
6.2.2 Implications for Learning Outcomes	23

6.2.3 Implications for Training Design	24
6.3 Potential for National Integration.....	24
6.4 Key Findings Summary.....	25
7. References	27

1. National Policy Framework for Digital and Sustainable Education

1.1 Digital Education Strategy and Teacher Competences

In Romania, the main policy reference for digital education is the *SMART.Edu* strategic initiative for the digitalisation of education, complemented by the *Law on Pre-University Education no. 198/2023* and the more recent professional profile and standards for teachers. SMART.Edu places strong emphasis on the initial and continuous training of teachers for digital education, on the creation of *Open Educational Resources (OER/RED)*, and on the broader goal of developing digital competences across the education community. Even where implementation has been uneven, these documents clearly position teachers not only as users of technology, but as mediators, designers, and evaluators of digitally supported learning.

Law no. 198/2023 establishes digital transformation as a strategic objective of pre-university education and links continuous professional development to the acquisition of digital competences (Romanian Parliament, 2023). Article 132 states that digital transformation in pre-university education must be guided by a national strategy for the digitalisation of education and the development of digital competences across the educational community. The same law also links continuous professional development to the acquisition of digital competences for teaching-learning-assessment. This is important for DigiSET because it means teacher digital competence is no longer peripheral; it is treated as a formal component of professional development and system reform.

According to the Ministry of Education (2024), teachers are expected to use digital technologies pedagogically and ethically. The new *Professional Profile and Standards for Teachers* make this even more explicit. The framework includes a distinct domain for the pedagogical use of digital technologies, states that teachers must help students understand both the opportunities and the limits/implications of technology, and explicitly references *DigCompEdu* as its benchmark. The wording is significant: digital competence is not reduced to technical operation, but is tied to pedagogy, ethics, critical use, and balanced judgment. This creates a useful foundation for a “digitally sustainable teacher” profile, even if sustainability itself is not yet fully integrated into the digital competence domain.

At the same time, research suggests that implementation remains uneven. Romanian teachers show growing engagement with digital tools, but still report training needs, especially where digital pedagogy moves beyond basic use toward assessment, collaboration, inclusion, and more advanced reflective practice. This means the policy framework is present, but competence development is still consolidating in practice. (Hatos et al., 2022)

1.2 Sustainability in Education Policy

Romania has a general sustainability policy anchored in the National Sustainable Development Strategy 2030, which emphasizes the integration of sustainability principles across public policies (Government of Romania, 2018) and a much more education-specific framework in the National Strategy on Environmental Education and Climate Change 2023–2030. For DigiSET, the latter is especially relevant because it moves from broad sustainability goals to concrete expectations for schools and teachers. It treats education as a mechanism for behavioural, institutional, and cultural change and includes measures targeting teacher training, school culture, and open resources.

Unlike many earlier policy texts, the 2023–2030 strategy directly addresses the teacher profession. (Ministry of Education, 2023). It proposes: inclusion of climate and environmental competences in the teacher competence profile; inclusion of environmental themes, environmentally responsible pedagogy, and even outdoor teaching in initial teacher education; development of continuous professional development courses on climate, environment, and

sustainability; county-level networks of trainers/mentors; and recognition of these learning pathways through transferable professional credits. This is one of the strongest policy links in Romania between sustainability and teacher competence development.

The sustainability strategy also has a partial connection to digital education. It acknowledges the role of digital tools and digital environments in supporting climate and environmental education and identifies open resources, partnerships, and digital instruments as enablers. However, the link remains supportive rather than fully integrated: digitalisation is treated mainly as an instrument to deliver sustainability education, not yet as an object of sustainability reflection in itself. In other words, the policy supports teachers in teaching sustainability with digital means, but says much less about the sustainability of digital education itself. (Ministry of Education, 2023)

Research on Romania reinforces this picture. Sustainability education is often perceived as insufficiently integrated across the curriculum (Chiriac & Iașu, 2022), and it is often associated with specific subjects such as geography rather than as a fully cross-curricular teacher competence area. Teachers generally value sustainability topics and express willingness to deepen their knowledge, but the national system is still moving from thematic awareness to systematic teacher preparation.

1.3 AI in Education Policy

Romania has formally adopted a national framework for AI development and governance (Ministry of Research, Innovation and Digitalization, 2024). This is an important development because it gives AI formal policy status at the national level and places education and digital skills within the broader AI transition. This strategy is not an education-sector framework in the narrow sense and does not yet function as a dedicated teacher-facing AI in an education guidance document for schools. Its relevance for DigiSET lies more in signalling national direction than in providing classroom-ready competence descriptors for teachers.

Current evidence suggests that Romania is in an early institutional phase regarding AI and teacher competence. National policy discourse increasingly recognises AI literacy, digital skills, and innovation, but there is still limited evidence of a comprehensive, official national framework specifically detailing what teachers should know and be able to do regarding AI literacy, pedagogical use, ethics, bias, assessment, transparency, or environmental costs of AI. In that sense, Romania has an AI strategy, but not yet a mature, education-specific AI competence policy for teachers comparable to the level of detail now available in UNESCO guidance.

Recent OECD TALIS 2024 data illustrate why this matters. In Romania, about **46% of teachers** reported having used AI in their work, yet among teachers who had not used AI, **58%** said they lacked the knowledge and skills to teach using it; **39%** also reported inadequate school infrastructure for AI use. This suggests that practice is moving faster than formal teacher preparation. For DigiSET, this is a strong argument for including AI literacy, critical evaluation of AI outputs, bias awareness, data/privacy issues, and ethical classroom use as explicit teacher competencies. Teachers' use of AI is increasing, although significant training needs remain (OECD, 2024).

Regarding the environmental impact of AI, no dedicated Romanian school policy or teacher guidance was identified that explicitly addresses energy consumption, computational footprint, or environmental trade-offs of AI in educational settings. This is a notable blind spot, particularly given DigiSET's sustainability orientation. The likely implication is that Romanian policy currently treats AI mainly through innovation and digitalisation lenses, not through a joined-up AI-and-sustainability lens for teachers.

1.4. Open Educational Resources (OER) in Education Policy

Romania has a longstanding but only partially realised policy orientation toward *Open Educational Resources*. OER are visible in several policy strands: the earlier legal basis for a *Virtual School Library*, the development of county and national *RED* (Resurse Educaționale

Deschise) networks, the digital education agenda in *SMART.Edu*, and more recent investments in national digital content platforms such as *EduLib*. These policy directions position teachers not only as consumers of materials, but increasingly as creators, adapters, and sharers of digital educational resources.

Law no. 198/2023 confirms the place of open/digital resources by stating that the national digital infrastructure includes the Virtual School Library and the national e-learning platform “Învățăm în România,” with curricular resources, lesson examples, methodological guides, and assessment examples. *SMART.Edu* also explicitly includes the creation of OER/RED among its major lines of action. This gives Romania a recognisable OER policy base, even if implementation has historically lagged behind legislative intent. Digital competences are formally linked to teacher professional development (Ministry of Education, 2023).

Romania's engagement with Open Educational Resources (OER) can be linked to initiatives such as the Virtual School Library and commitments to improve access to publicly funded educational materials (Open Government Partnership, 2018). Nevertheless, national efforts have focused primarily on expanding access to learning materials rather than on building a comprehensive framework for open educational practices. Monitoring reports noted that implementation of the Virtual School Library progressed slowly and that a dedicated OER strategy remained incomplete. While more recent initiatives have broadened access to educational content, the emphasis continues to be placed on distribution rather than on adaptation, collaboration, sharing, and teacher empowerment through open licensing.

For teacher competences, this means Romania offers an emerging but still under-consolidated environment for OER. Teachers are increasingly expected to locate, use, and contribute resources, but the competence model for open licensing, adaptation, co-creation, attribution, sharing practices, and quality assurance of OER remains less explicit than the infrastructure discourse. DigiSET can therefore add value by moving from “resource use” to “open pedagogical agency.” The *SMART.Edu* strategy places a strong emphasis on developing digital competences, creating Open Educational Resources, and strengthening the digital education ecosystem (Ministry of Education and Research, 2020).

1.5 Gap Analysis: Sustainable Digital Literacy

Romania has substantial policy development in digital education and clearer recent progress in sustainability education, but the two strands are still only partially connected. Digital policy focuses primarily on competences for teaching with technology, digital infrastructure, digital content, and system modernisation. Sustainability policy focuses primarily on environmental and climate education, school culture, and dedicated teacher training for these themes. What is still largely missing is an explicit, integrated policy concept of “sustainable digital literacy” for teachers. The *SMART.Edu* strategy places strong emphasis on teacher training, digital competences, Open Educational Resources, and the development of a digital education ecosystem (Ministry of Education and Research, 2020).

The existing frameworks tend to treat digital competence and sustainability competence as adjacent, not fused. The digital side increasingly includes pedagogy, critical use and ethics, but not yet ecological or systemic sustainability considerations. The sustainability side increasingly includes teacher training and school-level change, but not yet a full treatment of digital technologies as objects of critical sustainability reflection. AI policy makes this fragmentation even more visible: AI is entering schools and teachers' work, yet teacher-focused guidance on bias, transparency, inclusion, environmental impact, and responsible use remains limited. The professional profile for teachers explicitly includes the pedagogical use of digital technologies and references the DigCompEdu framework (Ministry of Education, 2024).

A second gap concerns implementation depth. Romania's laws and strategies now provide a stronger normative basis for teacher competences than before, but research and survey evidence show continuing needs in teacher preparation, especially in practical digital pedagogy, equitable access, collaboration, assessment, advanced resource design, and AI-related competences. Thus, the challenge is no longer only policy absence; it is also the need

for better operationalisation through ITE, CPD, accredited modules, mentoring, repositories, and quality-assured training pathways. Existing evidence suggests that teachers continue to require structured support for the effective use and development of digital educational resources (Mara et al., 2024).

For DigiSET, Romania is therefore a context in which the framework should **not replace** existing national priorities, but rather connect them. A strong DigiSET contribution would be to articulate a teacher competence profile that integrates: digital pedagogy, OER creation and sharing, critical and ethical AI literacy, inclusive design, and sustainability-oriented educational thinking. This integrated profile is not yet fully visible in Romanian policy, which is precisely why the project can be highly relevant and transferable.

2. Teacher competence frameworks in use

2.1 National teacher competence standards

The Romanian teacher competence framework has recently undergone significant revision, particularly with the introduction of the **Professional Profile and Standards for Teachers in Pre-University Education** (Ministerul Educației, 2024). This document represents the most comprehensive national reference for teacher competences and serves as a foundation for teacher education, professional evaluation, and career development.

The framework organizes teacher competences into several domains including:

- Pedagogical and didactic competences
- Digital competences for teaching and learning
- Assessment competences
- Professional collaboration and school development
- Ethical and social responsibility competences.

Digital competence is explicitly integrated into the framework as a transversal element of teaching practice. Teachers are expected to demonstrate the ability to select, use, evaluate and critically reflect on digital technologies in the teaching-learning-assessment process, as well as to facilitate students' development of digital literacy. Importantly, the framework also stresses the need for teachers to support learners in understanding both the opportunities and the limitations of digital technologies, including issues of safety, ethics, and responsible use.

The framework explicitly references *DigCompEdu* (Redecker & Punie, 2017) as a guiding European benchmark for teacher digital competences. This alignment reflects Romania's broader policy orientation toward European competence frameworks and provides a structured reference for teacher training institutions and professional development programmes.

Despite this progress, sustainability competences are less explicitly articulated within the teacher competence framework. Environmental education and sustainability themes appear primarily in relation to cross-curricular education priorities rather than as a dedicated competence domain. As a result, teachers are expected to address sustainability topics in teaching practice, but the competence descriptors related to sustainability pedagogy, systems thinking, or sustainable digital practices remain limited. This indicates that sustainability is currently more strongly embedded in curriculum policy and thematic strategies than in the formal teacher competence framework itself.

2.2 Adoption of European frameworks

Framework	Adoption Level	Notes
DigCompEdu (2017)	Recommended/referenced	DigCompEdu is explicitly referenced in the <i>Professional Profile and Standards for Teachers in Pre-University Education</i> (Ministerul Educației, 2024). It serves as the main European benchmark for digital teacher competences and informs national teacher training programmes and digital pedagogy initiatives. However, it is not formally mandated as the official national competence framework.
GreenComp (2022)	Recommended (indirect influence)	GreenComp is not formally adopted in Romanian education policy, but its principles align with the objectives of the <i>National Strategy on Environmental Education and Climate Change 2023–2030</i> . Sustainability competences are promoted through environmental education initiatives and teacher training programmes, though GreenComp itself is not yet explicitly referenced in teacher competence standards.
LifeComp (2020)	Not formally used / indirect influence	LifeComp has not been officially integrated into Romanian teacher competence frameworks. However, some of its competence areas (personal, social, and learning-to-learn competences) are reflected indirectly in curriculum reforms and transversal competences promoted in national education strategies.
EntreComp (2016)	Recommended / partially used	EntreComp principles are indirectly promoted through entrepreneurship education policies and EU-funded programmes implemented in Romanian schools and teacher training initiatives. Entrepreneurship education is included in the curriculum and project-based learning initiatives, but EntreComp is not formally embedded as a national teacher competence framework.
AI Competence Framework for Teachers (UNESCO, 2024)	Not yet used (emerging relevance)	The UNESCO AI Competency Framework for Teachers has not yet been formally integrated into Romanian teacher education policy. AI is addressed more broadly in the National Artificial Intelligence Strategy 2024–2027, but structured competence descriptors for teachers' AI literacy and pedagogical use are still under development.

Table: Overview of Adoption Level in ROMANIA

2.3 Gaps in current competence frameworks

Despite significant progress in defining teacher competences for digital education in Romania, several gaps remain in the current competence frameworks, particularly in relation to the integration of sustainability, emerging technologies, and interdisciplinary pedagogical approaches.

First, although digital competences are clearly included in the Professional Profile and Standards for Teachers in Pre-University Education (2024) and are broadly aligned with the DigCompEdu framework, these competences tend to focus primarily on the pedagogical use of digital technologies, digital resources, and online teaching practices. The environmental and social implications of digital technologies—such as the sustainability of digital infrastructures, energy consumption of digital tools, or responsible technological use—are rarely addressed explicitly. As a result, the concept of sustainable digital literacy remains largely absent from formal teacher competence frameworks.

Second, sustainability competences are promoted through national policy initiatives, particularly the National Strategy on Environmental Education and Climate Change 2023–2030, yet these competences are not systematically embedded in teacher professional standards. Sustainability education is often treated as a thematic or cross-curricular priority rather than as a structured competence domain for teachers. Consequently, teachers may address sustainability topics in specific subjects or projects, but there is limited guidance regarding pedagogical approaches, systems thinking, or interdisciplinary teaching strategies related to sustainable development.

A third gap concerns artificial intelligence and emerging digital technologies. Although Romania adopted a National Artificial Intelligence Strategy (2024–2027) and AI tools are increasingly present in educational practice, there is still limited policy guidance on teacher competences related to AI literacy, ethical use of AI in education, algorithmic bias, data protection, and critical evaluation of AI-generated content. Existing competence frameworks therefore, lag behind the rapid technological changes affecting educational environments.

Another challenge relates to the implementation of competence frameworks in teacher education and professional development. While national frameworks provide general competence descriptions, the operationalisation of these competences in initial teacher education programmes, continuous professional development courses, and teacher evaluation systems remains uneven. Teachers often report the need for more practical training in digital pedagogy, innovative teaching methods, and the integration of digital tools into meaningful learning activities (Hatos et al., 2022).

Finally, current frameworks tend to address digital competence, sustainability education, and innovation separately, without fully recognising the interconnected nature of these domains. The absence of an integrated competence model limits teachers' ability to approach digital transformation in education from a sustainability perspective that considers ethical, environmental, social, and pedagogical dimensions simultaneously. In this context, initiatives such as the **DigiSET project** can play an important role in bridging these gaps by promoting an integrated approach to teacher competencies that combines digital pedagogy, sustainability education, responsible technology use, and critical digital literacy.

3. Initial Teacher Education (ITE) and Continuous Professional Development (CPD) and its Certification

3.1 Initial Teacher Education (ITE) provision

In Romania, initial teacher education is mainly provided through universities, particularly through Departments for Teacher Training (Departamentul pentru Pregătirea Personalului Didactic – DPPD) within higher education institutions. These departments are responsible for delivering pedagogical training programmes for future teachers across disciplines. The ITE structure generally includes two certification levels:

- Level I (Bachelor level) – qualifies graduates to teach in lower secondary education.
- Level II (Master's level) – required for teaching in upper secondary education.

ITE programmes combine pedagogical theory, subject-specific didactics, and teaching practice in schools. The curriculum typically includes courses such as pedagogy, psychology of education, classroom management, assessment methods, and didactics of the discipline. In recent years, digital competences have become more visible within these programmes due to national digitalisation strategies and the increased use of educational technologies following the COVID-19 pandemic.

Digital pedagogy is increasingly addressed in teacher education programmes, usually through courses related to educational technologies, e-learning, or ICT in education. These courses focus on the pedagogical use of digital tools, digital learning environments, and the integration of technology into teaching and assessment processes.

Education for sustainable development is present in the Romanian education system mainly through cross-curricular themes and specific subject areas, such as geography, environmental education, or civic education. However, sustainability education is generally not structured as a dedicated compulsory competence domain within teacher training programmes. As a result, future teachers may encounter sustainability topics indirectly rather than through systematic training in sustainability pedagogy.

The use of artificial intelligence in education is currently at an early stage in Romanian ITE programmes. While AI-related discussions have increased in academic and policy contexts, structured courses addressing AI literacy, ethical implications of AI, or pedagogical integration of AI tools are still rare in formal teacher education curricula.

Competences related to Open Educational Resources (OER) are addressed only partially in ITE programmes. Some digital pedagogy courses introduce concepts such as open educational resources, digital repositories, or copyright and licensing, but systematic training in OER creation, adaptation, and sharing practices remains limited.

Romanian ITE programmes increasingly incorporate digital competence elements but still show limited integration of sustainability, AI literacy, and open education practices, highlighting the need for integrated competence frameworks such as those promoted by the *DigiSET* project.

Aspect	Adoption Level	Notes
Education for Sustainable Development	Optionally	Sustainability topics are present mainly through specific subjects (e.g., geography, environmental education) or interdisciplinary projects. However, structured training in sustainability pedagogy is not systematically integrated into ITE programmes.
Digital Pedagogy	Mandatory	Digital competence development is increasingly included in ITE through courses related to educational technologies, e-learning, and ICT in education. These courses focus on integrating digital tools into teaching and assessment practices.
AI in education	Not available / emerging	AI-related topics are not yet systematically included in teacher education curricula. Discussions about AI literacy and ethical use of

		AI in education are emerging, but are mainly addressed through research initiatives or optional activities.
OER creation	Optionally	Open Educational Resources are sometimes introduced within digital pedagogy or ICT courses, but practical training in OER creation, adaptation, licensing, and sharing is not consistently included in teacher education programmes.

Table: Overview of the Adoption Level of Digitally Sustainable Teaching Topics in Initial Teacher Education in ROMANIA

3.2 Continuous Professional Development (CPD) opportunities

Continuous Professional Development (CPD) for teachers in Romania is organised within a national system of accredited in-service training programmes designed to support teachers' professional growth throughout their careers. Teachers are required to periodically accumulate *professional development credits* through participation in accredited training activities, which may include courses, workshops, conferences, and postgraduate programmes.

The main providers of CPD programmes include:

- **Teacher Training Houses (Casa Corpului Didactic – CCD)** operating at the county level
- **Universities and higher education institutions** offering postgraduate programmes and certified training courses
- **Accredited training providers**, including educational NGOs and private organisations
- **European projects and international programmes**, which often introduce innovative themes and teaching approaches

CPD programmes are accredited by the Ministry of Education and Research and evaluated through the National Commission for Continuing Teacher Training. These programmes address various areas of professional competence, including digital pedagogy, inclusive education, curriculum innovation, and classroom management.

In recent years, digital competence development has become one of the most prominent areas of CPD for teachers in Romania. Following the COVID-19 pandemic and the rapid expansion of online and blended learning, numerous training programmes have been organised to support teachers in the use of digital platforms, digital assessment tools, and online teaching methodologies. Many of these programmes draw on European frameworks such as *DigCompEdu*, which provides guidance for the development of teachers' digital competences.

Training opportunities related to education for sustainable development (ESD) have also increased in recent years, particularly following the adoption of the *National Strategy on Environmental Education and Climate Change 2023–2030*. CPD programmes related to sustainability education are typically offered through interdisciplinary projects, environmental education initiatives, and partnerships with NGOs or international organisations. However, such training opportunities are still relatively limited compared to those focusing on digital competencies.

Professional development opportunities related to *artificial intelligence in education* are still emerging. Although interest in AI tools has increased among teachers, structured CPD programmes addressing AI literacy, ethical implications of AI in education, and the pedagogical use of AI tools remain relatively scarce. Most initiatives in this area are currently linked to pilot projects, research initiatives, or European educational programmes.

Training opportunities related to *Open Educational Resources (OER)* are generally integrated within broader digital pedagogy courses. Teachers may be introduced to digital

repositories, open educational materials, and basic concepts of open licensing, but systematic training in OER design, adaptation, and collaborative sharing practices is still limited within CPD programmes.

CPD opportunities in Romania show strong development in digital pedagogy but more limited and fragmented integration of sustainability education, AI literacy, and open education practices. These findings highlight the potential contribution of the *DigiSET* project in supporting a more integrated approach to digitally sustainable teacher competences.

Aspect	Adoption Level	Notes
Education for Sustainable Development	Optionally	Training opportunities exist through environmental education programmes, EU projects, and initiatives linked to the National Strategy on Environmental Education and Climate Change (2023–2030), but they are not systematically included in CPD programmes.
Digital Pedagogy	Mandatory / widely available	Digital pedagogy is one of the most common topics in CPD programmes. Training is offered by Teacher Training Houses (CCD), universities, and accredited training providers, focusing on digital tools, online learning platforms, and digital assessment methods.
AI in education	Not available / emerging	Dedicated CPD programmes on AI in education are still limited. Some training activities address AI tools indirectly within broader digital competence programmes or innovation projects.
OER creation	Optionally	OER-related training is sometimes included within digital pedagogy courses, particularly regarding digital resources and open educational materials. However, structured training in OER creation and licensing remains limited.

Table: Overview of the Adoption Level of Digitally Sustainable Teaching Topics in Continuous Professional Development in ROMANIA

3.3 Certification and recognition

Teacher competences in areas such as digital education, sustainability education, and other professional skills are formally recognised through the national system of continuous professional development (CPD) and the teacher career progression framework. Certification and recognition of teacher competences are regulated by the Ministry of Education, which accredits professional development programmes and ensures alignment with national educational policies and standards.

Teachers are required to periodically participate in CPD activities in order to maintain and improve their professional competencies. These activities are usually accredited by the Ministry of Education and organised by recognised providers such as Teacher Training Houses (Casa Corpului Didactic – CCD), universities, accredited training organisations, and educational projects funded through European programmes. CPD programmes typically provide teachers with professional development credits, which contribute to career advancement and professional recognition.

Teacher career progression in Romania follows several professional stages, including Definitivat, Second Teaching Degree (Gradul didactic II), and First Teaching Degree (Gradul didactic I). Participation in CPD activities and the development of new professional

competences—including digital competences—can support teachers in preparing for these career stages and demonstrating their professional development.

Competences related to digital education are increasingly recognised within CPD certification systems, particularly through training programmes focused on digital pedagogy, educational technologies, and digital assessment. These programmes often align with European frameworks such as DigCompEdu, which provides a reference model for assessing and developing teachers' digital competences.

Certification of competences related to sustainability education is less structured. Although training opportunities linked to environmental education and climate change are expanding following the adoption of the National Strategy on Environmental Education and Climate Change 2023–2030, formal certification pathways specifically focused on sustainability competencies remain limited. In many cases, sustainability topics are integrated into broader CPD programmes rather than recognised as a distinct competence area.

Regarding the recognition of competencies in emerging areas such as artificial intelligence in education, formal certification systems are still under development. Training related to AI tools or digital innovation is sometimes offered through pilot programmes or European educational projects, but these initiatives are not yet systematically embedded in national CPD accreditation frameworks.

Romania also operates within the National Qualifications Framework (Cadrul Național al Calificărilor – CNC), which aligns with the European Qualifications Framework (EQF). Higher education institutions and training providers may align professional development programmes with this framework, facilitating transparency and recognition of qualifications at the European level.

The concept of micro-credentials has recently gained attention in European education policy and could offer new opportunities for recognising teachers' competences in specific areas such as digital pedagogy, sustainable education, or AI literacy. Although micro-credentials are not yet widely implemented in Romania's teacher professional development system, universities and training providers are increasingly exploring this approach in response to European recommendations on flexible learning pathways and lifelong learning.

Thus, the development of training programmes within the *DigiSET* project could potentially contribute to the introduction of micro-credential-based certification for teachers' competences related to digitally sustainable education. Such an approach could support modular, flexible professional development opportunities and facilitate recognition of teachers' skills across European education systems.

3.4 Gaps in current ITE/CDP

The analysis of initial teacher education (ITE) and continuous professional development (CPD) in Romania shows significant progress in certain areas of teacher competence development, particularly in relation to digital pedagogy and the use of digital technologies in teaching and learning. However, several gaps remain in the preparation of teachers for the integrated competence profile required by the concept of a Digitally Sustainable European Teacher.

One of the most strongly supported competence areas in both ITE and CPD is digital pedagogy. Over the past decade, and especially following the COVID-19 pandemic, numerous training initiatives have been implemented to help teachers integrate digital technologies into teaching practice. These initiatives include courses on the use of digital learning platforms, online teaching methods, digital assessment tools, and digital communication with students. Such programmes are widely offered by universities, Teacher Training Houses (Casa Corpului Didactic), and accredited training providers. European frameworks such as DigCompEdu increasingly influence the design of these training programmes and the development of teachers' digital competences.

Another relatively well-supported area is the development of general digital competences, including the use of digital resources, collaborative online tools, and digital

classroom management strategies. Many CPD programmes focus on practical digital skills and the effective use of educational technologies in blended or online learning environments.

Competences related to education for sustainable development (ESD) are gradually gaining visibility within the Romanian education system, particularly after the adoption of the National Strategy on Environmental Education and Climate Change 2023–2030. Some training programmes address sustainability education, environmental awareness, and climate-related topics. However, these initiatives are often implemented through project-based activities, extracurricular programmes, or specific subject areas rather than through a systematic integration into teacher education curricula.

Similarly, competences related to open educational practices and the use of Open Educational Resources (OER) receive some attention within digital pedagogy training programmes. Teachers may learn how to use digital repositories or access open educational materials, but structured training in OER creation, adaptation, licensing, and collaborative sharing practices remains relatively limited.

The least developed competence areas concern the integration of artificial intelligence (AI) in education and the broader concept of sustainable digital literacy. Although interest in AI tools has grown rapidly among teachers, formal training opportunities addressing AI literacy, algorithmic bias, ethical implications, data privacy, and the pedagogical use of AI tools remain scarce in both ITE and CPD programmes.

Current training initiatives rarely address the environmental and social implications of digital technologies, such as the ecological footprint of digital infrastructures, responsible technology use, or the sustainability of digital practices in education. As a result, teachers are typically trained in how to use digital technologies but receive limited guidance on how to use them in ways that support broader sustainability goals.

The Romanian teacher education system still tends to treat digital competence, sustainability education, and emerging technologies as separate areas rather than as interconnected dimensions of modern teaching practice. This fragmented approach limits teachers' ability to develop the integrated set of competences required to address complex societal challenges such as digital transformation, climate change, and responsible innovation.

4. Analysis of the Four DigiSET Thematic Areas

4.1 Gender-unbiased AI in teaching

The topic of gender bias in artificial intelligence (AI) is gradually gaining attention in European policy discussions; however, in the Romanian educational context, it is still an emerging area. While national strategies acknowledge the importance of digital transformation and AI literacy, specific references to gender bias in AI systems and its implications for teaching and learning remain relatively limited in education policy and teacher training programmes.

At the national level, the Romanian National Artificial Intelligence Strategy (2024–2027) recognises the importance of ethical AI development, responsible data use, and the need to strengthen digital competences across society. The strategy highlights the role of education in preparing citizens to understand and critically engage with AI technologies. Nevertheless, the strategy focuses primarily on innovation, digital skills, and research development rather than on specific pedagogical issues such as gender bias or inclusive AI practices in school education.

Gender equality itself is addressed in Romanian public policy through broader national and European initiatives promoting equal opportunities, anti-discrimination, and inclusive education. However, the intersection between gender equality, AI technologies, and classroom teaching is not yet systematically addressed in teacher education programmes or professional development initiatives. As a result, most teachers have limited formal training

on identifying or addressing gender bias in digital systems, algorithms, or AI-generated content.

Some indirect attention to gender equality in education can be found in projects and initiatives supported by European programmes or civil society organisations. These initiatives often focus on gender equality in the labour market, digital inclusion, and equal access to STEM education. For example, European-funded projects addressing gender equality in professional environments or digital skills development may provide relevant educational resources that teachers can use to discuss bias and discrimination in digital contexts.

Within teacher education and professional development, training on digital competences typically emphasises the pedagogical use of digital tools, online learning platforms, and digital resources, but rarely addresses the ethical implications of AI systems, including algorithmic bias or gender stereotypes embedded in digital technologies. Consequently, teachers may use AI-based tools without fully understanding the potential risks related to biased data, unequal representation, or discriminatory outputs.

Despite these limitations, the growing international debate on ethical AI, responsible digital innovation, and inclusive technologies creates opportunities for integrating gender-sensitive perspectives into digital education. European frameworks and international guidance, such as UNESCO's work on AI competencies for teachers, highlight the importance of helping educators critically evaluate AI systems and understand how biases can influence automated decision-making and knowledge production.

4.2 Systems thinking for sustainability in education

Within the Romanian education system, however, the concept of systems thinking for sustainability is still developing and is not yet systematically integrated into teacher education or professional development frameworks.

At the policy level, sustainability-related competences are promoted through the National Strategy on Environmental Education and Climate Change 2023–2030, which aims to strengthen environmental awareness and climate literacy across the education system. The strategy emphasises interdisciplinary learning, critical thinking, and the development of competencies that enable students to understand complex environmental issues and take responsible action. These objectives are conceptually aligned with systems thinking approaches, which encourage learners to understand relationships between environmental, social, and economic systems.

In practice, elements of systems thinking are most often present in interdisciplinary teaching contexts, particularly within subjects such as geography, biology, environmental education, and civic education. Teachers may address sustainability challenges by exploring cause-and-effect relationships, global interdependencies, and long-term impacts of human activities on natural systems. However, these approaches are typically implemented through subject-specific content rather than through explicit training in systems thinking methodologies.

Teacher education programmes in Romania rarely include dedicated courses on systems thinking or sustainability pedagogy. Instead, future teachers may encounter sustainability-related themes through courses related to environmental education or through optional modules in specific disciplines. As a result, teachers may address sustainability topics in the classroom but often lack formal preparation in pedagogical approaches that explicitly promote systems thinking.

Continuous professional development opportunities related to sustainability education have increased in recent years, particularly through national initiatives and European-funded projects focusing on environmental education and climate change. These programmes sometimes encourage interdisciplinary approaches and project-based learning, which can support systems thinking by helping students explore connections between environmental, social, and economic factors. Nevertheless, structured training specifically focused on systems thinking as a pedagogical competence remains relatively limited.

The connection between systems thinking and Education for Sustainable Development (ESD) is increasingly recognised at the European level, where frameworks such as GreenComp highlight the importance of understanding complexity and interdependencies within sustainability challenges. While Romanian education policies reflect similar goals—such as promoting environmental responsibility and critical thinking—the explicit integration of systems thinking as a teaching approach is still emerging.

4.3 AI for adaptive learning

Adaptive learning technologies supported by artificial intelligence are gradually entering the Romanian education system, although their use is still at an early stage compared with more mature digital education ecosystems. Adaptive learning systems refer to digital platforms or tools that use algorithms and data analytics to personalise learning pathways, adjust learning materials to students' needs, and provide automated feedback based on learners' performance.

At the policy level, Romania has recently adopted the National Artificial Intelligence Strategy 2024–2027, which emphasises the development of digital skills, innovation ecosystems, and AI literacy across different sectors, including education. However, the strategy focuses primarily on research development and technological innovation rather than on the pedagogical integration of adaptive learning technologies in schools. Consequently, there is limited national guidance on how teachers should use AI-based tools to support personalised learning.

In practice, adaptive learning technologies are mainly present through digital learning platforms and educational software, some of which include elements of learning analytics, automated feedback, or personalised recommendations. These technologies are often introduced through national digitalisation initiatives, private educational platforms, or European-funded educational projects. Nevertheless, their adoption remains uneven across schools due to differences in digital infrastructure, access to resources, and teachers' digital competencies.

Teacher training related to personalised and adaptive learning is usually addressed indirectly within broader training programmes on digital pedagogy or technology-enhanced learning. These programmes typically focus on the use of digital learning platforms, online assessment tools, and strategies for differentiated instruction. However, structured training specifically addressing AI-driven adaptive learning systems, learning analytics, and data-informed teaching practices is still relatively limited in both initial teacher education and continuous professional development programmes.

Another important dimension concerns the ethical and pedagogical implications of adaptive learning technologies. Issues such as data privacy, transparency of algorithmic decision-making, potential bias in automated systems, and the responsible use of student data are becoming increasingly relevant as digital learning environments evolve. In Romania, these topics are generally addressed within broader discussions about digital citizenship, data protection, and responsible technology use, rather than through dedicated training modules on AI ethics in education.

From a pedagogical perspective, adaptive learning technologies offer opportunities to support personalised learning pathways, identify students' learning difficulties, and provide more targeted feedback. However, their effective use requires teachers to develop competences related to interpreting learning analytics, designing flexible learning activities, and critically evaluating the recommendations generated by AI-based systems.

4.4 Inclusive teaching practices and learning difficulties

Inclusive education has become an important priority within the Romanian education system, reflecting both national policy commitments and alignment with European and international frameworks promoting equitable access to education. Policies and regulations emphasise the integration of students with diverse learning needs into mainstream education and the development of teaching practices that support all learners, including those with learning difficulties, disabilities, or socio-economic disadvantages.

The legal and policy framework for inclusive education in Romania is supported by the Law on Pre-University Education no. 198/2023, which promotes equal access to education and the inclusion of students with special educational needs (SEN) within mainstream schools whenever possible. In addition, specialised support services are provided through County Centres for Educational Resources and Assistance (Centre Județene de Resurse și Asistență Educațională – CJRAE) and School Centres for Inclusive Education (CSEI), which offer counselling, educational support, and specialised interventions for students with learning difficulties or disabilities.

Teacher training related to inclusive education is addressed both in initial teacher education (ITE) and continuous professional development (CPD). In ITE programmes, future teachers typically attend courses related to psychopedagogy, inclusive education, and classroom diversity, which aim to develop competencies for working with students with different learning needs. These courses introduce concepts such as differentiated instruction, individualised education plans (IEPs), and collaborative work with specialised educational professionals.

Continuous professional development programmes also provide opportunities for teachers to develop competencies related to inclusive teaching practices. Training courses offered by Teacher Training Houses (Casa Corpului Didactic), universities, and accredited training providers often address topics such as inclusive teaching strategies, classroom differentiation, supporting students with learning difficulties, and promoting equity and participation in learning environments.

Digital technologies increasingly play a role in supporting inclusive education in Romania. Digital tools can facilitate personalised learning, provide alternative formats for learning materials, and support students with specific learning needs through assistive technologies. Examples include digital learning platforms that allow differentiated learning activities, multimedia educational resources, and accessibility tools such as text-to-speech functions or interactive learning applications. However, the integration of digital technologies for inclusive purposes depends significantly on teachers' digital competencies and access to appropriate digital infrastructure.

Despite progress in promoting inclusive education, challenges remain in ensuring that teachers are adequately prepared to support diverse learners. Teachers often report the need for additional training in differentiated instruction, the use of assistive technologies, and strategies for supporting students with complex learning difficulties. In many cases, inclusive education training remains relatively general and may not always provide practical guidance on how to integrate inclusive practices into everyday classroom activities.

From the perspective of digitally sustainable education, inclusive teaching practices also involve ensuring that digital learning environments are accessible, equitable, and responsive to diverse learners. This includes designing digital learning materials that are accessible to students with different abilities, using technology to support personalised learning pathways, and fostering inclusive classroom cultures that value diversity and participation.

5. Innovative practices and case studies

5.1 Case Study 1: *EduShift: Digital pedagogy for pre-university teachers*

Organisation/Project	Vasile Alecsandri University from Bacău, alongside the Teaching Resources Centers from Bacău, Neamț, Vaslui, Botoșani, and Brașov.
Main Dimensions Addressed	The program emphasizes Digital Pedagogy, Blended Learning strategies, Formative Digital Assessment, and the creation of Open Educational Resources (OER)
Teacher Competences Developed	Teachers acquire advanced skills in designing digital learning experiences, managing virtual classrooms, and evaluating digital content. It aligns with the DigCompEdu framework by focusing on professional engagement and empowering learners.
Learning Approach	A hybrid/blended learning model involving synchronous webinars, asynchronous module completion on a dedicated platform, and practical, project-based tasks where teachers create their own digital teaching artifacts
Transferability to DigiSET	EduShift provides a proven model for modular accredited training. It demonstrates how to move teachers from being passive users to active designers of digital learning, which is a core goal of the DigiSET framework.

EduShift is a comprehensive professional development initiative that addresses the urgent need for systematic digital training in Romania. Unlike basic ICT courses, it focuses on the *why* and *how* of technology use in the classroom.

Key features include alignment with standards, a strong OER focus, the development of a community of practice, and a strategic approach to addressing gaps in educational resources:

- The program is built around the European Framework for the Digital Competence of Educators (DigCompEdu), ensuring that the certification carries professional weight within the Romanian teacher career progression system.
- A significant portion of the training is dedicated to identifying, adapting, and creating Open Educational Resources. This directly addresses the national policy gap regarding “open pedagogical agency”.
- By using a collaborative platform, the program fosters a network of teachers who share best practices, effectively acting as a precursor to the “county-level networks of mentors” envisioned in recent sustainability strategies.
- It mitigates the reported lack of skills in digital assessment and advanced reflective practice by requiring teachers to document and reflect on their digital implementation in real-classroom scenarios. (Ministry of Education and Research, 2020)

5.2 Case Study 2: *Digital Technologies in Language Teaching*

Organisation/Project	DigiLang (Erasmus+ Project) , coordinated by an international consortium (including partners from Bulgaria, Romania, Austria, Sweden, and Turkey)
Main Dimensions Addressed	Digital technologies in language teaching, adaptive methodologies for multicultural classrooms, and the creation of interactive digital exercises.
Teacher Competences Developed	Proficiency in using digital exercise sets, mastering virtual learning environments for language acquisition, and pedagogical skills for teaching students with diverse linguistic backgrounds.
Learning Approach	Practice-based development through the use of a comprehensive Handbook, interactive lesson fragments, and test templates designed for immediate classroom application.
Transferability to DigiSET	DigiLang provides an excellent example of inclusion through technology. It demonstrates how digital tools can reduce language barriers—a key component for the 'sustainable European teacher' working in diverse environments.

The DigiLang project (2023–2026) is oriented toward supporting educators who face the challenge of teaching the national language to students who are non-native speakers, a critical aspect for ensuring educational equity.

The project's key features include alignment with standards, a strong OER focus, the cultivation of a community of practice, and a strategic approach to addressing gaps in digital education:

- The project is aligned with European linguistic and digital competence standards, providing a structured set of resources (Vocabulary and Grammar Constructs) tailored for different proficiency levels.
- The development of a digital exercise set and a collection of interactive lesson fragments that can be freely shared and adapted by teachers.
- Organizing seminars and workshops for international knowledge exchange, facilitating a support network among foreign language teachers.
- Directly targeting the lack of digital teaching materials adapted for immigrant students or those from disadvantaged backgrounds, providing concrete methodologies to facilitate their transition into mainstream classrooms. (DigiLang Project, 2026)

6. Conclusions and Implications

6.1 Competence Implications for the Digitally Sustainable Teacher

Based on the synthesis of the national policy framework, the current landscape of teacher education in Romania, and the practical evidence from the EduShift and DigiLang case studies, the following conclusions outline the emerging competence profile for the Digitally Sustainable European Teacher. The analysis reveals a significant evolution in the required professional profile of educators in Romania. Being a “digitally sustainable teacher” now transcends basic technical proficiency, requiring an integrated mastery of pedagogy, ethics, and environmental awareness. The evidence points toward four critical emerging competence areas that should inform the DigiSET framework.

6.1.1 Emerging Competence Areas

1. Pedagogical Agency in OER Creation and Adaptation

This competence shifts the teacher’s role from a passive consumer of digital content to an intentional designer. It is essential for ensuring that digital resources remain culturally relevant, accessible, and pedagogically effective over time.

Supporting Evidence

➤ Policy:

The *SMART.Edu* strategy and Law no. 198/2023 explicitly mandate the development of Open Educational Resources (OER) as a national priority. (Parliament of Romania, 2023).

➤ Practice:

The **EduShift** program demonstrates that teachers require structured training to move from basic ICT use to the “pedagogical agency” needed for remixing and sharing resources.

➤ Research:

While approximately 80% of Romanian teachers utilize digital resources, research indicates that only a small fraction (approx. 20%) engage in collaborative OER creation, largely due to a lack of knowledge regarding open licensing and copyright.

2. Critical AI Literacy and Ethical Evaluation

As AI tools enter the classroom, teachers must possess the ability to identify algorithmic bias (e.g., gender stereotypes) and evaluate the environmental costs, such as the energy consumption of computational models.

Supporting Evidence

➤ Research/Stats:

OECD TALIS 2024 data shows that while **46%** of Romanian teachers have utilized AI in their work, **58%** of those who have not yet used it report a lack of knowledge and skills as the primary barrier. (OECD, 2026)

➤ Policy Gap:

The *National AI Strategy 2024–2027* prioritizes innovation but lacks specific teacher-facing ethical guidelines or environmental impact descriptors. (Ministry of Research, Innovation and Digitalization, 2024).

3. Inclusive Design for Diverse Linguistic and Learning Needs

➤ Significance:

Technology must serve as a tool for equity. Teachers need the competence to deploy adaptive learning technologies and digital tools to support students with Special Educational Needs (SEN) or non-native language backgrounds.

Supporting Evidence

➤ Policy:

Law no. 198/2023 promotes the integration of SEN students into mainstream education through specialized support and digital infrastructure.

➤ Practice:

The **DigiLang** case study highlights that digital tools are vital for the social and linguistic integration of immigrant or disadvantaged students, ensuring no student is left behind in the digital transition.

4. Systems Thinking for Educational Sustainability

Significance

Teachers must understand the interdependencies between digital transformation and environmental impact, moving beyond teaching “about” the environment to practicing “sustainable” digital habits.

Supporting Evidence

➤ Policy:

The *National Strategy on Environmental Education and Climate Change 2023–2030* calls for the inclusion of climate competencies and environmentally responsible pedagogy in the teacher profile.

➤ Gap Analysis:

Current frameworks treat digital and sustainability competences as adjacent rather than fused; there is a clear national need for an integrated “Sustainable Digital Literacy”.

6.1.2 Underdeveloped Competences

Despite significant progress in general digital literacy, several specialized competence areas remain weakly addressed or entirely absent from formal teacher education and continuous professional development. These gaps are particularly important for the development of the Digitally Sustainable European Teacher framework because they represent the current limitations of the national system.

A primary concern is the lack of ethical AI integration and algorithmic bias awareness. While teachers are beginning to use AI tools, there is a profound lack of training regarding the ethical dimensions of these technologies, and most educators lack the competence to identify gender or cultural biases in AI outputs or to navigate the data privacy and transparency challenges inherent in adaptive learning systems. Furthermore, interdisciplinary sustainability pedagogy remains underdeveloped, as sustainability is currently treated as a thematic subject rather than a cross-curricular pedagogical approach. Teachers frequently lack the systems thinking skills required to connect digital transformation with environmental impact, which prevents them from moving beyond teaching about climate change to practicing green digital habits in the classroom.

Another significant gap involves advanced pedagogical agency in the creation of Open Educational Resources. While national policy encourages the use of digital resources, teachers' autonomy in creating, remixing, and legally licensing these materials remains limited, leaving a gap between being a user of technology and being a designer of open, sustainable digital content. Additionally, the critical evaluation of the digital ecological footprint remains a notable blind spot in the Romanian context. Competences related to managing the energy consumption of digital tools, hardware lifecycle awareness, and the sustainable management of school digital infrastructures are currently absent from teacher training standards.

Finally, the field of data-informed differentiation and inclusive AI is still in its infancy. While inclusive education is a national priority, the specific competence of using learning analytics and adaptive AI to support students with diverse linguistic or learning difficulties is not yet systematically addressed. As a result, teachers often lack the practical skills to move

from general inclusion to technology-enabled, personalized instruction that addresses the complex needs of modern classrooms.

6.2 Recommendations and Implications for DigiSET Framework Development

6.2.1 Implications for the Competence Framework

To ensure that the DigiSET Framework of Learning Outcomes remains highly relevant and transferable to the Romanian national context, the framework must bridge the gap between existing digital standards and the emerging requirements for sustainability and ethical innovation. The evidence suggests that the competence framework should prioritize the integration of digital pedagogy with environmental responsibility, moving beyond the current siloed approach where these domains are treated as adjacent but separate. A core recommendation for the framework is the inclusion of pedagogical agency as a primary competence area, focusing on the ability of teachers to act as autonomous designers of learning. This involves not only the technical skill of using tools but the sophisticated knowledge required to create, remix, and legally license Open Educational Resources that are culturally and linguistically adapted to diverse classrooms.

Furthermore, the framework should place a special emphasis on critical AI literacy as a foundational component for modern educators. This includes the development of specific skills to identify and mitigate algorithmic biases, such as gender stereotypes, and the cultivation of an ethical attitude toward data privacy and transparency in automated systems. Because national policy currently lacks detailed descriptors for the environmental impact of technology, the DigiSET framework has a unique opportunity to introduce the concept of the digital ecological footprint. This requires adding competence components that address the energy consumption of AI and digital infrastructure, fostering a professional attitude that values "green" digital habits as part of a teacher's social and environmental responsibility.

Finally, to be transferable, the framework must emphasize inclusive teaching practices that leverage adaptive technologies for students with diverse needs, including those with learning difficulties or linguistic barriers. The competence components should focus on the practical application of learning analytics and differentiated instruction, ensuring that teachers possess the skills to transform general inclusion policies into personalized classroom realities. By aligning these learning outcomes with the existing national professional standards and the DigCompEdu benchmark, the framework can facilitate a smoother integration into the Romanian continuous professional development system and support the recognition of these new skills through micro-credentials or professional credits.

6.2.2 Implications for Learning Outcomes

Upon completion of the training, teachers should be able to demonstrate a sophisticated integration of digital pedagogy and sustainability principles through concrete classroom applications. Central to these learning outcomes is the ability to design and implement learning activities that utilize artificial intelligence responsibly, ensuring that educators can critically evaluate AI-generated content for algorithmic bias and ethical transparency. Teachers should also be capable of integrating sustainability concepts across various subjects using systems thinking, moving beyond isolated environmental topics to foster a holistic understanding of how digital choices impact the global ecosystem.

Furthermore, the training will enable educators to adapt their teaching methodologies using specialized digital tools to meet the needs of diverse learners, specifically demonstrating the use of adaptive technologies and learning analytics to support students with special educational needs or linguistic barriers. A final key outcome is the ability to create, remix, and

share Open Educational Resources collaboratively within professional networks, ensuring that teachers act as autonomous pedagogical agents who contribute to a sustainable and open European educational commons. By achieving these outcomes, educators will transition from being mere consumers of technology to becoming digitally sustainable leaders capable of fostering inclusive and environmentally conscious learning environments.

6.2.3 Implications for Training Design

To facilitate the effective development of these integrated competences, the training design must move away from traditional, theoretical instruction toward a more dynamic and practice-based learning model. The evidence from the national context suggests that educators benefit most when training is grounded in real-world application, allowing them to test digital tools and sustainability strategies directly within their own classroom environments. This approach should be centered on the collaborative design of learning materials, where teachers work in peer networks to create and peer-review Open Educational Resources, fostering a sense of shared pedagogical agency and professional community.

Furthermore, the complexity of combining digital literacy with environmental ethics requires the implementation of interdisciplinary workshops that bring together teachers from different subject areas to explore systems thinking and the holistic impact of technology on society. These workshops should be complemented by structured reflective learning activities that encourage teachers to critically evaluate their own digital habits and the ethical implications of the tools they deploy, such as identifying bias in AI or assessing the energy footprint of their digital infrastructure. By providing modular, flexible learning pathways that prioritize hands-on creation and collective reflection, the training design will better align with the professional needs of Romanian educators and the overarching goals of the DigiSET framework.

6.3 Potential for National Integration

The potential for integrating the DigiSET training programme into the Romanian educational landscape relies on a strategic alignment with the current reform of the national teacher competence framework. To be successful, the programme must be positioned not as an additional burden, but as a specialized extension of the mandatory digital pedagogy requirements already established by national strategies. Integration into Initial Teacher Education could be achieved by embedding DigiSET modules into the existing university-based Departments for Teacher Training, specifically within ICT-related courses that currently lack sustainability and AI ethics descriptors. For in-service teachers, the most effective integration pathway is through the accreditation of the programme by the Ministry of Education, allowing participants to earn professional development credits required for career advancement.

The integration process is supported by several significant enablers, most notably the recent legislative shift represented by Law no. 198/2023, which provides a solid legal basis for digital transformation and continuous professional development. Furthermore, the explicit reference to European frameworks such as DigCompEdu in national standards creates a receptive environment for the DigiSET framework. The growing network of Teacher Training Houses and the success of existing digital initiatives like EduShift provide a ready-made infrastructure for large-scale dissemination. Additionally, the national priority given to the creation of Open Educational Resources and the emerging strategy on environmental education offer strong policy anchors for the project's thematic areas.

However, significant barriers remain that could impede seamless national integration, particularly the fragmented nature of current policies where digital competence and sustainability are treated as separate domains. A primary challenge is the “implementation gap”, where ambitious national strategies are often hindered by uneven digital infrastructure and varying levels of teacher readiness across different regions. Furthermore, the lack of an

existing national framework specifically addressing AI literacy and the ecological footprint of technology means that DigiSET must first overcome institutional inertia regarding these "blind spots". Finally, the rigid structure of traditional accreditation processes may act as a barrier to the adoption of flexible, modular learning pathways like micro-credentials, which are essential for the modern, digitally sustainable teacher.

6.4 Key Findings Summary

The analysis of the Romanian educational landscape reveals that the primary drivers shaping teacher competences are the recent legislative reforms, specifically Law no. 198/2023, and the SMART.Edu strategic initiative, which have shifted digital transformation from a peripheral interest to a core professional requirement. This shift is further propelled by the National Strategy on Environmental Education and Climate Change 2023–2030, which introduces the necessity for teachers to act as mediators of sustainable behavior and institutional change. Additionally, the rapid, though uneven, adoption of Artificial Intelligence in schools—as highlighted by recent data showing that nearly half of the teaching workforce is already engaging with AI—acts as a powerful catalyst for redefining professional standards.

The main competence needs identified through this research focus on the transition from technical operation to pedagogical and ethical agency. Teachers require advanced skills in creating and remixing Open Educational Resources to ensure curricular autonomy and the sustainability of digital content. There is also a critical need for AI literacy that encompasses the ability to detect algorithmic bias and manage the data privacy challenges of adaptive learning environments. Furthermore, educators must develop systems thinking to understand the environmental footprint of their digital practices, alongside specialized skills for inclusive design that support diverse linguistic and learning needs through technology.

Current gaps in the policy and training systems stem from a fragmented approach where digital pedagogy and sustainability education are treated as adjacent but separate domains. While national standards align with the DigCompEdu framework, they largely ignore the ecological costs of digitalization and the specific ethical complexities of AI in the classroom. Implementation depth remains a challenge, as initial teacher education and continuous professional development often lack structured, practical modules for OER creation, advanced learning analytics, and interdisciplinary sustainability projects. This creates a "blind spot" regarding the sustainability of digital education itself, rather than just using digital tools to teach sustainability.

The implications for the Digitally Sustainable European Teacher framework are profound, suggesting that the DigiSET project must serve as the connective tissue between these currently isolated priorities. The framework should articulate a profile that integrates digital pedagogy, ethical AI literacy, and inclusive design within a foundational layer of environmental responsibility. By focusing on practice-based learning and the collaborative design of resources, the framework can provide the operational tools necessary to move Romanian teachers from being consumers of innovation to becoming sustainable leaders in a digitally transformed European education system.

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