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SPAIN

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

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Abbreviations

AI – Artificial Intelligence

CPD – Continuous Professional Development

ITE – Initial Teacher Education

MOOC – Massive Open Online Course

OER – Open Educational Resources

ESD – Education for Sustainable Development

1. National Policy Framework for Digital and Sustainable

1.1 Digital Education Strategy and Teacher Competences

Spain's teacher-related digital education architecture is built through a combination of statutory provisions, implementation programmes and accreditation instruments rather than through a single omnibus digital education act.

Article 111 bis.6 of the consolidated Organic Law 2/2006 on Education assigns the Ministry of Education, Vocational Training and Sports responsibility for elaborating and revising the reference frameworks of digital competence that orient initial and continuing teacher training and facilitate the development of digital culture in schools and classrooms, after consultation with the autonomous communities. Spain is territorially organised into 17 autonomous communities and 2 autonomous cities (Ceuta and Melilla), each with its own government and legislative capacity. In the field of education, these autonomous communities act as the main regional-level authorities responsible for the implementation, management and adaptation of national education policies within their respective territories.

The same consolidated law also establishes that the digital platforms and resources used in schools should be selected according to quality criteria and should, where possible, facilitate adaptation, reuse and redistribution through open standards. This is directly relevant to DigiSET because it provides a legal basis for linking teacher digital competence with open educational resources and collaborative resource development (Organic Law 2/2006, BOE-A-2006-7899).

At implementation level, the most important national instrument is the updated *Marco de Referencia de la Competencia Digital Docente* (hereafter **MRCDD, Spanish Framework for Digital Teaching Competence**), published by the Resolution of 4 May 2022 of the Directorate-General for Evaluation and Territorial Cooperation of the Ministry of Education and Vocational Training, which establishes the framework as the national reference for the development, assessment and accreditation of teachers' digital competence (Ministry of Education and Vocational Training, 2022). **The MRCDD provides the operative national structure for teacher digital competence, organised in six areas and linked to progression levels A1 to C2.** Its companion instrument is the national agreement on the certification, accreditation and recognition of teacher digital competence, adopted by Resolution of 1 July 2022 of the Directorate-General for Evaluation and Territorial Cooperation of the Ministry of Education and Vocational Training, which establishes common procedures and mutual recognition rules among educational administrations for the official validation of teachers' digital competence levels (Ministry of Education and Vocational Training, 2022).

Under that agreement, the administrations are responsible for regulating accreditation procedures, and accreditation may be obtained through certified training, specific tests, official teaching qualifications, observation of performance, or evidence analysis, depending on the level concerned. For DigiSET project, this is a decisive finding: Spain already has a mature digital competence accreditation infrastructure that can anchor the digital dimension of the future DigiSET learning outcomes, especially if those outcomes are designed in a way that can be translated into recognisable MRCDD evidence (Resolution of 4 May 2022, BOE-A-2022-8042; Resolution of 1 July 2022, BOE-A-2022-11574).

The broader digital policy environment is reinforced by the *Plan de Digitalización y de Competencias Digitales del Sistema Educativo* (Digitalisation and Digital Competences Plan for the Education System, commonly referred to as Plan #DigEdu), adopted within the framework of the 2021 Territorial Cooperation Programme for the Digitalisation of the Educational Ecosystem, which sets out the strategic priorities for advancing digital transformation in education at national level (Ministry of Education and Vocational Training, 2021).

According to the official state resolution, the plan is structured around four areas:

1. educational digital competence of learners, teachers and centres
2. digitalisation of educational centres
3. creation of digital open educational resources
4. advanced digital methodologies and competences.

Within this architecture, the #CompDigEdu strand has sought to strengthen school digital plans, teacher development, and competence accreditation at scale. The policy drivers are therefore clear: digital transformation is understood as a systemic task that combines centre-level planning, teacher competence development, digital infrastructure and resource production, with Recovery and Resilience financing as an important catalyst (Resolution of 10 September 2021, BOE-A-2021-15397; Resolution of 19 December 2023, BOE-A-2023-26314; INTEF, #CompDigEdu).

The curricular layer is also relevant. In the national minimum curricula for compulsory secondary education and Bachillerato, digital competence is defined as the safe, healthy, sustainable, critical and responsible use of digital technologies for learning, work and participation in society. This formulation is significant because it already links digital competence to well-being, sustainability and critical judgement, all of which are central to the DigiSET concept of a digitally sustainable teacher. However, the legal formulation is learner-facing rather than teacher-facing. It defines the competence that learners should acquire, not a unified competence standard that teachers themselves must master beyond the MRCDD and the accreditation system (Royal Decree 217/2022, BOE-A-2022-4975; Royal Decree 243/2022, BOE-A-2022-5521).

Andalusia provides a strong example of regional operationalisation. By Order of 29 March 2021, Andalusia adopted DigCompOrg for non-university educational organisations and DigCompEdu for teachers in the Andalusian system, both public and private. This is a stronger and more explicit formal alignment with the European architecture than is visible in the national legal texts. The regional digital competence accreditation order of 11 May 2025 then linked the Andalusian procedure directly to the national MRCDD and the 2022 national agreement. In parallel, the 2025 Resolution on Código Escuela 4.0 placed computational thinking, programming, educational robotics and the good use of artificial intelligence within the Plan de Actuación Digital of schools and linked these measures to teacher coordination, support, evidence collection and accredited digital competence. For DigiSET, Andalusia shows that regional systems can move beyond abstract digital policy towards a whole-school implementation logic that is highly relevant for training transfer and impact pathways (Order of 29 March 2021, BOJA 67/2021; Order of 11 May 2025, BOJA 97/2025; Resolution of 1 August 2025, BOJA 151/2025).

In summary, Spain offers a strong baseline in teacher digital competence, digital centre planning and public digital education programmes. The main drivers shaping teachers' work are the statutory recognition of digital competence frameworks, the MRCDD accreditation structure, centre digital planning, Recovery and Resilience funded cooperation programmes, and regional implementation mechanisms such as those observed in Andalusia. From a DigiSET perspective, this baseline is highly favourable for the digital strand, but it does not by itself amount to a complete framework for sustainable digital literacy because the sustainability, AI and inclusion dimensions remain only partially integrated with the digital competence architecture.

1.2 Sustainability in Education Policy

Sustainability is firmly present in the Spanish education system, but mainly through general educational aims, curriculum requirements and sectoral vocational provisions rather than through a dedicated teacher competence standard. The consolidated Organic Law 2/2006 on Education integrates sustainable development at several levels within the education system (Organic Law 2/2006, BOE-A-2006-7899), it includes, among the system's aims:

- values related to environmental respect and sustainable development
- requires responsible consumption and sustainable development to be worked on transversally
- expressly provides that vocational education shall promote commitment to sustainable development alongside digitalisation, innovation and professional responsibility.

In formal legal terms, sustainability is therefore not peripheral in Spain's education legislation. It is embedded as a system value, a transversal pedagogical concern and a vocational objective (Organic Law 2/2006, BOE-A-2006-7899).

This general orientation becomes more concrete in the curriculum decrees. In compulsory secondary education, the national curriculum includes references to the Sustainable Development Goals, circular economy, sustainable lifestyles, responsible consumption and the social and environmental impact of technology.

In Bachillerato, the curricular language is even more explicit. The digital competence descriptor again includes sustainable use of technologies, while citizenship and science-related descriptors incorporate sustainable living, interdependence, ecodpendence, global responsibility, and commitment to climate action. Particularly relevant for DigiSET is the fact that the curriculum already contains elements of systems thinking for sustainability, especially where learners are expected to understand the interdependence between local and global actions and to adopt ecosocially responsible habits. However, these expectations are defined at the level of student learning outcomes and are not systematically translated into an officially codified framework of sustainability competences for teachers. (Royal Decree 217/2022, BOE-A-2022-4975; Royal Decree 243/2022, BOE-A-2022-5521).

Vocational education is especially relevant to DigiSET because the project targets institutions operating up to EQF level 5. Organic Law 3/2022 on the organisation and integration of Vocational Training requires the system to integrate competences linked to digitalisation, innovation and commitment to sustainable development. It also allows the competent administrations to create optional modules that deepen transversal competences

such as sector-applied digitalisation and sector-applied sustainable development. This is important because it shows that, in the Spanish VET reform logic, digitalisation and sustainability are already recognised as strategic transversal axes. However, **the law does not yet translate this into a dedicated, nationally standardised teacher competence framework that combines both dimensions in the manner envisaged by DigiSET** (Organic Law 3/2022, BOE-A-2022-5139).

At regional level, Andalusia complements the national baseline through programme-based sustainability implementation. The official *Programa para la Innovación y la Mejora del Aprendizaje* (**Programme for Innovation and the Improvement of Learning, hereafter CIMA**) is presented by the Regional Ministry of Educational Development and Vocational Training of the Government of Andalusia as an instrument intended to place the Andalusian education system on a path aligned with global objectives for a more sustainable and inclusive society through education. For the 2024/2025 academic year, the programme was formally convened by Resolution of 19 July 2024 of the competent regional authority (Junta de Andalucía, 2024, Programa CIMA, Junta de Andalucía; Order of 30 May 2023 for ESO, BOJA 104/2023; Order of 30 May 2023 for Bachillerato, BOJA 104/2023).

In parallel, the Andalusian curriculum orders for compulsory secondary education and Bachillerato regulate attention to diversity and individual differences within an inclusive logic and thus reinforce the social dimension of sustainability, understood not only environmentally but also in terms of equity, participation and educational justice. This matters for DigiSET because the project's sustainable teacher profile is not limited to environmental content; it also includes inclusion, citizenship and resilient educational ecosystems.

The connection between sustainability policy and teacher training is, however, weaker than the curricular and value-based connection. The official sources reviewed do not evidence a national teacher sustainability accreditation mechanism equivalent to the MRCDD in the digital field. Nor do they evidence a single official national framework that explicitly integrates DigCompEdu, GreenComp and LifeComp into one teacher professional standard. Sustainability is present in what teachers are expected to teach and enable. It is far less explicit in the formal standards that structure how teachers themselves are trained, accredited and recognised.

This asymmetry is one of the main reasons why DigiSET remains strategically relevant in Spain: the policy environment already legitimises sustainability in education, but it does not yet provide a consolidated teacher competence architecture for sustainable digital literacy.

1.3 AI in Education Policy

As of March 2026, no official primary source reviewed establishes a comprehensive, binding Spanish teacher competence framework specifically devoted to artificial intelligence across non-university education. The Spanish situation is therefore best described as one of emerging, partial and sector-specific regulation, combined with official guidance and implementation initiatives. This is a crucial audit finding. AI is clearly entering the official educational agenda, but the architecture remains less mature and less normatively consolidated than the architecture for teacher digital competence in general.

The strongest statutory reference located in the official corpus appears in the vocational training reform. Organic Law 3/2022 requires the Government to approve, in collaboration with the technology sector, a plan of competences in digitalisation and artificial intelligence in vocational training, including common transversal curriculum contents for all learners in the vocational training system. The same provision also states that the Government will promote the recognition of teacher digital competence for all vocational training teachers and trainers within the MRCDD. This is highly relevant to DigiSET because it indicates that AI is not marginal in the Spanish VET reform agenda. Nevertheless, **the law does not itself establish a completed teacher AI competence framework, nor does it define detailed competences for ethical AI use, adaptive learning, or OER production using AI** (Organic Law 3/2022, BOE-A-2022-5139).

In the absence of a dedicated binding framework, official guidance has become particularly important. The *Instituto Nacional de Tecnologías Educativas y de Formación del Profesorado* (hereafter INTEF¹, **National Institute of Educational Technologies and Teacher Training**), a unit of the Ministry of Education, Vocational Training and Sports responsible for digital integration and teacher training in non-university education, published its *Guide on the Use of Artificial Intelligence in Education* in 2024 ²and, in 2025, the document *Orientaciones para la integración de la IA en la formación docente* ³(Guidance for the Integration of AI in Teacher Training), updated in March 2026 (INTEF, 2024; INTEF, 2026).

The 2024 guide explicitly addresses teachers, learners and educational administration, discusses challenges and limitations, and includes ethical questions such as algorithmic bias, deepfakes, technological dependence and the need for appropriate regulation. The 2025 guidance document states that AI integration in teacher training must be effective and ethical, and frames teacher training needs in terms of principles, programme design, documentation and practical support. These are significant advances, but they remain guidance documents, not a formal teacher competence standard approved in BOE for the whole non-university system.

At regional level, Andalusia is moving AI from discourse into school implementation, although within a limited stage scope. The 2025 Resolution on measures to boost digital competence in publicly funded schools, issued in the framework of Código Escuela 4.0, presents educational robotics, computational thinking, programming and the good use of artificial intelligence as central components of the current digital transformation agenda for second-cycle early childhood education, primary education and compulsory secondary education. The related eAprendizaje portal⁴ further links these measures to teacher support, coordination roles, training, evidence collection and centre digital planning.

¹ <https://intef.es>

² https://code.intef.es/wp-content/uploads/2025/11/Guide-on-the-use-of-artificial-intelligence-in-education_INTEF_2024.pdf

³ https://intef.es/wp-content/uploads/2025/06/Orientaciones-para-la-integracion-de-la-IA-en-la-formacion-docente_Actualizacion_2026.pdf

⁴ <https://www.juntadeandalucia.es/educacion/eaprendizaje>

This is institutionally relevant, but it is not yet a full teacher AI competence framework for all stages within the present DigiSET scope, because Bachillerato and higher vocational education are not the core target stages of these specific Andalusian AI implementation measures (Resolution of 1 August 2025, BOJA 151/2025; eAprendizaje, Digitalisation and Artificial Intelligence).

Two gaps are particularly important for DigiSET. First, although ethical concerns and algorithmic bias appear in official guidance, no reviewed official source established a national, accredited teacher competence model for bias-sensitive, gender-aware AI pedagogy. Second, no reviewed official primary source explicitly addressed the environmental footprint of AI within teacher training or teacher competence regulation. For a project like DigiSET, whose rationale combines digital transformation and sustainability, this is a material gap. Spain is building capacity for AI literacy and educational use, but the sustainability and gender dimensions of AI remain under-specified in the formal teacher policy architecture.

1.4. Open Educational Resources (OER) in Education Policy

Spain has a significant official OER implementation ecosystem, but the official sources reviewed do not evidence a single stand-alone national OER law or a single national strategy explicitly framed as the implementation of the UNESCO 2019 Recommendation on OER. The Spanish situation is therefore characterised by strong infrastructure and programme support for OER, combined with a more dispersed legal basis.

The principal legal basis comes from the consolidated Organic Law 2/2006 on Education, which provides that digital platforms and resources used by the education system should, where possible, apply open standards and facilitate adaptation, reuse and redistribution. Although the law does not use the UNESCO terminology of OER in a detailed way, it clearly supports the technical and legal conditions required for open educational reuse. This is reinforced by the state Plan de Digitalización y de Competencias Digitales del Sistema Educativo, whose official structure includes a specific line devoted to the creation of digital open educational resources. From a DigiSET perspective, that is highly relevant because it shows that OER creation is not a marginal add-on but part of the official state digital education architecture (Organic Law 2/2006, BOE-A-2006-7899; Resolution of 10 September 2021, BOE-A-2021-15397; Resolution of 19 December 2023, BOE-A-2023-26314).

At operational level, the most important state-level instruments are hosted or supported by INTEF and the *Centro Nacional de Desarrollo Curricular en Sistemas No Propietarios* (hereafter **CEDEC⁵, National Centre for Curriculum Development in Non-Proprietary Systems**), a body under the Ministry of Education, Vocational Training and Sports.

INTEF's official resources portal presents Procomún⁶ as a network of open educational resources and multimedia elements where objects can be searched, viewed, downloaded and shared in standard formats and under open-use licences. The same official portal highlights CEDEC materials as open resources intended to support methodological and

⁵ <https://cedec.intef.es/>

⁶ <https://procomun.intef.es/>

digital transformation. CEDEC's Proyecto EDIA provides a bank of curricular OER for secondary education, Bachillerato and vocational training, expressly linked to active methodologies and the development of digital competence, and makes source files available so that teachers can download, use and modify the resources through free authoring software such as eXeLearning. These features correspond closely to DigiSET's emphasis on teacher agency in creating, adapting and sharing OER rather than merely consuming digital materials (INTEF, Resources portal; CEDEC, Proyecto EDIA).

Under the official-source protocol adopted for this report, there is no single, nationwide fund dedicated to OER, nor any specific state instrument formally recognized as Spain's mechanism for implementing the UNESCO 2019 Recommendation on OER. The UNESCO recommendation is internationally relevant and should inform DigiSET's framework logic, but the official Spanish sources reviewed here do not evidence an explicit legal transposition instrument using that formulation. Consequently, the conclusion is that **Spain has strong public OER repositories, authoring tools and programme support, but the formal policy framing remains more implicit and dispersed than the digital competence accreditation architecture.**

1.5 Gap Analysis: Sustainable Digital Literacy

The core policy gap in Spain is not the absence of digital policy, sustainability policy, inclusion policy, or even official AI guidance. The gap lies in their incomplete integration at teacher-competence level. Spain possesses a mature and legally grounded digital competence architecture for teachers, centred on the MRCDD and its accreditation procedures. It also possesses a strong curricular and value-based sustainability agenda, reinforced by the vocational training reform and by regional initiatives such as Andalusia's Programa CIMA. It additionally shows official movement on AI, especially through INTEF guidance and vocational training policy. Yet these three strands are not fused into a single, explicit, formally recognised competence model for teachers comparable to the "Digitally Sustainable European Teacher" profile envisaged by DigiSET.

More specifically, four disconnections are visible. First, sustainability is embedded mainly in learner curricula and educational aims, whereas digital competence is embedded mainly in teacher accreditation and centre digital transformation. Second, AI has entered official discourse and implementation, but not yet through a complete teacher competence standard covering ethics, bias, adaptive learning, data governance and sustainability. Third, OER infrastructure is strong, but OER creation and open licensing are not systematically formalised as accredited teacher competences. Fourth, no official primary source reviewed evidenced a formal, integrated national adoption of DigCompEdu, GreenComp and LifeComp as one combined teacher architecture. Andalusia partially reduces the first disconnection by directly adopting DigCompEdu and integrating digital planning into school practice, but it does not eliminate the broader national gap.

For DigiSET project, this gap is strategically productive. It means that the project should not simply duplicate existing Spanish digital competence provision. Rather, it should add the missing integrative layer: connecting teacher digital pedagogy to sustainability-oriented decision-making, inclusive design, responsible and bias-aware AI use, systems thinking, and OER authorship. In audit terms, the Spanish evidence therefore supports a clear conclusion. Existing frameworks do not yet address sustainable digital literacy for teachers as a unified

professional field. They address its component parts unevenly and through different instruments.

2. Teacher competence frameworks in use

2.1 National teacher competence standards

Spain does not currently operate with one single overarching statutory teacher competence standards framework covering the full professional profile of teachers in compulsory secondary education, Bachillerato and vocational education. Instead, the relevant standards are distributed across teacher qualification rules, curriculum obligations, professional development regulations, and the specific digital competence architecture built around the MRCDD. For institutions situated within the present DigiSET scope, the statutory entry and initial preparation requirements derive principally from the consolidated Organic Law 2/2006 on Education, the qualification order for the habilitating master's degree, and the Royal Decree regulating conditions of teacher formation and secondary teaching specialities. These texts define teaching as a regulated profession and require pedagogical and didactic training through the official secondary teacher education master's degree or equivalent routes where applicable (Organic Law 2/2006, BOE-A-2006-7899; Order ECI/3858/2007, BOE-A-2007-22450; Royal Decree 1834/2008, BOE-A-2008-19174).

The official competences required by the habilitating master's degree are broad and professionally significant. They include, among other elements, the capacity to plan, develop and evaluate teaching and learning; attend to student diversity; participate in collective curriculum planning; promote values, citizenship and equality; select and elaborate educational materials; integrate communication in oral, printed, audiovisual, digital and multimedia formats; and apply educational innovation and research. In other words, the national qualification framework for secondary teachers already includes digital, inclusive and innovation-related elements, but it does so through general professional competences rather than through a dedicated sustainable digital literacy standard. This is an important distinction for DigiSET. Spain already expects teachers to handle digital and multimedia information and to innovate pedagogically, but it does not yet articulate these expectations in a unified competence architecture combining digital transformation, sustainability, AI and OER (Order ECI/3858/2007, BOE-A-2007-22450).

Digital competences occupy a much more explicit position in the MRCDD than in the general teacher qualification regulations. The MRCDD is therefore the most operational and most auditable teacher competence standard currently in use in Spain for the digital domain. **It structures competence into six areas, defines progression levels from A1 to C2, and is directly linked to official accreditation procedures.** For DigiSET, this has two implications. First, any Spanish-facing competence framework that ignores the MRCDD would risk weak transferability. Second, the MRCDD provides a strong anchor for the digital dimension of the future DigiSET learning outcomes, but it does not by itself cover the full GreenComp and LifeComp dimensions that DigiSET intends to combine with DigCompEdu-derived thinking (Resolution of 4 May 2022, BOE-A-2022-8042; Resolution of 1 July 2022, BOE-A-2022-11574).

Autonomous Community of Andalusia adds an important formal layer. The Order of 29 March 2021 explicitly adopts DigCompEdu for teachers and DigCompOrg for schools in the Andalusian non-university system. The Order of 11 May 2025 then regulates the accreditation of teacher digital competence in Andalusia with direct reference to the national MRCDD and to the common state agreement. As a result, the digital part of the teacher competence architecture is more visible, more coherent and more operational in Andalusia than the sustainability or AI parts. This asymmetry again confirms the main policy pattern observed throughout the report: digital competence is the best-developed formal teacher competence field, while sustainability and AI remain more fragmented and less codified.

From the perspective of DigiSET, the key conclusion is that Spain already defines teachers in the EQF 2 to 5 context as regulated professionals expected to combine pedagogical knowledge, curriculum implementation, inclusion, innovation and continuing professional development. However, the system formalises the digital dimension much more clearly than the sustainability, AI and OER dimensions. **DigiSET therefore does not need to invent a new professional identity from scratch in Spain. It needs to articulate an integrative competence layer** that builds on the existing professional profile while connecting domains that are currently regulated unevenly.

2.2 Adoption of European frameworks

Spain's formal pattern of European-framework uptake is selective and asymmetric. The digital field is clearly the most advanced. Official INTEF material explicitly states that the MRCDD is the Spanish adaptation of DigCompEdu adjusted to the stages of teacher professional development. The national accreditation system is then built around the MRCDD rather than around DigCompEdu in its original JRC form. Andalusia provides an even more explicit example of uptake because the regional Order of 29 March 2021 directly adopts DigCompEdu for teachers and DigCompOrg for educational organisations. This means that, for DigiSET, DigCompEdu is not external to the Spanish context. It is already embedded, either indirectly through the MRCDD or directly in Andalusian regulation (INTEF, Marco de Referencia de la Competencia Digital Docente; Order of 29 March 2021, BOJA 67/2021).

By contrast, GreenComp and LifeComp are not evidenced in the reviewed official primary sources as formally adopted teacher frameworks in Spain or Andalusia. Their policy logic is present. Sustainability, inclusion, citizenship, well-being, reflection, responsibility and learning-to-learn clearly appear in Spanish legislation and curricula. However, there is a decisive difference between thematic affinity and formal framework adoption. Under an audit standard, it would not be correct to state that Spain has adopted GreenComp or LifeComp as teacher competence frameworks on the basis of the official sources reviewed here. The same caution applies to EntreComp and to the UNESCO AI Competency Framework for Teachers. Entrepreneurship and AI-related content are visible in policy and practice, but formal framework adoption was not verified in the restricted official corpus.

Framework	Adoption Level	Notes
DigCompEdu (2017)	Recommended	Spain uses the MRCDD as the national operative framework for teacher digital competence. Official INTEF sources describe the MRCDD as the Spanish adaptation of DigCompEdu. Andalusia goes further and directly adopts DigCompEdu for teachers through the Order of 29 March 2021.
GreenComp (2022)	Not used	No formal national or Andalusian teacher accreditation or regulatory adoption as a teacher competence standard was verified in the reviewed official primary sources. There is policy affinity through sustainability curricula and EU guidance, but not formal teacher-framework adoption.
LifeComp (2020)	Not used	No formal adoption as an official teacher competence standard was verified. There is thematic overlap with personal, social, reflective and learning-to-learn dimensions already present in general teacher preparation and school curricula.
EntreComp (2016)	Not used	Entrepreneurship and initiative appear in Spanish curricula and vocational training policy, but no formal adoption of EntreComp as a teacher competence framework was verified in the reviewed official sources.
AI Competence Framework for Teachers (UNESCO, 2024)	Not used	Official INTEF guidance on AI exists, but no formal national or Andalusian adoption of the UNESCO AI Competency Framework for Teachers as a regulatory teacher standard was verified in the official sources reviewed.

Table: Overview of Adoption Level in Spain

2.3 Gaps in current competence frameworks

The most highlighted competence field in the current Spanish framework environment is teacher digital competence understood as a structured, progressive and accreditable professional domain. This is the clearest area of maturity because it combines legal mandate, national reference framework, official accreditation, centre planning, public programmes, recognised training pathways, and regional implementation. In practical terms, this means that Spain is well positioned for those DigiSET competences that concern professional digital engagement, digital resources, pedagogically informed uses of technology, and the documentation of professional digital growth.

The least developed areas, from the perspective of the Digitally Sustainable European Teacher, are the integrative and cross-framework competences. The reviewed official sources do not provide a formally consolidated teacher standard for: the pedagogical integration of sustainability and digitalisation; systems thinking as a teacher competence; gender-unbiased and critically evaluated AI use; the environmental implications of digital and AI choices or OER creation as a structured, certifiable professional competence in its own right. **Spain therefore exhibits a competence-fragmentation pattern.** Digital competence is highly formalised. Sustainability and inclusion are strongly present in curricula and educational purposes. AI is emergent and guidance-led.

But the precise synthesis of these domains, which DigiSET seeks to construct, is not yet present as a coherent official competence framework.

For DigiSET project, this gap has a strategic consequence. The Spanish framework does not need to be replaced. It needs to be connected. The future DigiSET framework can add value precisely by building bridges between the existing digital competence architecture and the less formalised sustainability, inclusion and AI dimensions. In Spain, the strongest entry point for such integration is the already recognised digital competence system. The weakest points, and therefore the most valuable areas for DigiSET innovation, are the competences that require teachers to combine digital judgement, sustainability reasoning, inclusion, OER authorship and AI ethics within a single pedagogical repertoire.

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

3.1 Initial Teacher Education (ITE) provision

Initial teacher education for the Spanish stages most relevant to DigiSET is formally structured but not uniformly specialised in sustainable digital literacy. At national level, the key regulated route is the official master's degree qualifying for the teaching professions in secondary education, Bachillerato, vocational education and language education. The most important official reference remains Order ECI/3858/2007, complemented by Royal Decree 1834/2008, which together define the qualifying route and the professional preparation expected for these teaching contexts.

Within that formal route, digital pedagogy has a clear legal basis. The qualifying competences include the use of oral, print, audiovisual, digital and multimedia information in teaching and learning processes, as well as the design and application of methodologies adapted to student diversity. This means that, under the national regulatory framework, digital pedagogy is not optional in principle. It is part of the formal preparation of future teachers. However, the reviewed official sources do not evidence a nationally standardised, stand-alone pre-service requirement for sustainable digital literacy as an integrated field, nor a compulsory national ITE module specifically devoted to AI pedagogy or OER creation across all providers.

The same distinction applies to sustainability. Sustainability is strongly embedded in the wider education system, especially through Organic Law 2/2006, the curriculum decrees and the vocational education reform, but the reviewed official qualification rules for the teaching master's degree do not codify sustainability education as a uniformly identifiable compulsory ITE component for the relevant stages. The result is an asymmetry that matters for DigiSET: future teachers enter the profession through a regulated route that clearly includes digital and inclusive dimensions, but the integration of sustainability, AI and OER depends more heavily on provider-level curricular decisions than on a nationally standardised pre-service obligation.

In Andalusia, Decree 93/2013 adds a relevant governance layer because it regulates both initial and continuing teacher education and explicitly frames collaboration between the educational administration and universities.

This strengthens the regional infrastructure for linking university preparation, school needs and professional development. Even so, the reviewed official Andalusian sources do not establish a separate regional ITE competence matrix for sustainable digital literacy, AI pedagogy or OER creation. The most prudent conclusion is therefore that Spain has a formal and regulated ITE route, with a visible place for digital pedagogy, but without a fully integrated pre-service architecture addressing the full set of competences envisaged by DigiSET. (Consejería de Educación, Cultura y Deporte, 2013).

Aspect	Adoption Level	Notes
Education for Sustainable Development	Not available	No nationally standardised stand-alone ITE requirement for the reviewed stages could be verified in the official primary sources. Sustainability is present in the wider education system, but not as a uniform compulsory ITE component in the reviewed qualification rules.
Digital Pedagogy	Mandatory	Order ECI/3858/2007 explicitly requires competences linked to educational planning, resource use, innovation, and the use of oral, print, audiovisual, digital and multimedia information. This provides a formal mandatory basis within the qualifying master's degree.
AI in education	Not available	No official primary source reviewed establishes a nationally standardised compulsory ITE component specifically devoted to AI literacy, AI pedagogy or AI ethics for teachers in the relevant stages.
OER creation	Not available	No official primary source reviewed establishes a nationally standardised compulsory ITE component specifically focused on the creation, adaptation or open licensing of OER.

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

3.2 Continuous Professional Development (CPD) opportunities

For in-service teachers, Spain has a much more developed architecture than for pre-service integration of DigiSET-related themes. The consolidated Organic Law 2/2006 on Education establishes continuing professional development as both a right and an obligation for teachers and requires public authorities to promote professional development linked to pedagogical, scientific, didactic, digital and linguistic updating. This gives CPD a strong legal foundation. In the digital field, the national ecosystem is especially developed through INTEF, the #CompDigEdu line of action, the MRCDD accreditation system, and territorial programmes such as #DigEdu and Código Escuela 4.0. These instruments create a structured route through which teachers can train, evidence and obtain recognition of digital competence growth (Organic Law 2/2006, arts. 102 and 111 bis; Resolution of 10 September 2021; Resolution of 19 December 2023; Resolution of 1 July 2022).

Sustainability-related CPD also exists within the reviewed official ecosystem, but it is less standardised as a single competence track. Official Andalusian policy is relevant here because the III Andalusian Plan for Continuing Teacher Education and the subsequent regional training system regulated by Decree 93/2013 are explicitly school-improvement oriented, collaborative and practice-based, and Andalusia's Programa CIMA provides an official framework for school-level work on sustainability, inclusion and social transformation. This creates clear opportunities for DigiSET-type integration, even though the reviewed sources do not evidence a national teacher sustainability accreditation equivalent to the MRCDD.

AI in education is beginning to enter CPD through official guidance and territorial implementation. At national level, INTEF has published official guidance on the use of AI in education and, in 2025, specific orientations for integrating AI into teacher education. At regional level, Andalusia's digital competence ecosystem and the 2025 Código Escuela 4.0 measures explicitly mention the good use of AI. These are important signals, but they remain indicative of an emerging field rather than a fully consolidated compulsory CPD domain.

OER creation is also present in the official CPD environment, above all through INTEF, Procomun, CEDEC, Proyecto EDIA and the eXeLearning ecosystem. Yet the official primary sources reviewed show these mainly as supported and available professional learning resources rather than as a mandatory teacher development requirement. In summary, Spain offers a strong optional and incentive-rich CPD environment for digital pedagogy, and a growing but less standardised CPD environment for sustainability, AI and OER creation.

Aspect	Adoption Level	Notes
Education for Sustainable Development	Optionally	Official opportunities can be verified through regional teacher-training planning and school programmes such as Programa CIMA, but no universal compulsory CPD track equivalent to MRCDD was identified.
Digital Pedagogy	Optionally	This is the strongest CPD field. It is heavily supported through INTEF, MRCDD accreditation, #CompDigEdu, #DigEdu, Código Escuela 4.0 and regional training systems. It is not, however, a universally mandatory annual CPD obligation for every teacher.
AI in education	Optionally	Official guidance and implementation measures exist, especially through INTEF and recent regional digital initiatives, but no reviewed source evidences a general compulsory AI CPD requirement for all teachers.
OER creation	Optionally	Official repositories, tools and training resources are available through INTEF, CEDEC and related programmes, but the reviewed sources do not establish OER creation as a compulsory CPD component.

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

3.3 Certification and recognition

The clearest certification and recognition mechanism in the Spanish context concerns digital competence. The Resolution of 1 July 2022 of the Directorate-General for Evaluation and Territorial Cooperation of the Ministry of Education and Vocational Training publishes the Agreement of the Sectoral Conference on Education on the certification, accreditation and recognition of teacher digital competence and establishes a common national framework for levels A1 to C2 (Ministry of Education and Vocational Training, 2022).

The system is built on the MRCDD and is designed to ensure mutual recognition across education administrations. The same agreement requires each administration to regulate its own specific procedures within that common national architecture. This is highly relevant for DigiSET because it means that digital competence development already has a recognised evidencing and portability logic in Spain.

Andalusia has operationalised this architecture through the Order of 11 May 2025 regulating the regional procedure for accrediting teacher digital competence. That order recognises several pathways, including certified training, specific tests, official teacher qualifications, observation of professional performance, and the analysis of evidence. From a DigiSET perspective, this is a major strategic enabler because it shows that Spain, and specifically Andalusia, already accept evidence-based recognition formats that go beyond simple course attendance.

By contrast, no equivalent official certification architecture was verified in the reviewed primary sources for teacher sustainability competence, systems thinking, ethical AI pedagogy, or OER creation as distinct professional fields. These domains may appear in courses, programmes or school projects, but not in a national accreditation mechanism comparable to the MRCDD. This asymmetry is one of the main findings of the report.

As regards micro-credentials, a cautious interpretation is required. The review of official primary sources does not provide evidence of a dedicated national policy, framework or structured approach specifically addressing teacher-focused micro-credentials in non-university education in Spain, particularly in relation to the four thematic areas covered by DigiSET. What can be stated is that the structure of the MRCDD, with progressive levels, evidence-based recognition and administrative portability, offers an institutional logic that could facilitate future modular recognition or partial certification of DigiSET-related competences if competent authorities chose to develop it.

3.4 Gaps in current ITE/CDP

The most supported competence-development field in Spain is digital pedagogy understood in a broad professional sense: pedagogically grounded use of technology, digital resource selection and creation, centre digital planning, evidence of progression, and formal accreditation. This area is strong because it is simultaneously embedded in legislation, in national and regional programmes, in official training provision and in certification mechanisms.

The least supported fields are the genuinely integrative ones that DigiSET is designed to strengthen. The reviewed official sources do not evidence an equivalent structured pathway for sustainability competences in teacher accreditation; they do not evidence a nationally standardised teacher AI competence pathway with clear expected outcomes; and they do not evidence OER creation as a general certified professional requirement.

As a result, initial teacher education and continuing professional development in Spain currently support specific components of the competence framework envisaged by DigiSET, but not its full scope as a coherent professional formation pathway. This gap is particularly significant for institutions operating at the levels of Compulsory Secondary Education (ESO), Basic Vocational Education, Intermediate Vocational Education and Training, Bachillerato and Higher Vocational Education and Training. These stages already operate within a framework that values digital competence, inclusion, lifelong learning, sustainability-related curricular goals and, increasingly, AI awareness. What is missing is a professionally integrated teacher pathway that brings these elements together with sufficient conceptual coherence, evidencing mechanisms and transferability across providers and territories.

4. Analysis of the Four DigiSET Thematic Areas

4.1 Gender-unbiased AI in teaching

The reviewed official sources show that Spain recognises equality and non-discrimination as transversal educational principles, and that the official AI guidance now raises bias-related concerns. However, no official primary source reviewed establishes a nationally binding teacher competence domain specifically called gender-unbiased AI in teaching. The strongest evidence is therefore indirect but relevant.

First, equality between women and men is a constitutional and statutory principle reflected throughout the education system and in Andalusian curricular implementation. Second, the 2024 INTEF guide on the use of AI in education explicitly addresses ethical risks such as algorithmic bias, misinformation, deepfakes and the critical evaluation of AI outputs. Third, Andalusian curricular and inclusion regulations require teaching practice to attend to equality, diversity and inclusive design. Taken together, these elements create a policy environment in which gender-unbiased AI is compatible with official expectations, but they do not yet amount to a codified teacher standard.

For DigiSET, this area should therefore be framed as an emergent teaching domain in which teachers need to learn how to identify stereotyped or biased outputs, review prompts and AI-generated resources critically, avoid discriminatory representations in classroom materials, and apply equality principles when adapting or creating OER with AI support. This interpretation is fully consistent with the official Spanish direction of travel, but it also reflects the current absence of a complete formal standard (Government of Spain, 2006; INTEF, 2024, 2025).

4.2 Systems thinking for sustainability in education

Systems thinking for sustainability is more strongly embedded in the normative and curricular framework than in the regulation of teacher competences. The most explicit support is found at European level. In particular, the Council Recommendation⁷ of 16 June 2022 on learning for the green transition and sustainable development, adopted by the Council of the European Union, calls for the integration of sustainability into both initial teacher education and continuing professional development (Council of the European Union, 2022).

In Spain, the national curricula for Compulsory Secondary Education (ESO) and Bachillerato incorporate sustainability-related competences, responsible consumption and environmental awareness, and, in the case of Bachillerato, perspectives connected to interdependence and eco-social responsibility (Ministry of Education and Vocational Training, 2022a; 2022b).

The vocational education reform also links training provision to sustainable development and enables sector-relevant sustainability learning within vocational programmes (Organic Law 3/2022, BOE-A-2022-4975).

In Andalusia, *Programa CIMA* and the regional curricula reinforce school-level work on sustainability, inclusion and contextualised learning (Junta de Andalucía, n.d.; Regional Ministry of Educational Development and Vocational Training, 2022a; 2022b). Nevertheless, no reviewed official primary source evidences a formal teacher standard that defines systems thinking as a structured professional competence with descriptors, progression levels and recognition routes comparable to the MRCDD (Ministry of Education and Vocational Training, 2022).

The consequence is that systems thinking is present mainly as a pedagogical and curricular expectation rather than as an accredited teacher competence. DigiSET can therefore add value by converting this diffuse policy expectation into an operational teacher-competence area: understanding interdependencies, connecting digital and ecological transitions, designing interdisciplinary learning situations, and reflecting on the systemic effects of technological choices in education.

4.3 AI for adaptive learning

AI for adaptive learning is one of the most forward-looking DigiSET areas, and the reviewed Spanish official sources show a clear but still developing policy environment. At European level, the Digital Education Action Plan and related documents already frame AI and learning analytics as tools that can support assessment, inclusion and learner support (European Commission, 2021).

In Spain, the most explicit statutory reference in the reviewed national sources is the additional provision of Organic Law 3/2022 on vocational education, which requires a national plan on competences in digitalisation and artificial intelligence for vocational education (Organic Law 3/2022, BOE-A-2022-4975).

⁷ Council of the European Union. *Council Recommendation of 16 June 2022 on learning for the green transition and sustainable development* (2022/C 243/01). Available at: [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32022H0627\(01\)](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32022H0627(01))

At implementation level, INTEF's AI guidance and the 2025 orientations for integrating AI into teacher education provide official pedagogical framing, including ethical, critical and didactic considerations (INTEF, 2024; INTEF, 2026).

In Andalusia, the 2025 measures under Código Escuela 4.0 and the eAprendizaje ecosystem explicitly mention AI within school digital transformation. This confirms that AI is entering school-level practice and teacher support structures. However, the reviewed primary sources do not evidence a binding national methodology specifying how teachers in the EQF 2 to 5 educational segments should deploy AI for adaptive learning, how impact should be assessed, or how safeguards should be operationalised in all cases.

Therefore, the Spanish position can be characterised as high policy relevance but moderate formal consolidation. DigiSET should treat AI for adaptive learning as an area where teachers need strong professional judgement: selecting appropriate tools, preserving privacy and fairness, avoiding over-automation, documenting decisions, and ensuring that personalisation does not weaken inclusion, teacher agency or curricular coherence.

4.4 Inclusive teaching practices and learning difficulties

This is the DigiSET thematic area with the strongest and most mature policy grounding in the reviewed Spanish and Andalusian sources. Inclusion, attention to diversity and support for learners with specific educational needs are deeply embedded in the Spanish education system. The consolidated Organic Law 2/2006, as amended, is structured around inclusive education principles, and the national and Andalusian curriculum regulations for ESO and Bachillerato explicitly refer to universal design for learning, accessibility, personalised support and attention to differences. Andalusia's 2023 curricular orders are especially explicit in grounding diversity measures in inclusive education and universal access.

Digital dimensions are also present. Official national policy recognises the role of technology in supporting personalised learning, accessibility and educational response to diverse needs. The MRCDD includes competence areas directly relevant to inclusive digital practice, particularly in the areas of teaching and learning, assessment, and empowering learners. In parallel, AI-related official guidance increasingly frames technology as a potential support for adaptation, while also warning against ethical and quality risks.

For DigiSET, this means that inclusive digital teaching is not starting from zero in Spain. There is already a strong legal and pedagogical basis. What remains underdeveloped is the integrated operationalisation of inclusive teaching, digital competence, OER creation and critical AI use within one coherent training pathway for teachers working in the relevant EQF 2 to 5 contexts.

5. Innovative practices and case studies

The following two official practice examples were selected because they are documented through official institutional sources and illustrate transferable elements relevant to DigiSET's competence architecture. They are not presented as exhaustive national best practice, but as useful cases that show how digital resource creation, sustainability-related pedagogies, inclusion and emerging AI-related or digital-transformation logics are being operationalised within the Spanish context.

5.1 Case Study 1: CEDEC Proyecto EDIA

Organisation/Project	Centre for the Innovation and Development of Distance Education (CEDEC), under INTEF. Proyecto EDIA and associated open educational resources ecosystem.
Main Dimensions Addressed	Open educational resources, active methodologies, digital resource design, curricular integration, accessibility, digital citizenship, and cross-curricular work with social and ethical dimensions.
Teacher Competences Developed	Selection, adaptation and creation of open resources; pedagogically grounded digital design; classroom implementation of active methodologies; collaborative work; reflective improvement of teaching materials; and inclusive use of digital resources.
Learning Approach	Repository-based professional learning combined with ready-to-adapt materials, downloadable editable formats, methodological guidance, and school-level implementation through open digital authoring tools such as eXeLearning.
Transferability to DigiSET	High. The case provides a directly relevant model for OER-based teacher development, modular adaptation, reuse, collaborative improvement and classroom testing. It is especially useful for DigiSET's ambition to train teachers as co-creators and adapters of educational resources rather than only as users.

The **EDIA Project**⁸ (*Open Educational Resources for Digital, Innovative and Open Teaching Project*) is developed by CEDEC, the National Centre for Curriculum Development in Non-Proprietary Systems, an institution under INTEF and the Ministry of Education, Vocational Training and Sports. The project provides a repository of curriculum-referenced Open Educational Resources (OER) for Compulsory Secondary Education, Bachillerato and Vocational Education and Training, accessible through the official CEDEC portal and the INTEF Procomún repository. All resources are published under the Creative Commons CC BY-SA licence, which expressly authorises their use, adaptation and redistribution, provided that attribution is maintained and derivative works are shared under the same licence.

The pedagogical dimension of the project extends beyond the mere provision of content. Resources may be downloaded in EPUB3 format or as editable *.elp* source files (eXeLearning project files that allow full modification of content and structure), enabling teachers to adapt, shorten or expand them through the open-source authoring tool eXeLearning. This technical model positions teachers as active co-creators: the project protocol defines four key stages, create, experiment, review and disseminate, as an open process involving both resource developers and teachers who implement and analyse them in classroom practice, generating new versions on the basis of teaching experiences across different educational contexts. The methodology is grounded in approaches such as project-

⁸ CEDEC. *Project EDIA* Available at: <https://cedec.intef.es/proyecto-edia/>

based learning and flipped classroom models, with complete learning pathways for different grades and subjects that make it possible to address the full official curriculum.

From the DigiSET perspective, the relevance of the EDIA Project is direct and multifaceted. First, it demonstrates that teacher-led OER creation is both technically and institutionally viable within the Spanish education system, supported by official infrastructure, free authoring tools and open licensing frameworks. Second, its collaborative model, in which teachers from different schools create, implement, improve and republish resources, is structurally consistent with the community of practice logic that DigiSET seeks to establish. Third, the presence of resources linked to learning situations incorporating sustainability, digital citizenship and interdisciplinarity indicates that the project's pedagogical approach already partially anticipates the profile of the digitally sustainable teacher. For DigiSET, CEDEC and the EDIA Project represent both a reference model for the design of OER development activities and a public infrastructure upon which the learning outcomes of the training programme may build.

5.2 Case Study 2: Andalusia Código Escuela 4.0 and the digital transformation ecosystem

Organisation/Project	Consejería de Desarrollo Educativo y Formación Profesional of the Junta de Andalucía. Regional implementation of Código Escuela 4.0 and related digital competence measures, supported through the eAprendizaje ecosystem.
Main Dimensions Addressed	Teacher digital competence, centre digital planning, computational thinking, programming and robotics, good use of AI, advisory support, and structured regional implementation within publicly funded non-university education.
Teacher Competences Developed	Planning and evidencing digital transformation at school level; integrating emerging technologies into teaching; participating in accredited digital competence pathways; and linking classroom innovation with regional support structures.
Learning Approach	Institutional implementation through regional regulation, school planning instruments, advisory networks, accredited digital-coordination roles, and supported professional development connected to the regional digital ecosystem.
Transferability to DigiSET	High, especially for implementation strategy. The case shows how training can be connected to school plans, evidence collection, institutional support and recognised competence development. For DigiSET, it suggests that sustainability and AI-related competences will be more transferable if embedded in existing digital-governance structures rather than offered as isolated add-ons.

The Código Escuela 4.0⁹ Territorial Cooperation Programme constitutes the principal framework through which the Regional Ministry of Educational Development and Vocational Training of the Government of Andalusia promotes digital competence across all publicly funded non-university educational institutions, with the objective of transforming schools into digitally competent organisations. The programme is normatively structured through the Resolution of 1 August 2025 issued by the Directorate-General for Innovation and Teacher Training (BOJA 151/2025), which establishes the specific implementation measures for the academic years 2025–2026 and 2026–2027, in continuity with the process initiated in the 2022–2023 academic year under the #DigEdu Plan.

The architecture of the programme combines three interdependent dimensions. First, each school is required to develop a Digital Action Plan that includes a School Report displaying the certified level of teachers' Digital Teaching Competence, both globally and differentiated according to the areas of the Spanish Framework for Digital Teaching Competence (MRCDD), thereby integrating institutional diagnosis with individual teacher accreditation. Second, the programme establishes two coordination roles in each school: a designated Technical Innovation Adviser providing technical and pedagogical support, and a STEAM 4.0 school coordinator selected from among the teaching staff, with dedicated working hours specifically allocated to programme implementation. Third, STEAM 4.0 Projects are designed as a mechanism to foster the development of both student and teacher digital competence through computational thinking, programming, robotics and the responsible use of artificial intelligence, integrating these dimensions into the School Plan as an ordinary curricular component. The entire ecosystem is supported by the eAprendizaje portal, which centralises open educational resources, training opportunities, pedagogical guidance and access to accreditation procedures linked to the MRCDD and the Order of 11 May 2025 on digital teaching competence accreditation in Andalusia.

For DigiSET, this case is strategically relevant for three directly transferable reasons. First, it demonstrates that teacher training oriented towards digital competences produces stronger and more sustainable results when embedded within school governance structures, such as school plans, recognised institutional roles and evidence recorded in information systems, rather than being offered as isolated professional development. Second, the explicit inclusion of the responsible use of artificial intelligence as a programme component shows that AI has already entered Andalusia's institutional digital transformation cycle not merely as policy discourse, but as a regulated implementation objective. Third, the mentoring model between the Technical Innovation Adviser and the school coordinator provides a concrete reference for conceptualising how the "DigiSET CoP Ambassador" profile may be embedded within recognisable institutional structures in the Spanish and Andalusian context. Teachers appointed as STEAM 4.0 coordinators are preferably required to hold an intermediate accredited level of Digital Teaching Competence (B1 or B2), confirming that digital leadership profiles in schools are increasingly defined through demonstrated competence rather than solely through voluntary engagement or availability. DigiSET may build upon this institutional coherence to position its training pathway as a route towards such benchmark profiles in the Andalusian context. (Directorate-General for Innovation and Teacher Training, 2025)

⁹ Government of Andalusia. *Código Escuela 4.0 Programme Educational Digital Competence*. Available at: <https://www.juntadeandalucia.es/educacion/portales/web/codigo-escuela-4-0>

6. Conclusions and Implications

6.1 Competence Implications for the Digitally Sustainable Teacher

6.1.1 Emerging Competence Areas

The reviewed evidence points to several emerging competence areas that are especially relevant for the Digitally Sustainable European Teacher in Spain. First, teachers increasingly need the capacity to integrate digital tools into pedagogy in ways that are evidencable, professionally progressive and aligned with recognised competence frameworks. Second, they need the ability to select, adapt and create digital and open resources rather than merely consume them. Third, official AI guidance makes critical and ethical AI literacy an emerging requirement, including the ability to question outputs, recognise bias risks and protect educational integrity. Fourth, inclusion remains a central and highly developed policy area, which implies growing importance for competences in accessible design, differentiated digital pedagogy and support for learners with diverse needs. Fifth, sustainability is expanding from curricular content towards pedagogical orientation, which makes systems thinking, interdisciplinarity and the relationship between digital and ecological transitions increasingly relevant.

Taken together, these tendencies support a teacher profile that is reflective, evidence-aware, digitally competent, inclusion-oriented, able to work interdisciplinarily, and capable of creating reusable learning resources within collaborative environments. This profile corresponds closely to DigiSET's strategic rationale.

6.1.2 Underdeveloped Competences

The least developed competence areas are those at the intersection of domains. The reviewed official sources do not provide a sufficiently consolidated professional standard for ethical and gender-aware AI use in teaching, for systems thinking as an explicit teacher competence, for the environmental implications of digital and AI choices in education, or for OER creation as a generally recognised professional requirement. Likewise, GreenComp- and LifeComp-related dimensions are present in the wider policy environment but are not yet translated into a strongly codified teacher competence matrix in the reviewed Spanish and Andalusian sources.

These underdeveloped areas are precisely those where DigiSET can contribute most clearly. The project can fill an integration gap by connecting already mature digital-competence structures with sustainability reasoning, socio-emotional and reflective dimensions, inclusive pedagogies, and responsible AI-enabled resource creation.

6.2 Recommendations and Implications for DigiSET Framework Development

6.2.1 Implications for the Competence Framework

Based on the Spanish evidence base, the DigiSET competence framework should include at least the following key areas. First, professional digital pedagogy linked to planning, implementation, assessment and reflective improvement. Second, OER literacy, including legal, technical and pedagogical capacity to create, adapt, attribute, share and improve resources. Third, critical, ethical and bias-aware AI use in teaching, with explicit attention to transparency, quality assurance, privacy, inclusion and human oversight. Fourth, sustainability-oriented pedagogical design, including systems thinking, interdisciplinary connections and the ability to relate digital practices to environmental, social and economic sustainability. Fifth, inclusive design for diverse learners, including the use of digital and AI-supported strategies without weakening accessibility or equity.

In terms of competence components, the Spanish context suggests a balanced knowledge-skill-attitude model. Knowledge should include the regulatory environment, curricular implications, ethical principles, and framework literacy. Skills should include design, adaptation, implementation, evaluation, evidencing and collaborative improvement. Attitudes should include critical reflection, commitment to inclusion, professional responsibility, openness to collaboration and sustained willingness to learn across one's career.

6.2.2 Implications for Learning Outcomes

Based on the evidence reviewed for Spain, DigiSET learning outcomes should be formulated in ways that are both pedagogically meaningful and demonstrable through evidence.

In the Spanish context, teachers should be able to demonstrate that they can design learning situations in which digital tools are used purposefully rather than merely instrumentally. They should also be able to create or adapt OER with appropriate licensing, attribution and pedagogical coherence, and to integrate sustainability perspectives into subject teaching through interdisciplinary and context-sensitive approaches.

In addition, teachers are expected to critically evaluate and use AI tools, taking into account issues such as bias, privacy, fairness and educational relevance. They should be able to adapt digital teaching strategies to the needs of diverse learners, document their professional decisions and learning evidence, and collaborate within school or inter-school communities to improve resources and teaching practices.

This orientation is especially important because Spain already possesses a strong culture of digital competence evidencing through the MRCDD and associated accreditation procedures.

For that reason, learning outcomes should not be expressed only as general awareness. They should be observable through adapted teaching materials, OER outputs, designed learning situations, reflective commentaries, evidence of inclusive decision-making, documented use or non-use of AI tools based on educational and ethical judgement, and collaboration evidence in professional communities. Such an evidence-friendly approach would make the future framework more transferable to the Spanish context because it aligns

with existing institutional habits of documentation, accreditation and professional development rather than standing outside them. (Dirección General de Evaluación y Cooperación Territorial, 2022).

6.2.3 Implications for Training Design

The Spanish evidence suggests that training design should be practice-based, modular, evidence-rich and closely linked to school reality. Stand-alone theoretical familiarisation is unlikely to be sufficient. Teachers need structured opportunities to design, adapt, test and refine resources and learning activities, preferably in formats that allow them to generate evidence of competence growth. This is consistent with Spain's existing digital competence ecosystem, where development, evidencing and recognition are already strongly connected in the digital field (Dirección General de Evaluación y Cooperación Territorial, 2022a, 2022b).

A strong training model for Spain would therefore combine short guided modules, school-linked application tasks, collaborative OER design, peer review, scenario-based discussion of ethical AI use, and reflective activities focused on inclusion and sustainability trade-offs. Public infrastructures already available in the Spanish context, such as Procomún, CEDEC, Proyecto EDIA and the Andalusian eAprendizaje ecosystem, show that the national and regional systems are already compatible with resource-based, open and applied learning formats. DigiSET should take advantage of that compatibility.

Where possible, training should also be stackable and aligned with existing recognition logics. In Spain, this does not mean claiming that a DigiSET micro-credential architecture already exists for all competence domains. It means designing the programme in a way that could later facilitate partial recognition, portfolio-based validation or integration into existing continuing professional development routes, particularly where there is already a strong administrative culture of teacher competence accreditation. This approach is both realistic and transferable (Dirección General de Evaluación y Cooperación Territorial, 2022).

6.3 Potential for National Integration

The potential for national integration is significant, especially through continuing professional development. At national level, DigiSET can align with the existing architecture built around Organic Law 2/2006, the MRCDD, the accreditation agreement of 2022, INTEF resources, Procomún, CEDEC and the broader digital transformation programmes grouped under #DigEdu and related territorial initiatives. This makes Spain a favourable context for integration because the system already recognises teacher professional development as a legal obligation and already possesses a structured digital competence ecosystem. (Government of Spain, 2006; Dirección General de Evaluación y Cooperación Territorial, 2022; Ministerio de Educación y Formación Profesional, 2023).

At regional level, Andalusia offers a particularly strong integration pathway because it already combines DigCompEdu-based regulation, an operational digital competence accreditation route, a structured teacher training framework, the eAprendizaje ecosystem, school digital planning instruments and sustainability-oriented programmes such as CIMA and Aldea. In practical terms, this means that DigiSET can be positioned in Andalusia not as an isolated external course, but as an integrative enhancement layer that connects digital

competence, sustainability, inclusion and AI-related professional judgement within structures that teachers and centres already recognise. (Consejería de Educación, Cultura y Deporte, 2013, 2014; Junta de Andalucía, 2025).

The main enablers are therefore clear: an existing legal basis for continuing professional development, a recognised digital competence reference framework, public digital infrastructures, regional and national training mechanisms, and open educational resource platforms already in operation. The main barriers are equally clear: the lack of a parallel certification architecture for sustainability and AI-related teacher competences, fragmentation between digital, sustainability and inclusion policies, and variability across providers and territories in how these themes are translated into practice. DigiSET should therefore be presented in Spain as a bridge-building framework rather than as a substitute for existing structures.

6.4 Key Findings Summary

In Spain, teacher competence development for the DigiSET target context is shaped above all by four drivers: a mature teacher digital competence architecture, a strong inclusion framework, a sustainability agenda embedded mainly in curricula and system values, and an emerging but still partial AI-in-education policy environment. The strongest current field is digital pedagogy because it benefits from national reference frameworks, accreditation mechanisms, implementation programmes and regional operationalisation. Andalusia is especially relevant in this respect because it combines regulation, accreditation, training structures and digital transformation instruments in a comparatively coherent way.

At the same time, Spain still lacks an equally consolidated teacher competence architecture for the integration of sustainability, ethical and bias-aware AI use, systems thinking and OER authorship as a unified professional field. Sustainability is strongly embedded in curricula and in the wider legal orientation of the education system. AI is increasingly visible in official guidance and regional digital transformation. OER infrastructures are already available. But these strands remain unevenly connected at teacher-competence level. This is the central national gap identified by the report.

For DigiSET, the Spanish evidence therefore indicates both opportunity and need. Spain does not need a replacement digital framework. It needs an integrative teacher-learning offer capable of connecting already established digital competence structures with the less consolidated competences required for a digitally sustainable education model. That conclusion remains relevant across the EQF 2 to 5 scope addressed in this report, even if some sub-segments, especially those linked to secondary and vocational provision, currently display stronger formal policy visibility than others.

7. References

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