

Inclusive education and UDL in teacher training: A systematic literature review

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Abstract

Improving educational quality and inclusion is a global priority under the 2030 Agenda. Teacher training is central to this goal, requiring a clear understanding of current practices and progress. This article is part of the international DUAINCLUDIG project (Spain and Uruguay), which promotes inclusive education through the Universal Design for Learning (UDL) framework. A systematic review following PRISMA guidelines examined three areas: (1) concepts of diversity and inclusion in teacher education; (2) the development and characteristics of training programs; and (3) their design and evaluation. Findings reveal a limited number of rigorous studies validating inclusion-focused teacher training. Most initiatives rely on qualitative and reflective approaches, primarily in initial teacher education, with scarce integration of UDL. The results underscore the need to transform teacher training paradigms and to implement comprehensive, evidence-based models that fully incorporate UDL in Spain and internationally.

Migliorare la qualità e l'inclusività dell'istruzione è una sfida globale in linea con l'Agenda 2030. La formazione degli insegnanti è fondamentale per questa trasformazione e richiede di comprendere pratiche e progressi attuali. Questo articolo nasce dal progetto internazionale "Universal Design for Learning: contributi alle pratiche curriculari e alle culture inclusive e digitali delle scuole - DUAINCLUDIG" (Spagna e Uruguay), che affronta l'educazione inclusiva attraverso l'Universal Design for Learning (UDL). È stata condotta una revisione sistematica seguendo la metodologia PRISMA, focalizzata su tre assi: (1) il concetto di diversità e inclusione nella formazione degli insegnanti; (2) lo sviluppo e le caratteristiche dei programmi formativi; (3) la progettazione e valutazione della formazione e della ricerca. I risultati mostrano un numero limitato di studi rigorosi che validino la

Mercedes Llorent-Vaquero, Irene Martínez-Martín, Carmen Alba-Pastor, Teresa González-Ramírez – *Inclusive education and UDL in teacher training: A systematic literature review*

DOI: <https://doi.org/10.60923/issn.1970-2221/22903>

formazione sull'inclusione. La maggior parte propone modelli qualitativi, riflessivi e critici, prevalentemente nella scuola dell'infanzia, con scarsi riferimenti all'UDL. È necessario un cambiamento di paradigma verso modelli formativi completi ed *evidence-based* che integrino pienamente l'UDL, in Spagna e a livello globale.

Keywords: inclusion; teacher training; diversity; systematic reviews; Universal Design for Learning

Parole chiave: inclusione; formazione degli insegnanti; diversità; revisioni sistematiche; *Universal Design for Learning*

1. Introduction

In recent decades, inclusive education and perspectives on diversity have become priorities in both national and international agendas. This global consensus, reinforced by the 2030 Agenda (UN, 2015)—which establishes Sustainable Development Goal 4, aimed at “ensuring inclusive, equitable, and quality education and promoting lifelong learning opportunities for all”—alongside UNESCO’s ongoing proposals on the subject (UNESCO, 2024), has led to a surge in research in recent years focused on education and inclusion.

Consensus around inclusive education is now widespread across different areas and dimensions of the educational field. In this context, Universal Design for Learning (UDL) has emerged as a teaching and learning framework that seeks to maximize educational opportunities for all learners (CAST, 2018).

In order to explore the professional development needs in inclusion among in-service teachers, the DUAINCLUDIG project was launched. This project used a questionnaire to gather responses from a sample of 549 teachers in Spain and Uruguay. The most relevant findings related to this literature review are highlighted here. Although the majority of teachers (66.7%) reported having a professional development plan in their schools, just over half (56.84%) indicated that such plans included topics related to special educational needs (SEN) or inclusive education. Regarding UDL specifically, while most respondents stated they were familiar with the framework (69.4%), the majority (74.1%) had received no formal training on it. These findings reveal significant gaps in both general training on inclusion and, more specifically, on UDL (Silva-Laguardia & Alba-Pastor, 2025).

1.1 Teacher training in inclusive education

Teacher training has become a current and pressing issue, opening up crucial challenges for improving education through inclusion, as discussed in the previous section. Based on the challenges outlined by UNESCO (2022, 2024) and the report *The Global Status of Teachers* (Arnol & Rahimi, 2024), teachers are positioned as key agents in addressing these issues. Their professional development is therefore a top priority, whether in relation to digital learning, artificial intelligence, inclusion, environmental education, gender equality, or other emerging demands.

In this regard, previous systematic reviews (Tristani & Bassett-Gunter, 2020; Van Mieghem et al., 2020; Khamzina et al., 2024; Aguilera et al., 2024; Neira & Lima, 2025) have identified relevant approaches to teacher training. Notable among these are the effectiveness of collaborative and practice-based training formats (e.g., workshops or co-teaching), which engage the entire educational community—particularly school leadership—and the importance of practice-embedded training, which connects with teachers’ specific concerns and teaching contexts (Dignath et al., 2022).

Across these studies, the need for well-prepared teachers who can respond to the complex challenges of contemporary society is emphasized, along with the ability to understand the multifaceted nature of today’s educational landscape (Scott, 2015). Research in inclusive education (Arnaiz-Sánchez et al., 2023; Ainscow, 1995; Ainscow & Sandill, 2010) has demonstrated that traditional education models are not adequately meeting these demands. Therefore, it is essential to promote innovative, cooperative, and inclusive pedagogical methods, proposals, and strategies that can foster genuine transformation in educational environments.

The Universal Design for Learning (UDL), both as a pedagogical perspective and instructional framework, is gaining traction across a variety of educational initiatives: from national and international legislation (Higher Education Opportunity Act, 2008; Decreto-Lei 54/2018 de 6 de julho, 2018; Ley Orgánica de Modificación de

la Ley Orgánica de Educación, 2020), to curricular proposals implementing UDL practices in schools (Muhammad et al., 2024; Universell, 2016; Pedraza García, 2023), and, of course, in teacher training (Moscato & Pedone, 2024; Alba-Pastor, 2022).

As evidenced by the findings from the DUAINCLUDIG project, teacher training in inclusion is essential to broaden perspectives on diversity—shifting from deficit-based and individualized analyses to the ability to observe educational reality systemically and holistically, identifying barriers in the curriculum, learning context, and institutional structures (Dignath et al., 2022). This paradigm shift also involves developing another key competency: the ability to identify, understand, and integrate learner variability, considering its complexity across dimensions such as motivation, executive functioning, comprehension, knowledge expression, and identity (Balabarca et al., 2024; Gümüş, 2022). This transformation has been supported by institutions such as CAST through the UDL framework (CAST, 2018).

Moreover, recent studies show that inclusive teacher training is more effective when it combines theoretical instruction with contextualized, practical experience—enabling real-world application in diverse settings and improving inclusive attitudes and competencies (Khamzina et al., 2024).

1.2 Purposes of the present study

Within this framework, and building on the initial analysis, this article seeks to identify whether there is research that supports teacher training processes in inclusive education and Universal Design for Learning (UDL), highlighting the potential these studies offer to address the current need for high-quality, transformative inclusive education training. This involves recognizing the value of existing research on the topic, the theoretical models that underpin it, the methodological approaches employed, and the main findings (Morgan, 2024; Chavez et al., 2025).

The main objective of this study is to construct a comprehensive framework for designing teacher education in inclusion and UDL, grounded in a reflective and critical approach and supported by empirical evidence. The specific objectives are to: a) identify the concept of diversity and inclusive education embedded in training processes; b) analyze the development and characteristics of such training; c) describe the research designs used to evaluate these training processes; and, d) identify the presence of the UDL model in the inclusion-focused training programs reviewed. In this regard, the inclusion of Universal Design for Learning (UDL) as a specific theme in teacher training in recent years, within a model of transformative inclusive education, is considered a novel contribution (Karim, 2024). Furthermore, based on the results, the study seeks to determine the key elements highlighted in the scientific literature to advance proposals for teacher training in inclusion and UDL.

The research questions are as follows:

- RQ1: What concept of diversity underpins teacher education in inclusion?
- RQ2: What characteristics define teacher training according to the scientific literature?
- RQ3: What types of evaluations are used to validate inclusive education training models?
- RQ4: Is the UDL model featured as a central component in current teacher training practices?
- RQ5: What key elements does the literature offer to inform proposals for teacher training in inclusion and UDL from reflective and critical perspectives?

The ultimate goal of this review of the state of the art in teacher training for inclusion is to inform the design of future professional development initiatives in inclusive education and UDL—efforts that are urgently needed at present (Florian & Spratt, 2021).

2. Method

This article follows a systematic literature review (SLR) methodology based on the PRISMA model (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) (Page et al., 2021). The aim is to conduct a systematic review of rigorous studies that present outcomes from the implementation of teacher training programs—both initial and in-service—related to inclusive education. This review is guided by specific analytical criteria that allow for the organization and synthesis of knowledge accumulated over years of research (Sarkis-Onofre et al., 2021; Cuadro et al., 2025; Jaramillo Neira et al., 2024; Dzieciatko-Szendrei, 2024; Kang et al., 2025).

2.1 Eligibility criteria

In line with the objectives of this systematic review and the article itself, a search string was developed for use in the WOS and Scopus databases: (“inclusive education”) AND (“teacher training”) AND (“research”). This string was used in both English and Spanish. Initially, the term “UDL” was tested instead of “inclusive education”; however, this search returned no results. Alongside the search string, a set of inclusion and exclusion criteria was applied to refine the results. The inclusion criteria were as follows: a) Documents that are peer-reviewed journal articles; b) Teacher training programs with evidence-based outcomes; c) Publications dated between 2019 and 2023 (inclusive); and, d) Language: English and Spanish. The exclusion criteria were: a) Conference proceedings; b) Training programs without empirical results; and, c) Systematic reviews.

The initial search in the databases using the established string—refined by publication date (2019–2023), type of publication (articles), and language (English and Spanish)—yielded the results shown in Table 1.

Table 1

Initial search results

Data base	Result
WOS	105
SCOPUS	136
TOTAL	241

Following this initial search, duplicate copies of articles found in both databases were removed. Then, a two-step screening process was carried out. The first screening involved reviewing the titles and abstracts of the retrieved documents, applying the inclusion and exclusion criteria. The second screening consisted of a full-text review, using the same criteria. In this way, studies were excluded if they did not involve the implementation of a teacher training course in inclusive education, or if such courses were described without scientifically validated results.

This sequence aligns with current PRISMA standards, which recommend documenting study selection in two phases (title/abstract screening and full-text review), with duplicates removed beforehand from the databases used (Page et al., 2021). The screening was carried out by two reviewers applying the predefined inclusion and exclusion criteria. Discrepancies were resolved through discussion until consensus was reached.

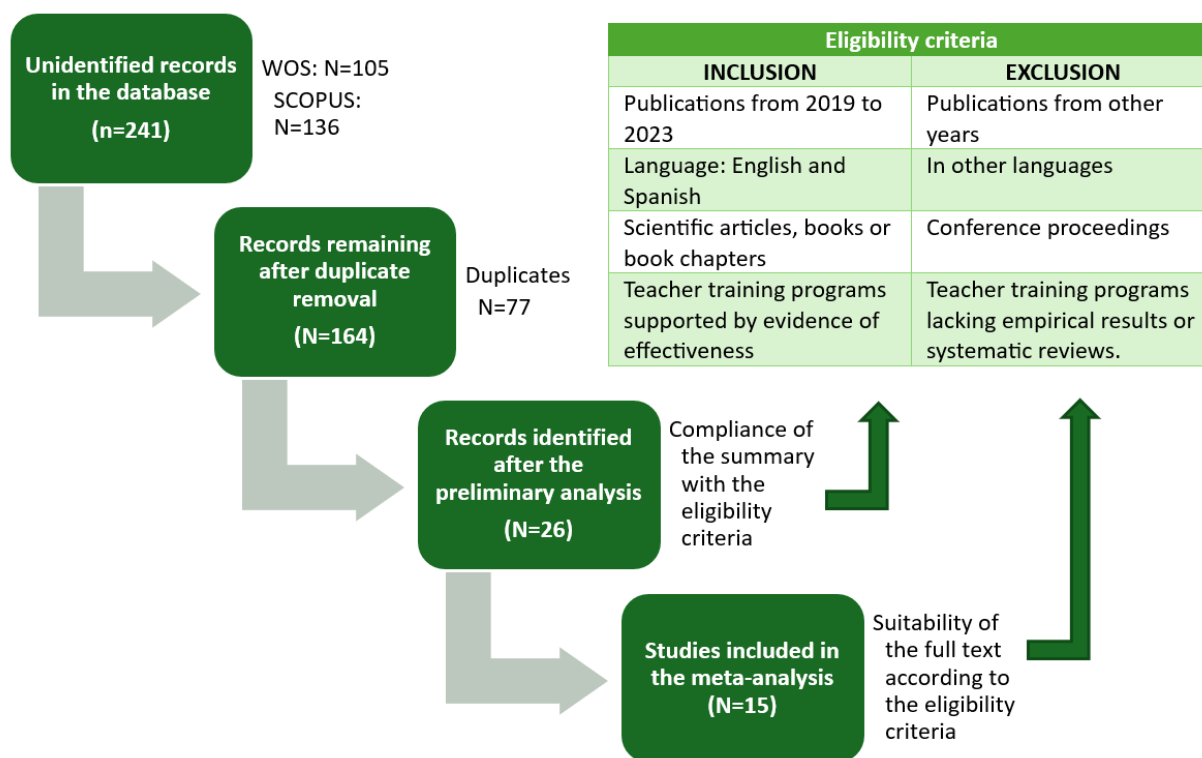
Data from the included studies were systematically extracted using a structured control sheet developed for this review. The extracted information included bibliographic data, training context (initial or in-service teacher education), research design, methodological approach, presence of Universal Design for Learning (UDL), and reported outcomes of the training programs.

2.2 Selection process

By applying the inclusion and exclusion criteria, a total of N=241 documents were initially identified. Of these, 77 were removed due to duplication across the two databases, resulting in 164 documents. After screening titles and abstracts, 26 documents remained that met the inclusion/exclusion criteria. Following full-text review, 15 documents were ultimately included for final analysis and discussion, as some were excluded for not meeting the established requirements. All 15 documents are peer-reviewed articles published in scientific journals. This process is illustrated in the flow diagram shown in Figure 1.

Figure 1

Flow diagram



From the selected articles, a series of descriptive charts are presented, reflecting authorship, year, country, research design, and type of training program (Table 2).

Table 2

Summary of data from the selected articles

Authors	Year	Country	Research Design	Training program
Maravé-Vivas et al.	2023	Spain	Qualitative-analytical	Initial (university-based)
Pinheiro et al.	2023	Brazil	Qualitative-analytical	Initial (university-based)
Fiuza et al.	2022	Spain	Mixed	Initial (university-based)
Yasar-Akyar et al.	2022	Turkey	Mixed	Continuing (in-service)

Gallego-Noche et al.	2022	Spain	Qualitative-analytical	Initial (university-based)
Saiz Linares et al.	2022	Spain	Qualitative-analytical	Initial (university-based)
Vandervieren & Struyf	2021	Belgium	Qualitative-analytical	Initial (university-based)
Sola-Ozguc	2021	Turkey	Quantitative (pre-post test)	Initial (university-based)
Cabrera-Cuadros et al.	2021	Spain	Qualitative-analytical	Initial (university-based)
Hassanein et al.	2021	Qatar	Quantitative (pre-post test)	Initial (university-based)
Gonzalez et al.	2021	Spain Chile	Qualitative-analytical	Continuing (in-service)
Zdanevych et al.	2021	Ukraine	Qualitative-analytical	Continuing (in-service)
Preichardt Duek et al.	2020	Brazil USA	Qualitative-analytical	Continuing (in-service)
Mendioroz et al.	2019	Spain	Qualitative-analytical	Continuing (in-service)
Geser & Martins	2019	Brazil	Qualitative-analytical	Initial (university-based)

In the table above, we can observe that the selected articles come from a variety of countries, with 46% originating from the Spanish context (Mendioroz et al., 2019; Cabrera et al., 2021; Gonzalez et al., 2021; Gallego-Noche et al., 2022; Fiuza et al., 2022; Saiz et al., 2022; Maravé et al., 2023). It is noteworthy that in recent years, inclusive education has become an emerging and increasingly prominent topic within Spanish educational research, gaining visibility in databases of scientific relevance.

Furthermore, the majority of articles employ qualitative-analytical methodologies (73%). This trend points to a type of practice-based research grounded in interpretive and critical paradigms, giving voice to diverse experiences and perspectives on inclusion. These studies often utilize more flexible and reflective research techniques, such as interviews, observations, or ethnographies (Mendioroz et al., 2019; Saiz et al., 2022; Maravé et al., 2023). This is consistent with the principles of inclusive education discussed in the previous section (Ainscow, 2020). In terms of training contexts, most of the articles report on studies conducted within initial university-based teacher education programs (73.33%). This reflects a growing interest in addressing initial teacher training models through the lens of inclusive education, with a focus on analyzing university-level training practices aligned with inclusive principles (Ainscow, 2005). A more in-depth interpretation of these findings will be presented in the following section.

3. Results

The analysis is structured around the three main axes of the review: the concept of diversity, the characteristics of the training programs, and the evaluation of the training. These axes provide responses to the research objectives and questions previously outlined.

3.1 Axis 1: The concept of diversity

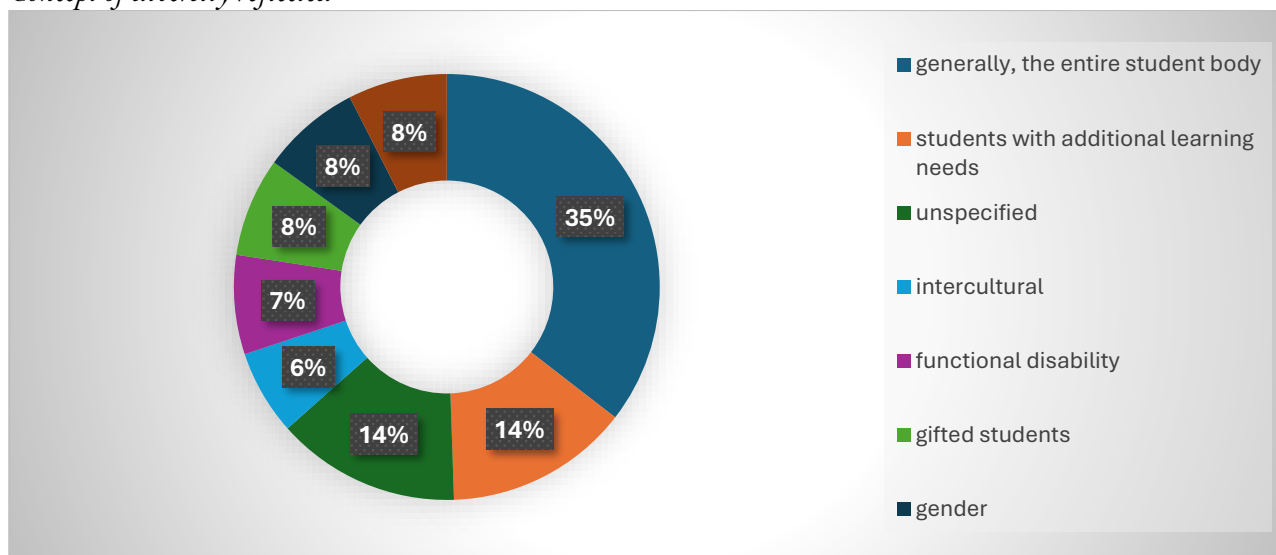
When designing a training course on inclusive education, the approach taken toward the concept of diversity is essential (Charitaki et al., 2024). As shown in Figure 2, one-third of the reviewed articles (33.33%) adopt a general approach to diversity. This means that they do not focus solely on intercultural, sensory, intellectual, or other specific types of diversity, but rather view diversity as a natural and inherent aspect of any educational process, regardless of student characteristics (Pincheiro et al., 2023; Sola-Ozguç, 2021; Gallego-Noche et al., 2022; Hassanein et al., 2021; Saiz Linares et al., 2022).

The remaining articles focus on specific dimensions of diversity, including gender (Geser & Martins, 2019), interculturality (González et al., 2021), giftedness (Mendioroz et al., 2019), sensory (Fiuza et al., 2022) and motor diversity (Maravé-Vivas et al., 2023), functional diversity (Preichardt Duek et al., 2020), or students with special educational needs (Zdanevych et al., 2021; Vandervieren & Struyf, 2021).

These findings reflect a continuing trend, identified in previous research (Charitaki et al., 2024; Mungarrieta et al., 2025), in which teachers and pre-service teachers tend to reduce the concept of diversity to issues related primarily to disability and culture (Ágreda-Montoro et al., 2016), or exclusively to functional diversity (Fuentes et al., 2021).

Figure 2

Concept of diversity reflected



It is worth noting that the Universal Design for Learning (UDL) appears in only two of the reviewed studies (Pincheiro et al., 2023; Vandervieren & Struyf, 2021). In these articles, it is assumed that the legislation of the country where the training is provided includes UDL. The training itself includes a theoretical introduction divided into three content blocks: the first is the continuum of support, the second is UDL, and the third is the needs-based assessment model. Following this theoretical training, classroom observations are conducted, after which reflections are made by proposing inclusive projects based on both theory and observed practice (Vandervieren & Struyf, 2021).

The limited presence of UDL in these recent training courses aligns with the concept of diversity being employed, as UDL understands diversity as a global and natural phenomenon present in all classrooms (CAST, 2018). This holistic perspective contrasts with the analysis of diversity from a singular viewpoint, commonly

associated with disability, which is prevalent in many studies examining teacher or student attitudes and needs regarding diversity (Mayo Pais et al., 2020; Valencia-Peris et al., 2020; Mirete et al., 2020).

Additionally, another point of interest when discussing inclusive education training is the use of ICT as a support tool (Veytia et al., 2024). Among the articles analyzed, technology appears in four (26.67%) (Saiz Linares et al., 2022; Yasar-Akyar et al., 2022; Sola-Ozguc, 2021; Zdanevych et al., 2021). In all cases, technology is part of the training, either as content, as a support element, or as a product developed as a result of the training. Two studies place technology at the core of the training, basing it on the use of digital tools for inclusive education. The first proposes a training course focused on a digital storytelling tool, offering various options to address student diversity (Yasar-Akyar et al., 2022). The second study centers on creating a digital product as a training outcome, which must meet specific inclusivity criteria to be usable by anyone (Saiz Linares et al., 2022).

Although technology is present in nearly a quarter of the analyzed courses, it is surprising that its integration is not more standardized, given its potential benefits for inclusive education (Reyes Chávez & Prado Rodríguez, 2020) as well as the foresight regarding students' preparation for interacting with these technologies in their future development (Cabero Almenara & Valencia Ortiz, 2019).

3.2 Axis 2: Characteristics of the training

First, it is notable that all the training analyzed was conducted in person. Regarding the training context, the majority of the programs take place within initial university teacher education (73.33%), compared to 26.66% offered as continuous or ongoing professional development for in-service teachers (Yasar-Akyar et al., 2022; González et al., 2021; Preichardt Duek et al., 2020; Mendioroz et al., 2019). As expected, most training programs are aimed at university students, with 11 articles addressing this topic (Maravé-Vivas et al., 2023; Pincheiro et al., 2023; Fiuza et al., 2022; Vandervieren & Struyf, 2021; Sola-Ozguc, 2021; Cabrera-Cuadros et al., 2021; Gallego-Noche et al., 2022; Hassanein et al., 2021; Zdanevych et al., 2021; Saiz Linares et al., 2022; Geser & Martins, 2019).

This initial training is divided into two groups: one that conducts the training exclusively within the university classroom setting (54.54%), and another that combines university classroom training with practical experience in educational centers (45.45%), allowing for more direct contact with the realities of inclusion in schools. This latter approach aligns with a growing trend in teacher education that promotes collaborative models between universities and schools, often referred to as an "intermediate space" or third space, which fosters integration between academic theory and professional practice through a non-hierarchical collaboration between university educators and in-service teachers (Heinz, 2024).

Regarding the training approach and methodology used, Table 3 presents the analysis results for courses aimed at initial teacher education. As shown in the table, the approach is predominantly critical and emancipatory (90.90%). Additionally, the critical approach is linked to practice through service-learning (Maravé-Vivas et al., 2023; Fiuza et al., 2022) or reflection on practice (Cabrera-Cuadros et al., 2021; Hassanein et al., 2021; González et al., 2021; Preichardt Duek et al., 2020; Zdanevych et al., 2021; Saiz Linares et al., 2022; Mendioroz et al., 2019; Geser & Martins, 2019). These results reinforce the idea that the most common methodology in initial teacher education for inclusive education is mainly reflective-dialogical (Cornish, 2024).

Although other methodologies such as practical, participatory-collaborative, or service-learning are relevant, reflective-dialogical approaches are observed most frequently (Kennelly & Oke, 2024). Furthermore, this reflection is grounded in practical experiences, either directly by engaging with inclusion in educational settings or indirectly through teacher narratives or needs analyses of real contexts. Rapanta et al. (2021) highlight that in-

clusion is constructed as a shared dialogical process between teachers and students from the very design of instruction. Similarly, Barak (2024) demonstrates how training equips future teachers with conceptual and reflective tools, facilitating the development of a dialogical pedagogy tailored to real classroom contexts. This reflective practice has been linked in various studies to improved professional teacher development (Nocetti et al., 2020) and to the co-construction of knowledge through the creation of spaces to share reflections and experiences within a collaborative and respectful environment (Strotmann & Custodio Espinar, 2021).

Table 3
Methodological approach in initial teacher education

Training Approach	Methodology	Articles
Critical-Emancipatory	Service-Learning	Maravé-Vivas et al., 2023
Critical-Emancipatory	Service-Learning	Fiuza et al., 2022
Critical-Emancipatory	Participatory-Collaborative, Reflective-Dialogical, Action Research	Vandervieren & Struyf, 2021
Critical-Emancipatory	Reflective-Dialogical	Cabrera-Cuadros et al., 2021
Critical-Emancipatory	Constructivist, Socio-affective, and Critical	Gallego-Noche et al., 2022
Critical-Emancipatory	Practical, Reflective-Dialogical	Hassanein et al., 2021
Critical-Emancipatory	Practical, Reflective-Dialogical	Zdanevych et al., 2021
Critical-Emancipatory	Participatory-Collaborative, Reflective-Dialogical	Saiz Linares et al., 2022
Critical-Emancipatory	Reflective-Dialogical	Geser & Martins, 2019
Critical-Emancipatory	Participatory-Collaborative	Pincheiro et al., 2023
Mixed	Technical-Directive and Practical	Sola-Ozguç, 2021

Regarding training aimed at the field of continuing or lifelong education, four scientific articles were identified (Yasar-Akyar et al., 2022; González et al., 2021; Preichardt Duek et al., 2020; Mendioroz et al., 2019). The teachers receiving this training belong to different educational levels: early childhood education (25%), primary education (75%), and secondary education (25%). Percentages exceed 100% because some training programs targeted teachers from more than one educational level. Most of the training courses last a full academic year (75%), except for one that is designed as a 3-day workshop. As for the context in which the training is delivered, it is evenly split between training conducted within schools (50%) and training carried out in external classrooms, such as universities or workshops offered by government agencies (50%).

Concerning the training approach and methodology used, as shown in Table 4, similar to initial teacher training, a critical and emancipatory character predominates (75%). This training tends to employ more participatory and collaborative methodologies (Martínez & Sanz, 2023). Although reflective, practical, and action-oriented components remain important, collaboration and participation are key to the development of inclusion training for in-service teachers and represent the most widely used methodology (Kennelly & Oke, 2024). Collaboration typically stems from teaching practice, providing an exchange of experiences and knowledge among participants

that enriches the training process while promoting professional exchange and critical-emancipatory development (Navarro & Navarro-Montaño, 2023). Moreover, the reflective or action-research component based on their own practice is fundamental for this exchange among teachers, allowing them to support each other in addressing inclusive challenges from a reflective-critical perspective and shared knowledge (Navarro-Montaño et al., 2022).

Table 4
Methodological approach to continuing education

Training Approach	Methodology	Articles
Critical-Emancipatory	Reflective-dialogical, Action research	Gonzalez et al., 2021
Critical-Emancipatory	Action research	Preichardt et al., 2020
Critical-Emancipatory	Participatory-collaborative, Practical, Action research	Mendioroz et al., 2019
Mixed	Participatory-collaborative, Directive-technical, Practical	Yasar-Akyar et al., 2022

The results reinforce the idea that the most commonly used methodologies in teacher training—both initial and ongoing—in inclusive education are reflective-dialogical and participatory-collaborative (Cornish, 2024; Kennelly & Oke, 2024). In this regard, it is evident how the very essence of these methodologies is inclusive, as they are based on a set of inclusion principles such as empathy, collaboration, respect, tolerance, etc., which serve as a fundamental pillar in promoting education spaces for all (Navarro-Montaño et al., 2022). Thus, these methodologies enhance both the technical or practical training of participants and their commitment to inclusive approaches, encouraging them to rethink and redesign their current and future teaching-learning environments (Parrilla, 2021).

3.3 Axis 3: Evaluation of training

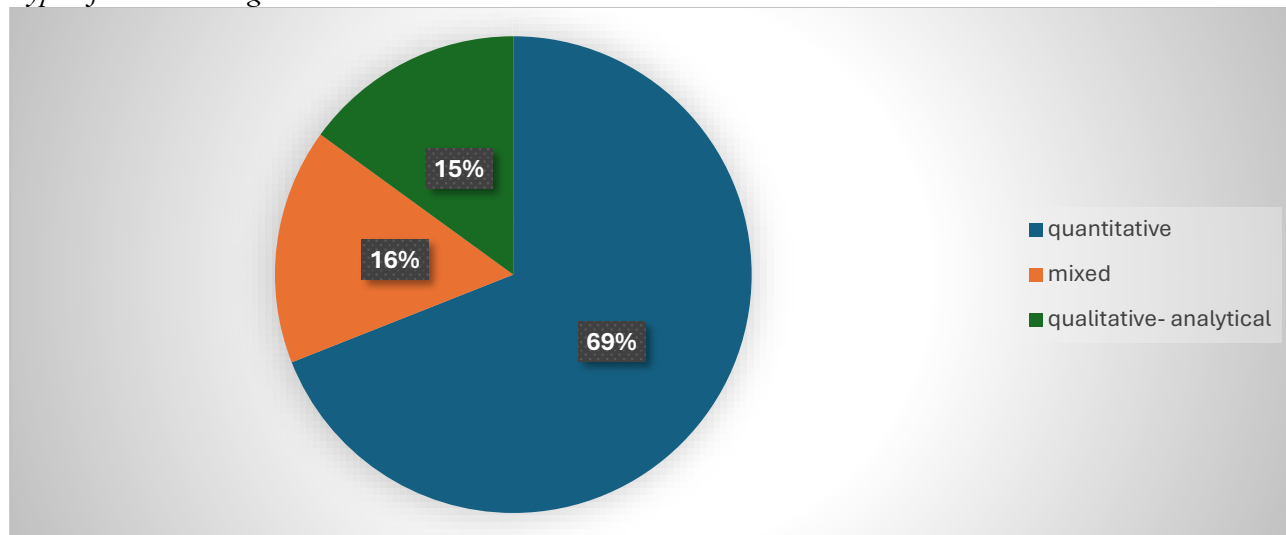
This section addresses the evaluation of the training programs described in the selected articles, always from a scientific criteria standpoint. That is, we focus on analyzing the research designs, techniques, and methodologies that accompany the training proposals under review.

Most of the objectives stated in the analyzed contributions specify that they aim to analyze the impact of the training program in terms of learning and competencies developed, benefits provided, or participant satisfaction (Maravé-Vivas et al., 2023; Pincheiro et al., 2023; Fiuza et al., 2022; Sola-Ozguc, 2021; Cabrera-Cuadros et al., 2021; Yasar-Akyar et al., 2022; Gallego-Noche et al., 2022; Hassanein et al., 2021; Zdanevych et al., 2021; Saiz Linares et al., 2022; Geser & Martins, 2019). It is noteworthy that several articles explore teachers' metacognitive processes related to inclusion, such as understanding (Yasar-Akyar et al., 2022), collaborative inquiry processes (Saiz Linares et al., 2022), the progression of their ideas (Gallego-Noche et al., 2022), problem-solving (Sola-Ozguc, 2021), attitude changes (Hassanein et al., 2021), or knowledge construction (Zdanevych et al., 2021). Additionally, some studies focus on identifying issues and proposing improvements for the training itself (Sola-Ozguc, 2021; Pincheiro et al., 2023).

All the training programs analyzed have been evaluated according to scientific research criteria (this was one of the screening reasons in the PRISMA process described). An initial analysis shows that the majority of studies are qualitative-analytical or mixed methods (Figure 3).

Figure 3

Types of research designs



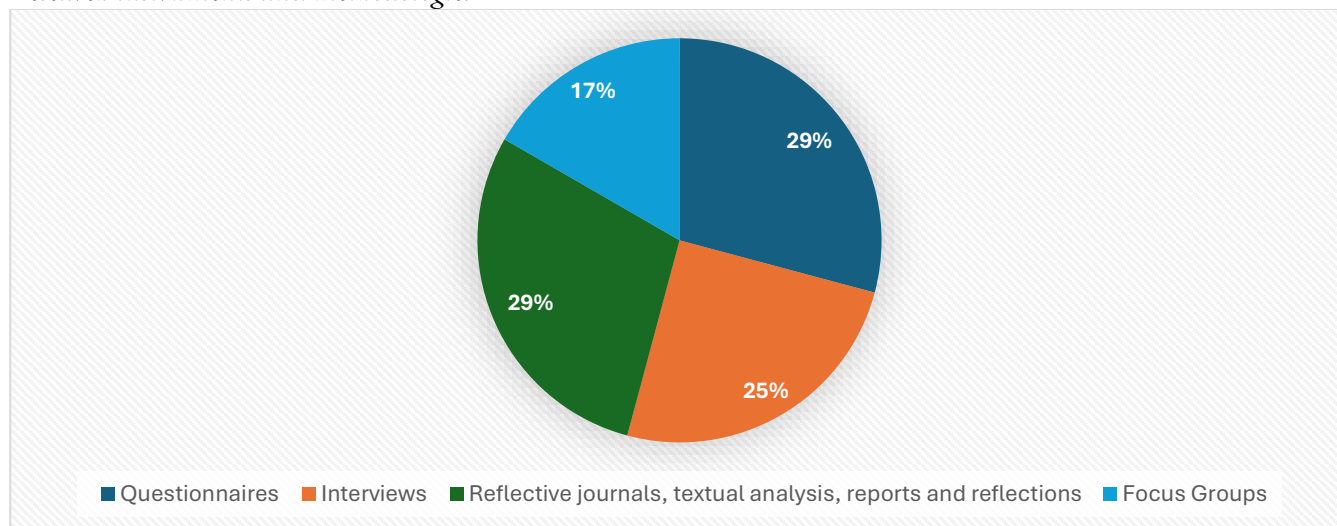
Most of the studies conducted adopt a qualitative approach (69%), aiming to gain a deeper understanding of the set objectives (Maravé-Vivas et al., 2023; Pincheiro et al., 2023; Vandervieren & Struyf, 2021; Cabrera-Cuadros et al., 2021; Gallego-Noche et al., 2022; González et al., 2021; Preichardt Duek et al., 2020; Zdanevych et al., 2021; Saiz Linares et al., 2022; Mendioroz et al., 2019; Geser & Martins, 2019). About 13% of the studies use a mixed methods framework (Yasar-Akyar et al., 2022; Gallego-Noche et al., 2022), combining qualitative and quantitative approaches, and another 13% focus solely on quantitative methodology (Zdanevych et al., 2021; Hassanein et al., 2021). As previously mentioned, this predominance of qualitative and mixed designs aligns with the principles of inclusive education, since these designs offer greater flexibility and a deeper understanding of socio-educational diversities and complexities (Navarro-Montaña et al., 2022).

Along the same lines, the research instruments employed (Figure 4) are varied, although there is a traditional tendency to use questionnaires, interviews, or focus groups. This also applies to data analysis methodologies. Noteworthy is the use of discourse or narrative analysis, ethnography, action research, and especially mixed methods that combine the aforementioned approaches with questionnaire analysis, consistent with what Navarro-Montaña et al. (2022) highlighted regarding the pillars of inclusive education (Ainscow, 2005, 2010, 2020). This integrated approach is supported by studies such as Engelbrecht and Savolainen (2018), who point out that mixed methods enable a deeper understanding of teachers' attitudes, beliefs, and practices regarding inclusion, considering both contextual and personal aspects. In this sense, combining quantitative and qualitative tools not only enriches the analysis but also provides a more holistic and realistic view of training processes. In this context, Alba-Pastor (2022) discusses the importance of seeking tools for listening, inquiry, and analysis that represent the multiple ways of knowing, learning, and expressing the complexity of classrooms. To this end, it is necessary to adopt methodological designs that break away from traditional knowledge boundaries, favoring mixed-method research. Although this systematic review's results do not show that this need to make research

designs more flexible (Sancho et al., 2020) is accompanied by more creative or critical analysis techniques and instruments beyond the traditional ones mentioned, there is a clear trend towards more participatory research methods. The contribution of these methods lies in the social transformation brought about by their implementation (Pajares Sánchez, 2020).

Figure 4

Research instruments and methodologies



Regarding the dimensions of the changes reflected in the results of the analyzed studies, these have been systematized in Table 5.

Table 5

Changes and contributions in the results of training courses

Dimensions of changes	Articles
Conception of diversity shifting toward more social and human rights-based models; changes in teachers' attitudes toward inclusion	Maravé et al., 2023; Vandervieren et al., 2021; Sola-Ozguc, 2021; Cabrera-Cuadros, 2021; Hassanein et al., 2021; Preichardt Duek et al., 2020; Zdanevych et al., 2021; Mendioroz et al., 2019; Geser & Martins, 2019
Development of inclusive pedagogical strategies and changes in curriculum design	Pinheiro et al., 2023; Yasar- Akyar et al., 2022; Gallego-Noche et al., 2022; Preichardt Duek et al., 2020; Zdanevych et al., 2021; Mendioroz et al., 2019; Geser & Martins, 2019
Processes of self-reflection on practice leading to change	Cabrera-Cuadros, 2021; González et al., 2021; Preichardt Duek et al., 2020
Integration of the concept of student variability in the classroom	Vandervieren & Struyf, 2021; Sola-Ozguc, 2021; Preichardt Duek et al., 2020

Success in the use of collaborative methodologies such as service-learning (S-L)	Maravé et al., 2023; Fiuza et al., 2023; Yasar- Akyar et al., 2022; Saiz-Linares et al., 2022; Zdanevych et al., 2021
Use of ICT in inclusion as support tools	Sola-Ozguc, 2021; Yasar- Akyar et al., 2022; Saiz-Linares et al., 2022; Zdanevych et al., 2021
Incorporation of Universal Design for Learning (UDL)	Pincheiro et al., 2023

Only two of the previously cited articles (Pincheiro et al., 2023; Vandervieren & Struyf, 2021) identify the incorporation of Universal Design for Learning (UDL) as a change, highlighting an increase in teachers' interest, promotion of further teacher training, and the identification of barriers to learning.

None of the articles reviewed mention the success or contribution of the use of ICT. In the few studies that consider the integration of ICT in inclusive education, these technologies primarily appear as support tools rather than as a central focus of the training. Bosse et al. (2024) argue that this traditional approach of viewing technology solely as a support mechanism is reductive in terms of educational inclusion. Conversely, studies that integrate technology within the UDL framework position it as a key element for truly transformative inclusive training, aligning with your observation of the contrast found in the reviewed articles (CAST, 2018; Veytia et al., 2024).

4. Discussion and conclusions

This analysis of the current state of teacher training in inclusive education and Universal Design for Learning (UDL) has allowed for the identification of both significant advances and persistent gaps, addressing the research questions posed. It is worth noting that the findings of this systematic review reinforce the results of the preliminary study (González-Ramírez et al., 2025) conducted in educational contexts in Spain and Uruguay, where, despite a high percentage of teachers reporting familiarity with the UDL model, the majority acknowledged having received no specific training on it. This disconnect between knowledge and training aligns with the limited presence of UDL in the experiences analyzed in the scientific literature, thereby justifying and underscoring the relevance of this critical review, which is key for the redesign of training in inclusive education and UDL (Ewe & Galvin, 2023).

This restrictive perspective directly impacts the limited incorporation of UDL in the reviewed programs. As a pedagogical approach grounded in student variability as a structural principle, UDL demands a comprehensive understanding of diversity, as highlighted by Sánchez-Serrano et al. (2023) in their systematic review on the impact of UDL training on teaching competencies.

Regarding the concept of diversity and educational inclusion within training processes, the results indicate that the concept of diversity needs to evolve towards a more global vision, approaching diversity from a broader, more natural perspective as an intrinsic aspect of society (Amaro, 2019; Lagos et al., 2022). Diversity continues to be limited to a specific type of “need,” which reinforces a partial or integrative approach to attention in classrooms, without achieving true educational inclusion. This restrictive view directly affects the scarce integration of UDL in the programs analyzed. The UDL model moves away from the traditional approach to diversity attention by promoting a comprehensive view of diversity in education that transcends the individual-centered perspective focused on specific educational needs (CAST, 2018). In other words, as a pedagogical approach based on student variability as a structural principle, UDL requires an integral understanding of diversity

(Rusconi & Squillaci, 2023). It also demands a paradigm shift in teacher training, as developed throughout this text and in line with experts in the field (Ainscow & Chapman, 2025; Zajda, 2024).

Regarding the methodological characteristics of the training programs, qualitative, critical, and reflective approaches predominate, supported by participatory and collaborative models. This aligns with the principles of inclusive education, favoring more innovative training approaches, with evidence suggesting that the most effective training for educators combines critical reflection, situated learning, and networked collaboration (Johnson & Erasmus, 2024). These proposals are based on flexibility, narrative approaches, and collaboration, also connecting with more authentic and community-oriented practices, such as service-learning, thereby promoting greater competencies in inclusion (Cerqueira-Rodrigues, 2024). However, these approaches are predominantly applied in initial teacher education, with a significant gap persisting in training offerings aimed at in-service teachers, consistent with previous research (Álvarez-Rementería et al., 2024), which limits the direct impact on school environments.

Another noteworthy element observed is the use of ICT. While some programs incorporate technology as a support tool, its integration remains at a technical or accessory level. This reinforces the idea that it is important to work towards a genuine symbiosis between inclusion and technology (CAST, 2018), reflecting on the possibilities they offer for inclusion in the classroom rather than focusing solely on their technical use as support resources in specific situations. As Lomellini et al. (2025) warn, it is necessary to move beyond the functionalist use of technology and advance toward its critical integration as a means of inclusive pedagogical design, aligned with the principles of UDL. Just as technology is not innovative merely because it is introduced in the classroom, it is not inclusive simply because it is used with diverse learners. This aligns with the report from the European Agency for Special Needs and Inclusive Education (2024), which states that a true transformation of schools towards inclusivity requires a successful digital transformation. Thus, its use must be carried out from a critical and inclusive perspective that encompasses all the potentialities of technology in this regard (UNESCO IITE, 2025), also consistent with the shift toward reflective and critical paradigms in teacher training.

Regarding the evaluation of training programs, the direct focus of this systematic review, there is a significant lack of empirical studies that scientifically validate the implemented interventions. In many cases, the reviewed articles describe teacher perceptions or needs without accompanying them with rigorous analyses of the training's impact; or focus on needs analyses and curricula or teaching guides from an inclusive perspective. Therefore, the sample of articles available for analysis is limited, highlighting a gap in educational research as framed here. This presents a challenge for generating new evidence-based knowledge in the field of teacher training in inclusive education and UDL, underscoring the need for rigorous evaluation of such initiatives and advancing toward a culture of continuous improvement in training practices (Gilleece & Clerkin, 2024).

In the articles that met the inclusion criteria, it is observed that the analytical techniques or research instruments used are interviews, questionnaires, or observations, with a notable absence of more participatory and transformative techniques. In this regard, recent studies such as those by Pineda et al. (2022) emphasize the need to employ participatory approaches and mixed methodologies that integrate the perspectives of both trainers and participants in the evaluation of training experiences—a topic still underexplored in the reviewed studies.

In summary, the review shows that, although significant efforts are being made in teacher training for inclusive education, UDL remains a marginal element: more frequently cited in normative and discursive frameworks than effectively implemented. The few experiences that include it indicate improvements in understanding diversity, curriculum redesign, and the implementation of inclusive pedagogical practices, but its presence is still insufficient to consolidate structural change. Therefore, it is urgent to advance toward more comprehensive,

sustainable, and scientifically validated training models that articulate theory and practice from inclusive, critical, and transformative principles, with special attention to the ongoing professional development of educators (UNESCO IITE, 2025; Gilleece & Clerkin, 2024).

Addressing the final research question posed, this review identifies key strategic lines for future training and research actions: designing empirically grounded programs that incorporate UDL as a central framework from a reflective and critical teacher education paradigm; strengthening the scientific evaluation of these proposals through mixed and participatory methodologies; and promoting collaboration networks among universities, schools, and administrations that foster an inclusive, situated, and systemic pedagogical culture.

4.1 Limitations and future implications

One of the main limitations of this systematic review has been the limited number of studies that meet the established inclusion criteria. Although the initial search yielded a considerable number of publications, the application of the PRISMA protocol revealed that many works lacked empirical validation of the described training programs or addressed only teacher perceptions, attitudes, or needs regarding inclusion rather than concrete training experiences.

This highlights a significant gap between the training practices being developed in various educational contexts and their scientific documentation and validation (Popova et al., 2022). In education, evaluation is constantly conducted, primarily in a processual, continuous, and formative manner aimed at improving practices and understanding situated, everyday realities. However, there is a lack of transfer between educational praxis and academic knowledge production, which limits both the consolidation of evidence and the possibility of replicating and adapting successful experiences to other contexts (Georgiou, 2020). This disconnect between formative evaluation in everyday practice and its systematic research documentation represents a structural weakness in the development of an evidence-based pedagogical culture (Gilleece & Clerkin, 2024).

Another notable limitation is the limited presence of UDL as an explicit component in the analyzed programs. Despite its recognition in international normative and theoretical frameworks, its concrete implementation in training processes remains marginal (CAST, 2018; Nin Piriz & Tamayo Ancona, 2024). This may be due both to the relative novelty of its inclusion in educational discourse and the aforementioned lack of rigorous evaluations.

In light of these limitations, urgent lines of action and research emerge. On one hand, it is essential to design and document training programs in inclusion and UDL that are solidly grounded, rigorously evaluated, and focused on both pre-service teachers and, especially, in-service educators (UN, 2016; UNESCO, 2020). On the other hand, fostering a pedagogical-scientific culture that values evaluation as a systematic improvement process, capable of generating transferable knowledge applicable to diverse contexts, is required (Ainscow & Chapman, 2025).

In this regard, a priority is to promote research that directly links teacher training with the impact on inclusive classroom practices, incorporating mixed, participatory, and transformative methodologies (Arnaiz-Sánchez et al., 2023). Likewise, expanding the integration of technologies from an inclusive and critical perspective will be key (Bosse et al., 2024), as well as strengthening the articulation between universities, schools, and educational administrations to consolidate multisectoral strategic alliances and coherent, sustainable training ecosystems (Cardini et al., 2021). Ultimately, advancing toward quality inclusive teacher education requires overcoming the epistemological, institutional, and methodological barriers that still persist. This review aims to contribute to that process by offering an initial roadmap upon which new scientifically based, ethically grounded, and socially committed research and training actions can be projected.

Acknowledgments

This work was supported by the Spanish Ministry of Science and Innovation under the R&D project titled "Universal Design for Learning: contributions to curricular practices and the inclusive and digital cultures of schools - DUAINCLUDIG" (Grant No. PID2020-112530RB-I00. 2020 Call for R&D+i Projects, within the State Plan for Scientific and Technical Research and Innovation 2017-2020).

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Mercedes Llorent-Vaquero, Irene Martínez-Martín, Carmen Alba-Pastor, Teresa González-Ramírez – *Inclusive education and UDL in teacher training: A systematic literature review*

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Mercedes Llorent-Vaquero, Irene Martínez-Martín, Carmen Alba-Pastor, Teresa González-Ramírez – *Inclusive education and UDL in teacher training: A systematic literature review*

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Mercedes Llorent-Vaquero, Irene Martínez-Martín, Carmen Alba-Pastor, Teresa González-Ramírez – *Inclusive education and UDL in teacher training: A systematic literature review*

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