





# Universal Design for Learning. A systematic review of its role in Teacher Education

Diseño Universal para el Aprendizaje. Una revisión sistemática de su papel en la formación docente

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### Abstract

Universal Design for Learning (UDL) is a developing educational approach that aims to improve learning for all students without having to make significant modifications to the curriculum. This concept has been progressively incorporated into pedagogical debates and education regulations. Along this line, some publications have illustrated the efficacy of UDL in terms of access, participation, and commitment to learning processes, especially in the case of students with disabilities. To the best of our knowledge, this work provides the first systematic review of relevant academic literature that enhances our understanding of how UDL was integrated into teacher education processes. The sample consisted of a total of 88 documents retrieved from the WOS and SCOPUS databases and published between 2008 and 2022, all of which analyze the incorporation of Universal Design for Learning into initial and in-service teacher education processes. The results point to a dominant approach grounded on a problematic association of UDL with students with disabilities or learning difficulties. This narrow view restricts how teachers apply inclusive practices in classrooms, calling for a broader interpretation of UDL. The study contributes to fostering discussions about Universal Design for Learning (UDL) as a whole, including the dominant perspective projected in how it is understood and applied in teacher education and classrooms. It envisions new, more inclusive scenarios for the development of educational approaches that support all learners, fostering a truly inclusive learning environment.

Keywords: inclusion, diversity, inclusive education, teacher education, special education, universal design for learning.

#### Resumen

El Diseño Universal para el Aprendizaje (DUA) es un enfoque educativo en desarrollo que persigue mejorar el aprendizaje de todo el alumnado sin tener que recurrir a modificaciones significativas del currículo. Progresivamente, este concepto se ha incorporado a los debates pedagógicos y a la normativa educativa más actual. En esta línea, algunas publicaciones han ilustrado la eficacia del DUA en términos de acceso, participación y compromiso con los procesos de aprendizaje, especialmente en el caso del alumnado con discapacidad. Este trabajo presenta, para nuestro conocimiento, la primera revisión sistemática de la literatura que ayuda a comprender bajo qué enfoques se integra el DUA en los procesos de formación docente. La muestra contó con un total de 88 documentos recogidos en las bases de datos WOS y SCOPUS y publicados entre 2008 y 2022. Todos ellos analizan la incorporación del Diseño Universal para el Aprendizaje en los procesos de formación inicial y permanente del profesorado. Los resultados apuntan a un enfoque dominante basado en la vinculación del DUA con los estudiantes con discapacidad. Esta visión restringe la forma en que los profesores aplican prácticas inclusivas en las aulas, lo que exige una interpretación más amplia y comprensiva del DUA. El estudio contribuye a fomentar el debate sobre el Diseño Universal para el Aprendizaje (DUA) en su conjunto, incluida la perspectiva dominante proyectada en la forma de entenderlo y aplicarlo en la formación del profesorado y en las aulas. Además, prevé nuevos escenarios más inclusivos para el desarrollo de enfoques educativos que apoyen a todos los alumnos, fomentando un entorno de aprendizaje verdaderamente inclusivo.

**Palabras clave:** inclusión, diversidad, educación inclusiva, formación de docentes, educación especial, Diseño Universal para el Aprendizaje.

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### 1. Introduction

The United Nations (UN) first established the universal right to education in Article 26 of the Universal Declaration of Human Rights (1948). Social changes in later decades created spaces for reflecting on inequalities, highlighting education processes. This led to the emergence of new pedagogic waves and initiatives such as Education for All (UNESCO, 1990), the Salamanca Statement (UNESCO, 1994) and the Delors Report (Delors, 1996), which align closely with the principles of inclusive education. In this context of change, the Center of Applied Special Technology (CAST), formulated, in the 1990s, a concept that strengthened its presence in education: Universal Design for Learning (UDL). The term's origin comes from architect Ron Mace (1941-1998) and his team at the Center for Universal Design (CUD), who proposed a design approach for products, environments, and services that guarantee access to all, without adaptations (Canter et al., 2017; Connell et al., 1997; Griful-Freixenet et al., 2021a). With this approach as the basis, CAST members connected architecture and education, showing that Universal Design could be the foundation for equal, fair education (Rose, 1999). Thus, UDL was conceived as an innovative approach, originally focused on students with disabilities or difficulties, and now generalized to ensure learning access for all students, regardless of disability or difficulty (Rodríguez Martín et al., 2020).

Technology also became essential in this initial context, presented as a key mechanism for reducing inequalities, thanks to its potential to make the learning processes more flexible and personalized (Rose, 1999, 2000, 2002). Over time, the concept evolved into a theoretical-practical approach focused on adapting the curriculum rather than individual students (Horn & Banerjee, 2009). In this sense, UDL prioritizes flexible curricula that adapt to the needs of a diverse student body, requiring rethinking of objectives, methods, assessments, and materials from a broader perspective (Cook et al., 2017; Meier & Rossi, 2020; Rao & Meo, 2016; Symeonidou & Mavrou, 2014).

UDL is founded on three core neuropsychological principles grounded in the idea that brain function relies on three different but interconnected neurological networks (recognition, strategy, and affective) that each contribute in the teaching-learning processes (García-Campos et al., 2020; Rose & Meyer, 2002). These principles translate into 9 guidelines and 31 considerations. These are the cornerstone of UDL, oriented towards facilitating their practical implementation in educational environments, which are becoming ever more diverse and heterogeneous (CAST, 2018b). The following table (Table 1) shows these principles and explains their objectives and pedagogic associations concerning their neuropsychological basis.

Principle	Objective	Pedagogic question	Neuropsychological basis
Principle 1: The ways of participating in lear- ning processes are based on a wide range of possibilities that facilitate self-management and self-regulation and generate diverse spaces to awaken and capture the interest of students.	Provide multiple means of Engagement.	Why do you learn?	(Affective networks - Emotional intelligence). Associated with the limbic system, they allow the activated cognitive mechanisms to be analyzed and assigned an emotional meaning.
Principle 2: Content is presented through multiple channels that favour diverse avenues for its perception and understanding.	Provide multiple means of Re- presentation	What do you learn?	(Recognition networks - Cognitive intelligence). Associated with the parieto-occipital region, they identify and manage sensory information that allows new information to be recorded, combi- ning it with previous experience and knowledge.
Principle 3: Multiple possibilities must be provided to gene- rate responses, communicate results, promo- te spaces for interaction and monitor learning processes.	Provide multiple means of Action and Expression.	How do you learn?	(Strategic networks - Executive intelligence). Associated with the prefrontal cortex, they allow actions to be planned, executed, and monitored based on the information captured by the recognition networks.

Table 1. Summary of the components and foundations of UDL

Adapted from CAST, 2018b

#### 1.1 Expansion and implementation of UDL

UDL emerged from the CAST in the USA and grew under educational inclusion laws (IDEA<sup>1</sup>, 1997; NCLB<sup>2</sup>, 2001), which helped promote its foundations. With the publication UDL official guidelines, which outlined its principles and application indicators, UDL gained institutional support in the USA through laws like the Higher Education Opportunity Act (2008), Every Student Succeeds Act (ESSA, 2015), and the Strengthening Career and Technical Education Act (2018). Over time, UDL expanded internationally, with countries such as Canada (2020), New Zealand (2015) or Spain (2020), integrating it into their educational regulations. Concurrently, international organizations, such as UNESCO (2020), also supported its curricular implementation, thus contributing towards its dissemination and integration across different educational systems.

The growth of UDL ideas has also been supported by studies showing high levels of acceptance among both students and teachers (Alharbi & Newbury, 2021; Cumming & Rose, 2022; L. Scott et al., 2015). Along this line, some publications have illustrated the efficacy of UDL in terms of access, participation, and commitment to learning processes (Daley et al., 2020; Marino et al., 2014; Quintero et al., 2022), especially for students with disabilities (Ok et al., 2017).

In recent decades, approaches to education, particularly Inclusive Education, have evolved rapidly. However, it seems that UDL has not progressed as swiftly. In this sense, and despite the fact that more recent definitions emphasize the role of UDL as a paradigm that seeks to improve the learning of all students (Fernández Portero, 2020), the reality is that much of the literature focuses on students with various disabilities or learning difficulties (Armstrong, 2022; Bartz, 2020; Reyes et al., 2022; Van Munster et al., 2019; Wright et al., 2022).

Other studies underline the value of UDL as a mechanism for addressing diversity in classrooms, beyond disability, and integrating an intercultural component within its definition (Andrews & Fouche, 2022; Bartz & Kleina, 2021; Delk, 2019; Quintero et al., 2022). A more critical perspective has emerged, highlighting the importance of social, economic, and political contexts in educational processes. In this sense, some authors (Karisa, 2023; Mehta & Aguilera, 2020) point out that UDL, intrinsically, cannot and should not assume the responsibility for reversing structural inequalities embedded in neo-liberal systems. In the same manner, it is assumed that this framework of inequality is not constructed exclusively according to the concept of disability, but instead, other axes of oppression exist, such as racism or sexism, that demand a re-thinking of equality from an intersectional perspective (Hackman, 2008).

On the other hand, some research finds positive impacts of UDL on academic outcomes (Baumann & Melle, 2019; Rappolt-Schlichtmann et al., 2013; Wilson et al., 2011), while other studies question these benefits (King-Sears et al., 2015; Roski et al., 2021). Authors like Murphy (2021) even call into question the implementation of UDL, due to the lack of scientific evidence, pointing out that "because the effectiveness of this theory has not been proven, there are no grounds for UDL implementation plans to be framed as "evidence-based" decisions" (p. 7).

Therefore, there are many discrepancies in the manners in which to understand or implement UDL (Hollingshead et al., 2022; Lowrey et al., 2017) and due to this, authors such as Capp (2020) invite us to continue researching and delving into this educational approach, from a more critical and open perspective, to delve into its impact on students, classroom practices, and the organization and management of education centres, to better understand the real possibilities and contributions of this concept, and its potential for educational and social transformation.

UDL views student diversity as a natural part of educational reality (Griful-Freixenet et al., 2021a), but this is a challenge for teachers, who, aside from knowing the objectives and contents of the curriculum, are also responsible for guaranteeing access to them for all students under the prism of equality (Scott et al., 2017). In this sense, some studies indicate that teachers often feel unprepared to address such

I Individuals with Disabilities Education Act, 20 U.S.C. (2004).

<sup>2</sup> No Child Left Behind Act of 2001, P.L. 107-110, 20 U.S.C. (2002).

broad demands through UDL, highlighting teacher training as a valuable starting point to improve this situation (Capp, 2017; Fuchs, 2010; Vitelli, 2015).

The growing interest in UDL in the recent scientific literature, its epistemological complexity, and its progressive incorporation into educational curricula, have awakened the need to study the role of educators in this context, by assuming a direct link between educational theory and the implementation of inclusive practices (Sharma, 2018). It is therefore valuable to explore how UDL is articulated within teacher training, examining the perspectives and methods through which educators address UDL, how they interpret its principles, and how this translates into educational practice.

Recent literature underscores the critical rol of teachers in transferring UDL knowledge to the classroom, with studies analyzing how UDL training enhances inclusive teaching practices (Courey et al., 2013; Spooner et al., 2007). Nevertheless, although different studies describe different perspectives for addressing UDL, few explicitly characterize these methods, particularly in teacher training. The present article proposes a study aimed at understanding how UDL is contextualized in teacher training by analyzing its representation in scientific literature.

### 2. Method

This study follows a systematic literature review model, as presented in prior educational research by authors like Sant (2019) and Menéndez-Álvarez-Hevia et al. (2022). First, a sample of scientific works was selected based on a set of predefined and justified parameters, which structured the search and application of inclusion/exclusion criteria. Once the corpus of study was finalized, an analysis was carried out, in which interpretative strategies of reading and analysis were applied. As in the review studies previously mentioned, the aim was to delve into the discursive relationship between the different ideas developed in the texts. The discussion focuses on ways UDL is articulated in studies on teacher training, while also examining the evolution of the UDL concept in schools, teacher training in UDL, and its potential connection to teaching practices.

The search was conducted considering the two databases containing the greatest number of high-impact journals and publications, Web of Science (WOS) and SCOPUS. In this way, a large spectrum of scientific production associated with the central subject of the present study was sought. The search procedure was divided into 3 phases, which are detailed below:

## Phase 1: Initial screening based on inclusion and eligibility criteria and obtaining the first sample (Identification)

The first phase of the search used the terms "Universal Design for Learning" and "Universal Design Learning". The search terms were delimited to their presence in the title, abstract, and keywords. Additional terms were excluded to allow an initial, broad view of UDL's conceptual impact in the literature and to yield a manageable number of publications for analysis. This broad approach aimed to reduce the risk of overlooking relevant studies. Aside from these terms, the type of document was established as a parallel inclusion criteria. For this first phase of the study, journal articles and conference papers were selected, excluding book chapters due to accessibility constraints. On the other hand, the date range was set to 2008-2022. With the latter, the aim was to limit the number of results, given that in 2008, the CAST published the first UDL guidelines and implementation guide, which helped in providing global visibility to the concept.

After the application of the corresponding operators, the first search resulted in a total of 1133 documents (SCOPUS = 556; WOS = 577), from which the selection of the final sample was performed.

# Phase 2: Selection and construction of the initial sample (Screening).

To facilitate the organization and management of the information, the results were systematized through the use of Rayyan Software, which eases the detection and elimination of duplicate records, the categorization of files, and the process of selection.

The elimination of the duplicates resulted in a total of 780 publications. To outline the results, and to obtain a more reduced and manageable sample, the Conference Papers were eliminated, to focus the search on scientific articles, as more rigorous scientific literature, for a total of 567 results. Afterwards, to more precisely adjust the sample to the area

of study, the Rayyan files were filtered according to the following keywords associated with teacher training: Teacher training, Preservice, Pre-service, Professional Development, Teacher Education, Candidate, Candidates. The introduction of these criteria resulted in a sample of 97 results, which were selected for further examination and analysis.

# Phase 3: (Included) Final sample (Included)

Lastly, during the reading process, 9 publications were detected which were deemed not appropriate for their inclusion due to diverse motives. In some cases, the research was centred on the role of UDL, but did not allude to teacher training (N=7);



on the contrary, others highlighted the teacher training process without integrating UDL in the article (N=1). Lastly, one of them was framed outside of the limits of the area of education (N=1). Thus, from an international perspective, a final sample of 88 articles was obtained, which addressed the integration of UDL in the processes of teacher training between 2008 and 2022. The information was extracted through the use of the Excel tool, which facilitated its categorization based on the research questions, as well as the review and analysis of the content.

Below, the flow diagram (PRISMA) is shown, which includes all the previously explained phases, as well as the decisions that were taken successively until the final sample was obtained.



#### 3.1 Results and Discussion

The main objective of the present study is to analyze how UDL is integrated into teacher training processes. Its progressive incorporation into the legislative frameworks and educational curricula demands the presence of teachers who are trained and prepared to guarantee its efficient implementation. Thus, it is indispensable to understand the mechanisms through which UDL is articulated in teacher training processes, both to clarify and systematize the advances made until today, pathways that bridge the gap between theory and practice.

# 3.2 Current state of UDL in the study of teacher training processes

Studies examining the role of UDL in teacher training processes have increased exponentially since 2019, peaking between 2021 and 2022. In fact, 40% of the selected articles were published during these two years, underscoring a recent surge in interest toward understanding and assessing the impact of UDL in teacher training and exploring methods for its integration.

In terms of geographic distribution, the USA leads in UDL research, accounting for nearly half of the studies. In recent years, UDL has expanded beyond the USA, particularly to Canada and Spain (Benet-Gil et al., 2019; Bradford et al., 2021; Diaz-Vega et al., 2020; Moghaddam et al., 2020), as well as Belgium, Brazil, and South Africa (Griful-Freixenet et al., 2021b; Hayward et al., 2022; Ragpot, 2011; Zerbato & Mendes, 2021). This phenomenon, which progresses along with the recent addition of UDL to institutional documents and education guidelines (UNESCO, 2020; LOMLOE, 2020; ESSA, 2015), could greatly justify the growth in scientific production in this area.

When centring on research objectives, it seems that the main axis of literature that associates teacher training with the Universal Design for Learning is constituted through a fundamentally practical approach. In this way, we find the predominance of quantitative and positivist empirical studies (30), followed by those more qualitative and interpretative (21). To a lesser degree, we find studies that used mixed research methods (11). Of these, most of the studies sought to improve the practice of teaching, or when applicable, suggested changes in the teaching plans to reach this objective, through studies that investigated the effects of the application of a training program in which UDL was one of the main contents (Ciampa, 2017; Craig et al., 2022b; L. Scott et al., 2022), or the effects of the application of a training program in which UDL was the paradigm that guided the training proposal (Basham et al., 2010; Gutiérrez-Saldivia et al., 2020; Navarro et al., 2016; Trust & Pektas, 2018). Lastly, we find a lower interest in addressing the subject matter from a theoretical perspective (26) (Bradford et al., 2021; Fornauf et al., 2021; Messinger-Willman & Marino, 2010), a phenomenon that contravenes the importance of theory to guarantee successful education practices, especially when dealing with Inclusive Education (Sharma, 2018). It must also be highlighted, in this respect, that no prior systematic reviews were found that examined the role of UDL within the context of teacher training.

Lastly, the analysis revealed a tendency to focus on UDL in the training of teachers who work with students with disabilities or learning difficulties. In this sense, there was a significant number of articles related to the training of Special Education teachers (Basham et al., 2010; Bondie, 2015; Courey et al., 2013; Scott et al., 2015, 2022). In cases where training fell on General Education teachers, there was a significant sample of publications that explicitly alluded to the intervention with disabled students or those with learning difficulties (Hayward et al., 2022; Hutchison et al., 2022; Lee & Picanco, 2013; Mady, 2018; Navarro et al., 2016). Some studies addressed both profiles at the same time, though most were primarily focused on on interventions for students with a disability or learning difficulties (Barrio & Hollingshead, 2017; Lee & Griffin, 2021; Misquitta & Joshi, 2022).

# 3.2 Approaches of UDL in the literature that addressed teacher training

Generally, much of the literature supports that UDL was developed under principles established for Inclusive Education (Canter et al., 2017; Cook et al., 2017; Rao & Meo, 2016). This systematic review, however, reveals divergent perspectives on UDL's interpretation. Thus, the results from the review show three different approaches to conceptualizing UDL within teacher training processes.

#### *3.2.1 Clinical approach*

This approach builds on the initial UDL principles (D. Rose, 1999). Within teacher training, UDL is conceived as an efficient tool for addressing diversity in education centres, and ensuring equal learning opportunities, primarily defined in terms of disability/ability. UDL interventions in this framework typically start with a medical diagnosis, focusing primarily on students with disabilities or learning difficulties. Consequently, there is a tendency toward studying Special Education teacher training, both initial (Basham et al., 2010; Bondie, 2015; Courey et al., 2013; Haley-Mize & Walker, 2014) and permanent (Agostini & Renders, 2021), or both at the same time (Courey et al., 2013; Scott et al., 2015, 2022; Zerbato & Mendes, 2021), consolidating this perspective further. The clinical approach is manifested using a double approach: one of them, which will be denominated *explicit model*, evidently prioritizes the implementation of UDL with students who are disabled or who have learning difficulties, insisting on their diagnosis, and in that the benefits have a direct impact on students with a specific need (Elder Hinshaw & Sakalli Gumus, 2013; Lee, 2018; McKenzie et al., 2023). The implicit model, on its part, highlights the value of diversity and the positive impact of UDL on the entire student body, although it continues to point to more vulnerable students in terms of ability (Frey et al., 2012; Hayward et al., 2022; Lee & Picanco, 2013; Unluol Unal et al., 2022).

This creates a certain discordance with the inclusive approach, on which UDL is based, resulting in a gap between the principles postulated in theory and their practical implementation.

In terms of research, the clinical model fundamentally responds to quantitative and positivist research studies (Courey et al., 2013; Craig et al., 2022b, 2022a; Hromalik et al., 2021; Lanterman & Applequist, 2018; Westine et al., 2019). The objective consists of obtaining data that is objective, quantifiable, and generalizable to the entire population, without delving into their causes (Alharahsheh & Pius, 2020; Ramos, 2015). Even in the mixed studies, a certain tendency towards the quantification of the results was observed (Barrio & Hollingshead, 2017; Corbin Frazier & Eick, 2015; Lee & Griffin, 2021).

#### 3.2.2 Diversity approach/social approach

Another approach under which UDL is presented, although to a lesser degree, is that we refer to as the plural model or diversity model. Here, UDL is viewed as an appropriate approach to addressing the demands of an inherently diverse student body (Moghaddam et al., 2020). Diversity is conceived as a positive phenomenon (Benet-Gil et al., 2019), from an optimist perspective, without deeply exploring its potential implications in terms of social and educational vulnerability (Bradford et al., 2021). This model proposes a broader perspective on diversity, expanding the focus beyond disability (Gentile & Oswald, 2021), and recognizing that diversity is explained by multiple factors, among which we find the sociocultural component, which greatly stands out (Bartz & Kleina, 2021; Delk, 2019). In this sense, the paradigm is directly related to the Inclusive Education approach, promoted by Booth and Ainscow (2015), which highlights the importance of guaranteeing the presence, participation, and progress of all students, by removing barriers to learning. Additionally, teacher training is extended to all teachers, beyond the specialists, regardless of the educational level at which the training is directed.

In this case, empirical studies show a balance between quantitative and qualitative perspectives, with interpretative studies being slightly more prevalent (Bartz & Kleina, 2021; Glas et al., 2023; Moghaddam et al., 2020). Likewise, a proportional increase was observed in theoretical and reflective studies, concerning the clinical model (Attwood, 2022; Flood & Banks, 2021; Reinhardt et al., 2021; Vininsky & Saxe, 2016), in which they have a lesser impact.

#### 3.2.3 Critical approach

The critical approach of UDL in teacher training processes comes from a fundamental premise: disability, understood from its most widespread approach, is not the only risk factor for socio-educational exclusion. With this respect, the post-structuralist view provided by *Critical Disability Studies* provides a framework of reference to understand UDL from a broader perspective, while promoting teacher training aimed at transforming and building a more equitable education system (Fornauf & Mascio, 2021). For this, two main issues are proposed. The first implies rethinking the guidelines and criteria under which the concept of ability/disability is delimited, as well as analyzing the tensions that emerge across this spectrum (Goodley, 2016; Sanmiquel-Molinero, 2020). The second requires adopting an intersectional perspective on diversity, recognizing that multiple factors come together in shaping identity and educational participation (Annamma et al., 2013; Hackman, 2008; Liasidou, 2014). This idea was summarized by Alim et al. (2017) when pointing out that exclusion mechanisms such as racism and ableism must be understood together, "otherwise, each separate system of oppression will take each other's place to accomplish the same result of marginalizing particular children" (p. 8). In this sense, teachers must be trained on competencies that will allow them to identify the mechanisms of structural inequality in the educational system, and the multiple channels of oppression that extend beyond disability, including behaviorism, ableism, gender identity or racism.

On the other hand, the critical approach of UDL in the training of teachers presents the paradigm as a process rather than a fixed state. This perspective implies that UDL should be subject to continuous reform and change. In this sense, UDL should not be viewed as an absolute or unchallengeable truth, on the contrary. The objective of UDL under a critical approach seeks to question its epistemological principles and their relationship with hegemonic norms of the education system that are found under the protection of systems of oppression. As Fornauf et al. (2021) note, this approach continuously reconstructs the concept by questioning the role of the expert, and examining to what extent this role reflects a structurally unjust social system that may perpetuate these dynamics within an educational context. In this line, we must ask if schools are truly responding to the diversity, and if the resources destined towards UDL are adequate for incorporating UDL effectively and for breaking away from the prevailing mechanisms of exclusion and discrimination.

All approaches and their main characteristics are summarized in the following figure to synthesize and visually present the information.





# 4. Implications of the approaches to teacher training

The results show that there are many ways to understand and incorporate UDL principles in teacher training. There is an open discourse in which various interpretations of the concept converge (Rao et al., 2019), highlighting the challenges of the experts when systematizing its conceptualization (Hollingshead et al., 2022; Lowrey et al., 2017).

In any case, a clinical approach predominates, viewing UDL primarily as a tool for addressing diversity in terms of disability and learning difficulties. In this sense, empirical and positivist studies are prominent, focusing on the effectiveness of integrating UDL in teacher training processes, especially for those tasked with meeting the needs of students with disabilities. This intention of generalizing the results comes face to face with the nature of the education context, a complex and diverse reality with a multitude of individual particularities that cannot always be studied as a whole. Likewise, the dominance of the clinical model delimits the educational scenario within a healthcare sphere that is at risk of driving UDL away from its pedagogic aim: to ensure universal access to the curriculum, and ultimately, to leverage learning as a means of social advancement.

It is important to consider that the predominance of one discourse over another depends on dominant power mechanisms, which strongly influence how UDL is incorporated into teacher training programs and, consequently, its direct implementation in the classroom. Nonetheless, it is important to highlight that the variety of discourses fosters new opportunities for debate, new horizons of improvement, and new ways to reflect on the application of the paradigm. This opens doors to the construction of new perspectives that can help complement and enrich prevailing assumptions within the current educational context.

### 5. Conclusion

This systematic review allowed us to describe the evolution of the UDL concept within teacher training processes. It also allowed us to determine the current state of research, and to discover what models or approaches facilitate its understanding when speaking about teacher training.

The literature describes UDL as a model addressed in teacher training from diverse perspectives. Among these, the clinical approach predominates, emphasizing UDL's role with students who have specific needs, primarily related to disabilities. an alternative approach has emerged that considers UDL an ideal framework to tend to diversity, understood as a positive (Benet-Gil et al., 2019) and multifactorial (Bartz & Kleina, 2021) phenomenon, which strongly emphasis on contextual factors, hence the social approach. Lastly, a more critical perspective has arisen, which seeks to repeatedly revise its principles, and utilize UDL not as the sole tool, but as a valuable one, when dealing with, in an intersectional manner, the system of structural oppression that results in mechanisms of educational exclusion and vulnerability (Fornauf et al., 2021; Fornauf & Mascio, 2021).

Rather than favoring a specific approach to understanding UDL, the article aims to foreground for the first time the broad variety of ways that UDL can be designed to be introduced to teachers and to acknowledge how such choices inevitably follow teachers into classrooms. The work contributes towards promoting the debate on UDL in general, and on the hegemonic view that is projected in the manners in which to understand and implement it, in both teacher training and the classrooms, conceiving new scenarios for the construction of new more inclusive educational proposals.

As a limitation of the study, even though the systematic review process was performed with a detailed and rigorous procedure, the results and the discussion were primarily interpretive. This may introduce an ideological component that could lead to a biased view of the context. Another limitation is that only 50% of the articles included in the sample correspond to publications over the last 6 years. However, it should be noted that the aim of the review was not only to capture the most recent contributions but also to study the evolution of approaches to UDL in teacher education. Thus, Clinical and Diversity approaches have been present from the earliest publications to the most recent ones, showing that there has been little overall change in perspective. On the other hand, the results enabled us to define three discourses that can be used as a starting point for understanding how UDL is understood in the processes of teacher training and the implications this may have in its practical implementation. However, the proposal does not delve into the relationships or overlaps that may be found between the approaches, which may result in the emergence of other complementary perspectives. Future research should explore the relationships between the different approaches to identify potential synergies or tensions that could enrich the understanding of UDL.

Teacher education has a direct impact on teacher practice. Understanding the approaches under which UDL is constructed allows us to identify and narrow down its implementation paths and redesign training processes to ensure that UDL is applied according to the educational context. This will facilitate the fostering of inclusive practices that address the needs of all learners and promote equitable learning environments. Ultimately, this research can serve as a starting point for the analysis of these approaches beyond teacher education. Thus, the door is open to future research to see if these same findings can be transferred to other settings, such as primary and secondary education or non-formal contexts.

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