

# UNIVERSAL DESIGN FOR LEARNING AND SELF-DETERMINATION. A SYSTEMATIC REVIEW ON EDUCATIONAL PRACTICES FOR STUDENTS WITH DISABILITIES

## UNIVERSAL DESIGN FOR LEARNING E AUTODETERMINAZIONE. UNA REVISIONE SISTEMATICA DELLE PRATICHE EDUCATIVE RIVOLTE A STUDENTI CON DISABILITÀ



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### ABSTRACT

The Universal Design for Learning (UDL) framework fosters inclusive education and promotes self-determination in students with disabilities. This systematic review, conducted according to PRISMA guidelines, analyzed empirical studies on UDL's impact. Results show that UDL enhances autonomy, self-efficacy, and active participation, supporting resilient learner identities and highlighting the need for longitudinal research.

Il paradigma dello Universal Design for Learning (UDL) promuove l'educazione inclusiva e sostiene l'autodeterminazione negli studenti con disabilità. Questa revisione sistematica, condotta secondo le linee guida PRISMA, ha analizzato studi empirici sull'impatto dell'UDL. I risultati evidenziano un miglioramento dell'autonomia, dell'autoefficacia e della partecipazione attiva, sottolineando la necessità di ulteriori ricerche longitudinali.

### KEYWORDS

Universal Design for Learning, Self-Determination, Disabilities, Students, Systematic Review.

Universal Design for Learning, autodeterminazione, disabilità, studenti, revisione sistematica.

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## Introduction

Inclusive education requires pedagogical strategies capable of recognizing and valuing the diversity of all learners, particularly those with disabilities. This perspective involves not only ensuring access to learning, but also promoting educational and social equity by supporting students in developing meaningful skills for their life paths (Canevaro et al., 2022). Within this framework, the ability to act as autonomous and responsible individuals referred to as self-determination represents a core competence that should be fostered from the early stages of education (Cottini, 2016).

Self-determination includes a set of interrelated skills and attitudes such as autonomy, goal setting, decision-making, self-advocacy, and self-efficacy. These are considered essential for academic success, future employability, and active participation in social and civic life (D'Alonzo, 2018). Supporting the development of these dimensions is especially critical for students with disabilities, who often face systemic barriers to full participation and agency within traditional school settings.

The Universal Design for Learning (UDL) framework, developed by CAST (2011; 2018) and grounded in cognitive neuroscience, offers a promising approach for inclusive education. By promoting multiple means of representation, engagement, and expression, UDL supports the design of learning environments that are flexible, accessible, and responsive to learner variability. UDL shifts the focus from individual accommodation to universal design, with the aim of activating students as self-regulated and self-determined learners (Sgambelluri, 2020).

Although literature on both UDL and self-determination is growing, empirical evidence explicitly examining how UDL-based educational practices contribute to the development of self-determination skills in students with disabilities remains fragmented. To date, no comprehensive synthesis has explored the specific relationship between UDL and this key educational outcome.

This systematic review aims to address this gap by analyzing existing empirical studies on the role of UDL in fostering self-determination among students with disabilities in primary and secondary school settings.

## 1. Methodology

This systematic review was conducted through an extensive and structured process (Petticrew & Roberts, 2008), designed to ensure transparency, replicability, and methodological rigor throughout all phases of the study. The process was articulated across several interdependent stages: defining the educational phenomenon under investigation, selecting and critically appraising the relevant empirical literature (Noblit & Hare, 1988), and systematically extracting, organizing, and aggregating the data (Ghirotto, 2020).

Grounded in an aggregative synthesis approach, this review aimed not to generate new theoretical constructs, but rather to collect, systematize, and interpret existing empirical findings related to the implementation of Universal Design for Learning (UDL) and its impact on the development of self-determination in students with disabilities. This approach allowed the identification of recurrent themes across studies, facilitating the construction of a structured overview of the educational effects of UDL strategies, especially in relation to outcomes such as autonomy, goal setting, self-advocacy, and self-efficacy (Sandelowski & Barroso, 2007).

The review was informed by sensitizing concepts (Noblit & Hare, 1988; Hammersley, 2006), including learner variability, inclusive education, and student agency. These theoretical lenses oriented the interpretative reading of the empirical material, supporting the recognition of key educational priorities for students with disabilities and helping frame the review within an inclusive pedagogical paradigm.

To support the methodological credibility and transparency of the process, a review protocol was developed and prepared for submission to PROSPERO, the international prospective register of systematic reviews in health and social care. Although at the time of writing the registration is not yet formalized, the design follows the expected standards of preregistered protocols and adheres to recognized norms for reporting educational evidence syntheses.

The review strictly followed the PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (Moher et al., 2010), which offer a consolidated structure for reporting systematic reviews in a clear, transparent, and reproducible way. Although originally conceived for quantitative reviews, and particularly for meta-analyses of randomized controlled trials, PRISMA has become widely adopted in the educational research community, especially for reviews involving qualitative and mixed-methods studies. In this review, the PRISMA

framework served to structure each phase—database search, screening, eligibility, inclusion, and synthesis providing a replicable narrative and ensuring coherence between the review objectives, methods, and results.

In sum, the methodological framework adopted in this study combined rigor and flexibility, allowing for the structured synthesis of a wide range of empirical contributions related to UDL and self-determination. The process was rooted in international standards, theoretically informed, and pedagogically oriented toward improving inclusive educational practices for students with disabilities.

### **1.1 Review question**

This systematic review is guided by the following research question:

*“What empirical evidence exists on the effectiveness of Universal Design for Learning (UDL)-based teaching strategies in promoting self-determination skills in students with disabilities?”*

To ensure clarity and consistency in both the literature search and study selection processes, the PICOS framework (Population, Intervention, Comparison, Outcomes, Study design) was adopted as a guiding structure (Methley et al., 2014). This framework enabled a systematic and transparent approach to defining inclusion and exclusion criteria aligned with the objectives of the review.

The components of the PICOS framework were defined as follows:

- **Population (P):**  
The review focused on children, adolescents, and young adults with disabilities enrolled in formal school settings, including primary, lower secondary, and upper secondary education. Studies targeting adults in higher education or non-formal or vocational training contexts were excluded to maintain a consistent focus on the compulsory education system and its inclusive pedagogical practices.
- **Intervention (I):**  
Eligible studies had to describe teaching strategies or educational practices explicitly based on the Universal Design for Learning (UDL) framework. Only interventions clearly referencing UDL principles—such as the provision of multiple means of representation, engagement, and expression—were considered. Studies applying generic inclusive methods without specific alignment to UDL were excluded.

- **Comparison (C):**  
When applicable, comparison conditions included traditional teaching approaches, the absence of a defined intervention, or educational practices not grounded in UDL. However, studies without a control or comparison group were not excluded a priori, as the focus was on capturing a broad range of empirical contributions.
- **Outcomes (O):**  
The primary outcomes of interest were indicators related to self-determination, including the development or enhancement of autonomy, decision-making, goal setting, self-advocacy, self-efficacy, and active participation in learning. These outcomes reflect the multidimensional nature of self-determination as conceptualized in the educational and psychological literature.
- **Study Design (S):**  
The review included empirical studies employing qualitative, quantitative, or mixed-methods designs, as well as randomized controlled trials (RCTs), quasi-experimental studies, and case studies. The decision to include diverse methodological approaches was aligned with the aggregative synthesis strategy, which aims to reflect the range of evidence available in the field of inclusive education.

By clearly articulating these eligibility criteria, the review ensured the inclusion of high-quality empirical studies that collectively offer a meaningful understanding of how UDL contributes to self-determination for students with disabilities in school contexts.

## **1.2 Review strategy**

A comprehensive and systematic literature search was conducted across six major academic databases to ensure broad and interdisciplinary coverage of empirical studies relating to Universal Design for Learning (UDL) and the development of self-determination skills in students with disabilities. The database selection was based on their relevance to education, psychology, and inclusive pedagogical research, and their inclusion in previous high-quality reviews in the field.

The following databases were selected:

- ProQuest: A multidisciplinary platform offering access to peer-reviewed journals, academic dissertations, and grey literature across educational and social science disciplines.
- ERIC (Education Resources Information Center): A key reference database for education-related research, managed by the Institute of Education Sciences (IES) of the U.S. Department of Education.
- SCOPUS: One of the largest abstract and citation databases, covering peer-reviewed literature across scientific, technical, medical, and social sciences, including educational research.
- Web of Science: A multidisciplinary citation index providing access to high-impact journals in education, psychology, and the broader social sciences.
- Wiley Online Library: A publisher-specific academic platform hosting a wide range of peer-reviewed journals, particularly relevant to educational and developmental psychology.
- EBSCOhost (Education Source): A specialized education database indexing scholarly articles, policy documents, case studies, and reports.

The search strategy was designed to retrieve studies that directly investigate the intersection between UDL-based pedagogical strategies and the promotion of self-determination among school-aged students with disabilities. A combination of Boolean operators (AND, OR) and truncations was used to structure the query and enhance the retrieval of relevant records across different indexing systems. The search terms were grouped into five conceptual categories:

1. *Universal Design for Learning*
2. *Self-determination-related constructs*
3. *Disability terminology*
4. *Instructional strategies*
5. *Study design filters*

The final query was slightly adapted for each database to align with its specific search architecture. A representative version of the search string used is as follows:

*("Universal Design for Learning" OR UDL OR "Universal Design for Education" OR "inclusive pedagogy" OR "inclusive teaching" OR "inclusive education" OR "differentiated instruction" OR "flexible learning environments" OR "universal instructional design")*

AND

*("self-determination" OR "student agency" OR "self advocacy" OR "self-efficacy" OR*

*autonomy OR "goal setting" OR "student empowerment" OR "decision-making skills" OR "self-regulation")*

*AND*

*("students with disabilities" OR "learners with disabilities" OR "special education students" OR "disabled students" OR "students with special needs" OR "neurodiverse students" OR "students with learning disabilities" OR "SEN students")*

*AND*

*("teaching strategies" OR "educational practices" OR "instructional methods" OR "inclusive practices" OR "inclusive pedagogy" OR "pedagogical strategies" OR "learning strategies")*

*AND*

*("empirical study" OR "empirical evidence" OR "qualitative study" OR "quantitative study" OR "mixed methods" OR "case study" OR "evaluation study" OR "experimental study")*

The initial database search yielded 1,457 records distributed as follows: SCOPUS (n = 72), ERIC (n = 86), Web of Science (n = 90), Wiley Online Library (n = 348), ProQuest (n = 798), and EBSCOhost (n = 72). After the removal of 285 duplicate entries, 1,172 unique records were retained and screened for eligibility based on the predefined PICOS criteria.

The search strategy was explicitly aligned with the objective of identifying peer-reviewed empirical studies—whether qualitative, quantitative, or mixed-methods—that examined how UDL-based instructional practices promote one or more dimensions of self-determination in students with disabilities enrolled in formal primary or secondary school settings.

### **1.3 Inclusion and exclusion criteria**

To ensure methodological transparency and consistency in the selection process, clear inclusion and exclusion criteria were developed based on the PICOS framework (Methley et al., 2014). These criteria were defined prior to the screening phase and applied systematically to guide the eligibility assessment at both the abstract and full-text levels.

The inclusion criteria were designed to capture empirical studies that directly investigated the implementation of Universal Design for Learning (UDL) in formal school settings and reported outcomes related to self-determination in students with disabilities. Studies that did not meet the defined population, intervention, or outcome criteria were excluded.

The following table (Table 1) summarizes the criteria used in this review:

Criteria	Inclusion	Exclusion
<b>Population</b>	Children, adolescents, and young adults with disabilities enrolled in school settings (primary, lower secondary, or upper secondary).	Adults in higher education or in non-school-based vocational training; populations without disabilities.
<b>Intervention</b>	Educational practices explicitly informed by the Universal Design for Learning (UDL) framework.	Interventions not based on UDL or unrelated to inclusive instructional design.
<b>Comparison</b>	No intervention, traditional teaching approaches, or practices not aligned with UDL (if present).	Studies lacking a relevant comparison group or without a clearly described intervention.
<b>Outcomes</b>	Development or enhancement of self-determination skills (e.g., autonomy, self-advocacy, goal setting, decision-making, self-efficacy, active participation).	Studies not addressing outcomes related to self-determination.
<b>Study Design</b>	Empirical studies: qualitative, quantitative, mixed methods, RCTs, quasi-experimental, or case studies.	Theoretical papers, literature reviews, bibliometric analyses, or studies without empirical data.
<b>Publication Type</b>	Peer-reviewed journal articles.	Grey literature (e.g., theses, reports, book chapters, conference proceedings).
<b>Language</b>	Publications written in English.	Publications in other languages.
<b>Context</b>	Studies conducted in formal school environments (general or special education).	Studies conducted outside formal school settings (e.g., universities, workplaces, community programs).

Table 1. Inclusion and Exclusion criteria

These criteria ensured the relevance, quality, and focus of the included studies and contributed to the internal coherence of the review findings. The inclusion of diverse methodological approaches (qualitative, quantitative, and mixed methods) is aligned with the review’s aggregative strategy, which aimed to capture the complexity and variety of educational practices grounded in UDL.

#### **1.4 Communicating the review (PRISMA)**

This systematic review adheres to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (Moher et al., 2010), which offer a standardized and transparent framework for the reporting of systematic reviews. Originally developed for meta-analyses and quantitative reviews involving randomized controlled trials, PRISMA has since been recognized as an effective tool for ensuring clarity and methodological rigor in reviews that incorporate qualitative, quantitative, or mixed-methods studies.

The adoption of the PRISMA 2020 framework allowed for the comprehensive and coherent documentation of all review phases—from database searching and duplicate removal to screening, eligibility assessment, and final study inclusion. This structured approach facilitated the organization and presentation of data in a way that enhances the replicability of the review process and the accessibility of its findings for researchers, educators, and policymakers.

In alignment with PRISMA recommendations, a detailed flow diagram (see Figure 1) is provided below to illustrate the different stages of the screening process and the number of studies included and excluded at each step. This visual representation contributes to the transparency of the review and supports a more accurate understanding of the scope and filtering logic applied during study selection.

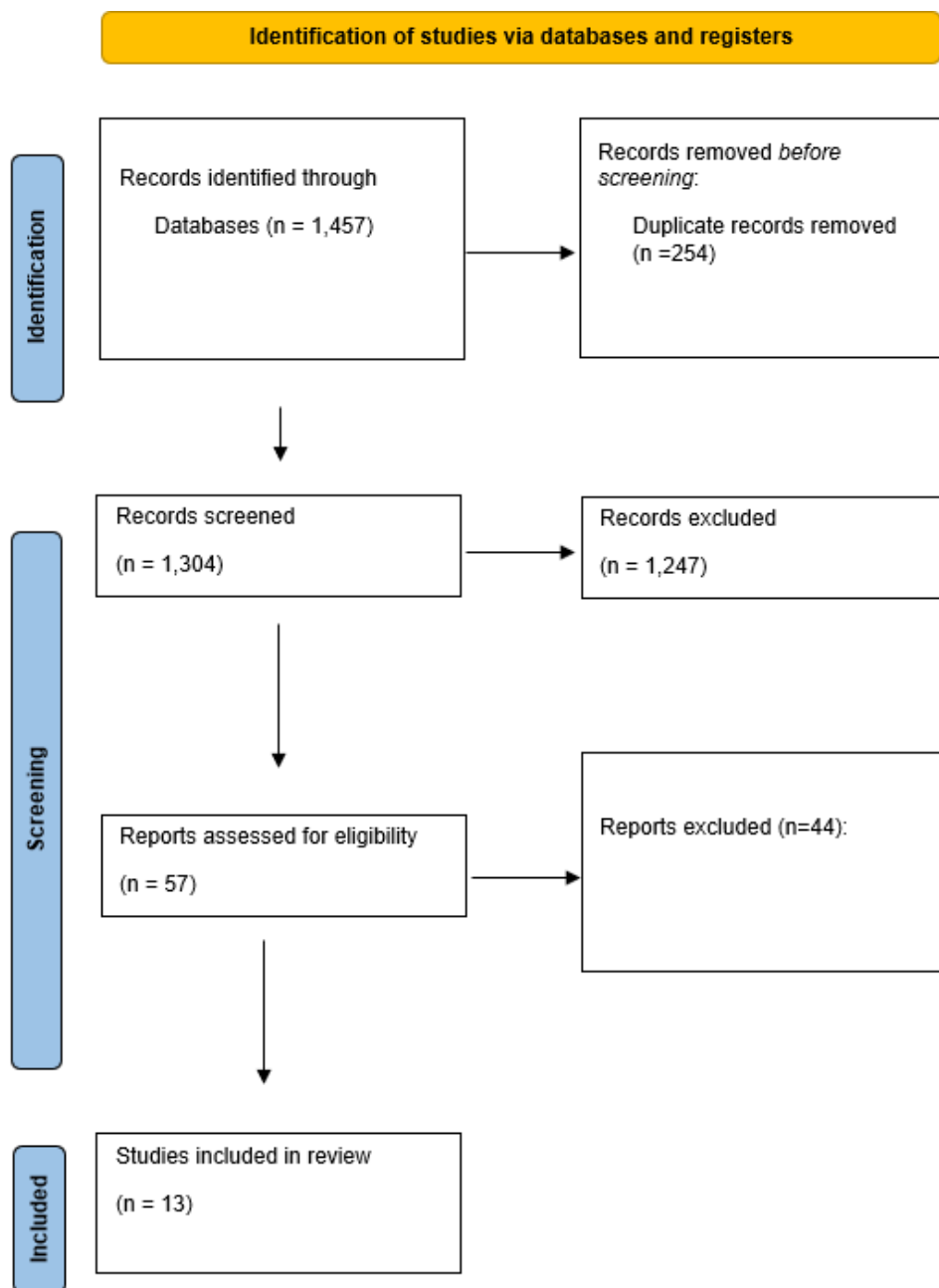


Figure 1. (PRISMA 2020 flow diagram)

## 2. Results

To support the organization and documentation of the study selection process, the web-based platform Rayyan was employed. This open-access tool facilitates the systematic screening of large volumes of references and allows researchers to manage records collaboratively, using blinded assessments, tagging, and annotation functionalities. In this review, Rayyan was used to import and manage citations retrieved from six academic databases, enabling both automatic and manual deduplication of records, and promoting methodological transparency throughout the selection process.

The search across the selected databases yielded a total of 1,457 records, distributed as follows:

- ProQuest: 798
- Wiley Online Library: 348
- Web of Science: 90
- ERIC: 86
- SCOPUS: 72
- EBSCOhost: 72

During the deduplication phase:

- 153 records were automatically removed as duplicates;
- 101 records were manually identified and removed as duplicates through consensus between reviewers;
- 31 records were confirmed as non-duplicates and retained.

Following this process, a total of 1,304 unique references were retained and subsequently screened by title and abstract, based on the predefined PICOS criteria.

Screening Phase

- Title and abstract screening: Among the 1,304 records screened, 1,247 were excluded due to irrelevance or failure to meet inclusion criteria. The most common reasons for exclusion at this stage included lack of reference to UDL, absence of outcomes related to self-determination, and non-empirical study designs.

- Full-text review: The remaining 57 articles were retrieved and assessed in full. Of these, 44 were excluded. The primary reasons for exclusion during this phase were:
  - Lack of original empirical data (e.g., theoretical or narrative reviews);
  - Absence of an explicit connection to the UDL framework;
  - Contexts outside formal school education (e.g., university-level or community-based settings);
  - Populations not aligned with the inclusion criteria (e.g., adult learners without disabilities).
- Final inclusion: A total of 13 studies met all eligibility criteria and were included in the final synthesis.

These 13 studies represent a heterogeneous corpus of empirical research, encompassing a wide variety of methodological approaches, disability types, and school levels. The selected studies span from early childhood to upper secondary education, and include participants with diverse learning profiles, such as specific learning disabilities, autism spectrum disorder, intellectual disabilities, Down syndrome, and neurodiversity. All studies explicitly applied the Universal Design for Learning (UDL) framework as a core component of their intervention or instructional design, and consistently focused on outcomes related to self-determination, including autonomy, goal setting, self-advocacy, self-efficacy, and student agency.

The characteristics and thematic contributions of the included studies are presented in detail in the following sections.

## **2.1 Overview of Included Studies**

This review included 13 empirical studies conducted between 2013 and 2023, across eight countries, mainly the United States, Canada, Colombia, Malaysia, Turkey, and Australia. Educational levels ranged from early childhood to secondary school, with one study in higher education. The target populations were students with a range of disabilities, including learning disabilities (LD), autism spectrum disorder (ASD), Down syndrome, and diverse or mixed learning needs.

Study designs included qualitative case studies, quasi-experimental and experimental designs, mixed-methods approaches, and design-based research. All studies explicitly integrated Universal Design for Learning (UDL) principles in

educational strategies aimed at promoting autonomy, self-regulation, motivation, and other self-determination-related competencies.

Several studies emphasized the role of UDL in supporting students' autonomy and capacity for self-regulation. For instance, Harper et al. (2017) explored the use of the Livescribe Pen in a fourth-grade classroom with a student with dyslexia, reporting enhanced independence in completing homework and increased confidence in managing academic tasks. Similarly, Daley et al. (2016) demonstrated that UDL-based metacognitive feedback and personalized learning analytics improved students' help-seeking behaviors and promoted greater autonomy in online environments.

Katz (2016) highlighted how the Three-Block Model of UDL influenced inclusive instructional practices, with teachers reporting that students—especially those with significant disabilities—participated in the same academic tasks as their peers, supporting self-directed learning and ownership.

Another recurring theme was the development of self-efficacy and increased student engagement. Kennedy et al. (2014) and Hitchcock et al. (2016) both reported that UDL-aligned multimedia instruction improved students' confidence and academic persistence, particularly among learners with LD. Marino et al. (2014) found that accessible texts and educational video games fostered higher levels of engagement in middle school students with learning disabilities, even when standardized test scores did not show significant gains.

Thomas et al. (2023), using a multitiered system of supports (MTSS) framework, demonstrated how UDL principles integrated into tiered interventions enhanced students' participation and engagement in both general and individualized instruction.

Many studies emphasized UDL's contribution to increasing student voice and agency. Cologon (2024) described how young children engaged in co-designing inclusive playgrounds, evidencing empowerment and decision-making even at the early childhood level. Montgomery and Snow (2024) documented how UDL-based course design in online learning environments promoted choice and flexibility, helping students with diverse learning needs take ownership of their learning paths.

Daley et al. (2014, 2016) also highlighted how making learning data visible to students supported the development of metacognitive skills and decision-making related to the use of learning supports.

A subset of studies focused on the integration of assistive technology within a UDL framework. Harper et al. (2017) and Giraldo Martínez & Ramos Carvajal (2021) explored digital tools such as the Livescribe Pen and remote learning platforms, showing how these technologies supported not only accessibility but also motivation, emotional well-being, and increased aspirations among students and families.

Other studies (e.g., Nasri et al., 2021; Yavuzarslan & Arslan, 2020) demonstrated that combining UDL with context-specific technologies (e.g., in STEM or math instruction) led to improvements in students' self-efficacy, engagement, and academic independence.

### **3. Discussion**

This systematic review aimed to synthesize empirical evidence on how Universal Design for Learning (UDL)-based instructional practices support the development of self-determination in students with disabilities. The analysis of 13 empirical studies reveals consistent findings: UDL-based interventions foster various dimensions of self-determination, including autonomy, self-regulation, self-efficacy, and student agency.

The review shows that UDL not only enhances access to learning but also transforms students' active roles in educational processes. These findings support prior theoretical assumptions that UDL, grounded in neuroscience and the principles of variability, can empower students with disabilities by offering multiple means of engagement, representation, and expression (Meyer, Rose, & Gordon, 2014).

Across contexts and disability types, UDL strategies facilitated the development of self-determined behaviors. Autonomy was enhanced through flexible and student-centered instruction, as seen in the use of assistive technologies like the Livescribe Pen (Harper et al., 2017) and in student-led design processes (Cologon, 2024). The reviewed studies provide evidence that when students are offered meaningful choices, accessible tools, and personalized supports, their motivation, persistence, and engagement increase.

Self-efficacy, another core component of self-determination, emerged as a recurring outcome, particularly in multimedia- and technology-enhanced UDL environments (Kennedy et al., 2014; Daley et al., 2016). These environments

supported students in understanding their learning processes, managing challenges, and gaining confidence in their abilities.

Furthermore, the promotion of voice and agency—key dimensions of self-determined learning—was evident in several studies. Students who had opportunities to reflect, self-assess, and make learning decisions reported increased ownership of learning and a sense of purpose, which are crucial for long-term educational success.

The findings of this review reinforce the relevance of UDL as a pedagogical approach that not only ensures access but also promotes participation and empowerment. Educators should be encouraged to adopt UDL principles not only to accommodate diversity but to foster students' self-determined learning pathways.

From a pedagogical perspective, UDL offers a proactive and flexible model that aligns well with inclusive education. The integration of UDL strategies—such as goal-setting supports, feedback mechanisms, assistive technologies, and flexible assessment—can be intentionally designed to develop students' autonomy and voice, especially in students who have historically been marginalized or excluded. Moreover, the review highlights the importance of professional development for teachers, who play a key role in implementing UDL with fidelity and purpose. Teachers' attitudes, beliefs, and competencies in designing inclusive, student-centered environments are crucial for promoting self-determination in diverse classrooms.

### **3.1 Research gaps and future directions**

Despite the promising findings, the current body of empirical evidence remains limited in scope and depth. Most studies were conducted in the United States, with a few in other cultural and educational systems. There is a need for more cross-cultural and longitudinal studies to explore how UDL impacts self-determination across time, developmental stages, and educational systems.

Additionally, few studies employed validated instruments to measure self-determination outcomes directly. Future research should include standardized tools to assess changes in autonomy, self-regulation, and self-advocacy in order to strengthen the evidence base and enable comparability across studies.

Lastly, more research is needed in primary education, where early support for self-determination can have long-lasting effects. There is also a need for more

intervention studies that examine the combined effects of UDL and emerging technologies—such as AI, adaptive learning systems, and gamified environments—on the development of self-determined learners.

## **Conclusions**

This systematic review explored how Universal Design for Learning (UDL)-based educational strategies contribute to the development of self-determination in students with disabilities. The analysis of 13 empirical studies highlights the transformative potential of UDL in promoting autonomy, self-regulation, self-efficacy, and student voice across diverse educational contexts.

UDL emerges as more than a framework for accessibility—it is a catalyst for meaningful inclusion and student empowerment. By offering flexible pathways to learning and recognizing learner variability, UDL enables students with disabilities to engage actively in their education, make informed decisions, and develop the competencies needed for academic and life success.

The findings call for greater integration of UDL principles in teacher education, instructional design, and educational policy, emphasizing the importance of fostering environments that nurture self-determined learners. To deepen the impact, future research should adopt more rigorous methodologies, explore long-term outcomes, and examine the intersection of UDL with emerging technologies and diverse cultural contexts.

Ultimately, supporting self-determination through UDL is a key step toward realizing an inclusive, equitable, and learner-centered education for all.

## Appendix – Included studies

Author (Year)	Country	Study Design	UDL Strategy	Outcomes on Self-Determination
Bateman et al. (2022)	USA	Naturalistic intervention	UDL-informed engagement strategies during non-instructional times	Increased engagement, positive affect, and task persistence
Cologon (2024)	Australia	Practitioner research	Child-led inclusive co-design of play environments	Empowerment, voice, and agency in design processes
Daley et al. (2016)	USA	Design-based research	UDL-based feedback on learning analytics and self-reflection	Improved help-seeking, reflection, and self-regulation
Giraldo Martínez & Ramos Carvajal (2021)	Colombia	Qualitative case study	UDL-informed digital tools for remote language learning	Increased communication, participation, and motivation
Harper, Kurtzworth-Keen & Marable (2017)	USA	Qualitative case study	Use of Livescribe Pen aligned with UDL principles	Enhanced autonomy, motivation, and aspirations
Hitchcock et al. (2016)	USA	Mixed-methods	TeenACE: multimedia and scaffolds for writing	Improved self-expression and task ownership
Katz (2016)	Canada	Quasi-experimental	Three-Block Model of UDL	Greater teacher efficacy, student participation, and inclusion

<b>Kennedy et al. (2014)</b>	USA	Experimental	UDL-based multimedia for vocabulary instruction	Improved self-efficacy and academic confidence
<b>Marino et al. (2014)</b>	USA	Mixed-methods	Video games and accessible text (UDL-aligned)	Increased engagement, autonomy, and participation
<b>Montgomery &amp; Snow (2024)</b>	Canada	Qualitative	UDL principles in online course design	Promoted learner voice, choice, and confidence
<b>Nasri et al. (2021)</b>	Malaysia	Quasi-experimental	UDL + Multiple Intelligences in STEM	Enhanced engagement and interest in STEM
<b>Thomas, Lembke &amp; Gandhi (2023)</b>	USA	Case study	UDL in multi-tiered systems of support (MTSS)	Greater autonomy and active engagement
<b>Yavuzarslan &amp; Arslan (2020)</b>	Turkey	Descriptive survey	UDL-aligned math instruction strategies	Improved engagement and academic independence

### Author contributions

Rosa Sgambelluri is the scientific coordinator of the research and the author of §§ Introduction, 1, 2, 2.1, 3 and 3.1. Francesca Placanica is the author of §§ 1.1, 1.2, 1.3, 1.4, and § Conclusion is the result of a shared discussion between the authors.

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