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Enhancing Inclusive Education in Higher Education: Best Practices for UDL Implementation

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Abstract

The increasing diversity of student profiles in Higher Education presents a valuable opportunity to enhance teaching and learning processes. However, for education to be truly inclusive, it requires an intentional approach. Creating an inclusive classroom environment is, therefore, a challenge for educators, who often face uncertainty about how to begin this process and what methodological approaches to adopt. Universal Design for Learning (UDL) offers a holistic framework focused on supporting the learning of all students and recognising diversity as the norm, encouraging, as well, the proactive identification of barriers within the curriculum, rather than attributing them to the students themselves. The goal of UDL is to create teaching and learning experiences that are accessible, inclusive, and flexible, regardless of individual student characteristics. Despite its potential, there are significant challenges to implementing UDL, including time and resource constraints, a lack of institutional support, and limited faculty awareness of this curriculum design model. Additionally, in Portugal, there is an absence of overarching guidelines or specific national legislation, leaving each Higher Education institution responsible for defining its own framework. This exploratory scoping review aims to analyse emerging trends and best practices in the implementation of Universal Design for Learning (UDL). Drawing on international case studies, it offers practical guidelines for designing inclusive lessons, emphasizing the importance of setting clear learning objectives and proactively addressing potential barriers to learning. The purpose of this summary is to support the effective transformation of teaching and assessment practices in Higher Education.

Keywords: Universal Design for Learning; Higher Education; Student-Centred Learning; Inclusive Education.

1 Introduction

Diversity emerges as an opportunity to enhance student learning. However, inclusion must be intentionally pursued to achieve this purpose. Conversely, the personalised adaptation of lessons, materials, and assessment elements can be perceived as laborious for educators. In addition, there is uncertainty regarding how to initiate this process and which methodological approaches to adopt (Sanger, 2020). The objective of this exploratory study is to investigate strategies planned and implemented in Higher Education at a curricular level, presenting them in a flexible way and offering a guiding proposal for planning inclusive lessons, informed by international examples and complementing existing guidelines (CAST, 2024).

Anticipating differences at the classroom level can promote greater inclusion and quality in education, benefiting all students (Sanger, 2020). In this context, the Universal Design for Learning (UDL) framework will be addressed from an inclusion-facilitating perspective, referring to the planning and curricular organisation around universal measures, with accessible, flexible, and effective actions (King-Sears et al., 2023). According to the [guidelines](#) proposed by CAST (2024), the promotion of the following principles are suggested for a student-centred learning: (1) Engagement: multiple means of engagement—the ‘Why’ of learning; (2) Representation: multiple means of representation—the ‘What’ of learning; and (3) Action and Expression: multiple means of action and expression—the ‘How’ of learning.

2 Methodology

2.1 Objective and research questions

The decision to undertake a scoping review was adopted as the most suitable method for mapping the existing literature on the implementation of the Universal Design for Learning framework in Higher Education. An exploratory study, focusing on trend analysis, was conducted, examining publications from the last two years. This approach was deemed appropriate for synthesising available knowledge, identifying key concepts, and exposing gaps in the literature. These objectives are materialised in the following Research Question (RQ):

RQ1: How is Universal Design for Learning (UDL) planned, implemented, and evaluated in Higher Education Institutions?

2.2 Eligibility criteria

Once the research question was established, the eligibility criteria for the scoping review were defined by the research team. The eligibility criteria resulted in the inclusion of: 1) documents indexed in Scopus or WoS databases; 2) documents with keywords found in the article title, abstract, or keywords in the case of Scopus, or in the abstract in the case of WoS; 3) documents written in English, Portuguese, or Spanish; 4) documents published in the last two years; 5) documents from all subject areas; 6) open Access; and 7) only articles were considered. The first set of exclusion criteria included: 1) studies not conducted in Higher Education; 2) studies focused on specific topics unrelated to the implementation of UDL in Higher Education; 3) theoretical studies; 4) editorials; 5) literature reviews; 6) articles with restricted access; and the final criterion: 7) studies focused on specific topics unrelated to education.

2.3 Identification of databases and search terms

The studies were identified through the Scopus and Web of Science (WoS) databases. Despite recognising potential limitations, such as the exclusion of other valuable articles, the choice of these databases is justified as they are considered the most comprehensive data repositories for various purposes (Pranckutė, 2021). In terms of the methodological approach, the initial step involved defining keywords and constructing the search query. The search terms used were as follows: ("Higher education" OR universit* OR college OR "tertiary education" OR "post-secondary education") AND ("universal design for learning" OR "UDL" OR "universal design" OR "UD").

2.4 Selection of Studies

The subsequent steps in the methodology involved the organisation and categorisation of the data to address the central research question, followed by the comparison and analysis of the collected data. In the initial phase of research, a total of 149 publications were identified (74 in WoS; 75 in Scopus). After the removal of duplicates, 115 articles remained. Subsequently, 79 articles were excluded for not being related to the study's theme and objectives, for UDL implementation being applied in extracurricular activities rather than in curricular areas, the article not being published in a journal related to Educational Sciences or for being review articles. Consequently, in accordance with the inclusion and exclusion criteria, 36 articles were thoroughly analysed. Following a full-text screening, 24 publications were excluded for not presenting or describing specific UDL strategies or for restricted access, resulting in a total of 12 articles. This selection methodology was based on PRISMA – Preferred Reporting Items for Systematic Reviews and Meta-Analysis (Moher et al., 2009).

3 Data analysis and Discussion

Following the various stages of screening and selection, a total of 12 articles were included in the scoping review. These articles were all published in 2024 (n = 12) and none in early 2025 (n = 0), reflecting the exploratory nature of the study and its focus on capturing the most recent research developments. Based on the geographical data reported in the studies, five were conducted in the United States, two in the United Kingdom and one each in Australia, Chile, China, Spain and Turkey. This distribution demonstrates a wide international representation: Asia, America, Europe and Oceania. However, it also highlights the absence of national contributions and representativity (Portugal). The target population of these studies comprises general students in eight articles. Two of these articles also include neurodivergent students and students with disabilities in their samples. Additionally, one article each represents international students, students with disabilities, and working-class students. The selected articles were subjected to content analysis to address the research question: *How is Universal Design for Learning (UDL) planned, implemented, and evaluated in Higher Education Institutions?* Based on the analysis, the results are organised into the following thematic categories: (1) Curriculum Planning and Design, (2) UDL Implementation Strategies, and (3) Evaluation of UDL Implementation.

3.1 Curriculum Planning and Design

One of the key aspects in the implementation of UDL is its integration at the level of curriculum design, including the definition of learning objectives, the specification of intended competencies, and the methods of assessment (Knarlag, 2016). In the present scoping review, five of the twelve studies analysed propose a curriculum design or redesign based on UDL principles (Manly, 2024; Montgomery et al., 2024; Rao et al., 2024; Redstone & Luo, 2024; Seymour, 2024). Of these, four are focused on online learning environments, while one pertains to face-to-face instruction within a work-integrated learning context. Among the studies reviewed, four incorporated all three UDL principles—Engagement, Representation, and Action and Expression—into their curricular restructuring, whereas one (Seymour, 2024) addressed only the principle of Engagement, summarised in Table 1.

Table 1. Analysis of Studies in Curriculum Planning and Design

Referenced Studies	Modality	Multiple Means of Engagement	Multiple Means of Representation	Multiple Means of Action and Expression
Manly (2024)	Online	- Option to choose the start date of the course unit (7.1) - Completion of online quizzes for progressive access to content (8.2) - Opportunities for discussion and feedback through an online forum (8.2; 8.3; 8.4; 8.5; 9.2)	-Access to diversified resources (1.2) -Access to technology in the classroom (1.1)	-Discussion group with student-suggested topics (5.3) -Diversified assessment methods (e.g., video creation; audio; text) (5.2)
Montgomery et al. (2024)	Online	-Problem-Based Learning (8.3) - Student autonomy in selecting problem questions (7.1) - Frequency of theoretical, laboratory, and workshop classes (7.2.)	-Synchronous and asynchronous classes (1.2.)	-Choice of structure and format for the final conference presentation (5.1; 5.2)
Rao et al. (2024)	In person (work-integrated learning)	-Establishment of equity and inclusion values (7.4) -Definition of learning objectives, assessment methods, and activities to implement (8.1) -Post-internship reflection, conducted in multiple formats (9.3) -Community of Practice (CoP) among teachers (8.3)	-Raising teacher awareness of cultural and diversity issues (1.3)	-Definition of inclusive feedback and assessment moments (4.1; 5.2; 5.3) -Communication with students during internships (e.g., periodic check-ins) (6.4)
Redstone & Luo (2024)	Online	Course syllabus: -Instructor information (7.2) -Clarification of assessments in relation to learning objective (8.1)	-Supplementing texts with multimedia resources, consolidated on a single page (1.1) -Creation of concept maps (1.2) -Description of alternative materials to texts (2.1)	-Discussion Board (5.3) -To-Do List for clarifying objectives (6.1; 6.3) -Course scheduling and online definition of assignment due dates (6.2)
Seymour (2024)	Online	-Asynchronous weekly tasks (e.g., quizzes, podcasts, films, recordings; surveys, case studies) (7.3; 8.2)		

		<ul style="list-style-type: none"> -Instructor availability to contact students (e.g., reinforcing discussion topics and aligning with learning objectives) (8.1; 8.5) -Signposting (7.1; 7.2) -Addition of accompanying images to communicate content (8.1; 8.5) -Delineation of topics (8.2) -Structured online group activities (e.g. ethical dilemma) (8.3; 8.4) 		
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3.2 UDL Implementation Strategies

This category outlines the implementation of teaching activities and strategies in which UDL principles were applied. In this scoping review, eight out of the 12 studies analysed report the implementation of strategies and activities within classroom or equivalent settings (Adler & Kletenik, 2024; Durgungoz & Durgungoz, 2024; Evmenova et al., 2024; Gill et al., 2024; Navarro et al., 2024; Qu & Cross, 2024; Ramos & Wilson-Kennedy, 2024; Seymour, 2024). Among the studies presented, five applied the full range of UDL principles, one applied two (Engagement and Representation), and two applied only one principle (Engagement). The characteristics of the studies, along with selected replicable strategies and their corresponding UDL checkpoints, are summarised in Table 2.

Table 2. Analysis of Studies in UDL Implementation Strategies

Referenced Studies	Multiple Means of Engagement	Multiple Means of Representation	Multiple Means of Action and Expression
Adler & Kletenik, 2024	<ul style="list-style-type: none"> -Gamification (competition; challenge) (7.3) -Self-reflection between rounds, based on the scores obtained (7; 8; 9) 		
Durgungoz & Durgungoz, 2024	<ul style="list-style-type: none"> -Active Learning (gamification; flipped learning; group discussions; scenario-based learning) (7; 8; 9) -Interactive feedback to clarify objectives, monitor progress, and avoid distractions (e.g., gamified quizzes) (7.2; 7.3; 8.5) -Lectures related with real-world examples (7.2) -Outline lecture objectives and summarised key points at the end (8.1) 	<ul style="list-style-type: none"> -Integration of technological tools (e.g., Canva; Padlet) (1.2; 2.5) -Prior access to diverse instructional materials (e.g., videos; podcasts) (1.2) -Begin lecturing with a brief review of previous material (3.1) -Provide lecture notes in advance (1.1) -Present keypoints visually (1.1) 	<ul style="list-style-type: none"> -Multiple media for communication (e.g. lectures; demonstration videos) (5.1)
Evmenova et al., 2024	<ul style="list-style-type: none"> -Offer choices in assignments, assessments (e.g. text; photo; quiz) (7.1) -Feedback via formal/informal means (7.3) -Simulation, hands-on activities (7.2) -Clear goals and timelines (8.1) -Step-by-step guides (8.2) -CoP (8.3) -Peer assessments and feedback (8.4) -Gender-neutral language (9.1) 	<ul style="list-style-type: none"> -Offer print/digital versions of books/readings (1.1) -Make auditory content visual (1.2) -Offer color inversion (1.3) -Define key terms (2.1) - Explain module organisation (2.2) -Make some readings optional (2.3) -Provide links to translators (2.4) -Multiple tools to offer content (video; podcasts) (2.5) -Break lectures for discussion (2.5) 	<ul style="list-style-type: none"> -Vary participation in discussions and submission of assignments (4.1) -Use dictation and voice typing tools (4.2) - Multiple forms of interaction (e.g. synchronous; asynchronous; individual) (5.1) -Allow to express understanding in words, diagrams or other (5.2) -Allow drafts for feedback (5.3) -Share weekly objectives and individual goals (6.1)
Gill et al., 2024	<ul style="list-style-type: none"> -Active Learning: Use of gamified challenges (e.g., discussions, decision-making, and collaborative work; active participation) (7; 8; 9) -Freedom in workgroup role selection (7.1) 	<ul style="list-style-type: none"> -Vocabulary clarification (2.1) -Use of videos, 3D models, and physical puzzles to provide access to additional materials for lectures and repeated viewing of content (1; 3) 	<ul style="list-style-type: none"> -Feedback sessions (6.4) -Peer-to-peer discussion (4.1; 6.5) -Freedom in task selection (5.1; 5.3) -Competitive Speed Challenge (5.2; 6.2) -Microlearning content (5.2) -Completing Physical Puzzle (4)
Navarro et al., 2024	<ul style="list-style-type: none"> -Creation of accessible videos for students, aimed at peers with cognitive, sensory, or linguistic issues (7; 8; 9) -Teacher supervision and collaboration in video creation (7.3) -Multidisciplinary teaching staff (7.2) -Collaborative work and shared responsibility (8.3) 	<ul style="list-style-type: none"> -Multiple means of accessing content, shared through the video script (e.g., text; images; elimination of irrelevant information) (1.2) -Videos: Visual illustrations accompanied by voice (highlighting important information) (1.1; 2.5) 	
Qu & Cross, 2024	<ul style="list-style-type: none"> -Group work with UDL principles: Definition and distribution of specific tasks within the group (e.g., poster creation; leading a debate) (7.1; 8.3) 	<ul style="list-style-type: none"> -Provision of materials based on text, video (1.2) -Integration of student projects into teaching materials (1.3) 	<ul style="list-style-type: none"> -Online discussion forum (5.2; 5.3) -Feedback, reflection, and diverse assessment (e.g., weekly poster creation and presentation) (5.3; 6.4) -Option for summative or formative assessment method (4.1)
Ramos & Wilson-Kennedy, 2024	<ul style="list-style-type: none"> Using AI: -Creation of culturally inclusive learning scenarios (7.4; 8.4; 9.1) 	<ul style="list-style-type: none"> Using AI: -Mobilization of culturally relevant examples (1.3) 	<ul style="list-style-type: none"> Using AI: -Inclusive learning environments: Access to content via mobile phones by rural

	-Translation tools (8.2) -Problematization of real-world scenarios (7.2) -Clarification of complex concepts (8.2)	-Personalization of learning processes (1.3)	populations or those with deficient infrastructure (4.2; 6.5) -Diversification of assessment methods (4.1)
Seymour, 2024	-Weekly preparation of documents and tasks (8.2) -Weekly communication via email (8.2; 8.5) -Group discussions (8.3) -Negotiation of curriculum content (7.1) -Online recorded instructions (8.2)		

Through the curricular restructuring and lesson planning described, it becomes clear that only 33% of the studies analysed implemented the full range of UDL principles in the curriculum and 42% addressed the second premise. This partial adoption of UDL principles may be attributed to the fact that only one of the studies mentioned institutional support for teaching staff by academic personnel. Faculty training is regarded as one of the most crucial factors for the development of intentional and effective practices, as highlighted in the systematic review conducted by Seok et al. (2018). Such support can be seen as a pioneering institutional measure, particularly in raising awareness of UDL—an area that has yet to become a widespread practice within the Portuguese higher education context also (Maia & Santos, 2024). Nevertheless, it is important to emphasise that the majority of the practices described align with principles that enhance the effective implementation of UDL. These include the use of practical examples during classes, hands-on activities reflecting active learning strategies (in multiple means of engagement principle), flexible assessment opportunities, and the provision of ongoing feedback throughout the course (Seok et al., 2018).

3.3 Evaluation of UDL Implementation

This category outlines how activities or projects that operationalise UDL principles were evaluated, particularly from a methodological standpoint. In parallel, the main findings are also briefly presented in Table 3. In this review, 10 out of the 12 studies analysed reported on the evaluation of the implementation of strategies based on UDL principles (Adler & Kletenik, 2024; Durgungoz & Durgungoz, 2024; Evmenova et al., 2024; Gill et al., 2024; Manly, 2024; Montgomery et al., 2024; Navarro et al., 2024; Redstone & Luo, 2024; Qu & Cross, 2024; Seymour, 2024). Of these, seven employed a mixed-methods approach, two adopted quantitative methodologies, and one only utilised a qualitative methodology.

Table 3. Analysis of Studies in Evaluation of UDL Implementation Strategies

Referenced Studies	Variables & Methodology	Main Findings
Adler & Kletenik, 2024	-Mixed-Method: satisfaction with the initiative; performance; empathy and attitudes towards people with disabilities	-Accessibility games educated students about challenges and increased consideration for users with disabilities -Integrating accessibility-focused games in classrooms enhances student learning outcomes -Games improved students' attitudes towards people with disabilities and understanding of barriers, with a large effect size for the latter
Durgungoz & Durgungoz, 2024	-Mixed-Method: students' engagement; students' perspective about the strategies implemented	-UDL strategies significantly improved cognitive and emotional engagement for ND and NT students, with ND students showing a more pronounced increase in emotional engagement. -ND students preferred anonymous, technology-driven interactions and practical tasks over group discussions, which they found overwhelming
Evmenova et al., 2024	-Mixed-Method: student feedback; course satisfaction (pedagogical inquiries)	-Improvement in academic outcomes compared to traditional courses
Gill et al., 2024	-Mixed-Method: interest/enjoyment, perceived competence, and perceived choice (Intrinsic Motivation Inventory); Hedonic and pragmatic qualities (user-experience questionnaire); Students' preference (interviews; self-reports)	-The AR DfMA game received high ratings for its pragmatic and hedonic qualities -The game boosted intrinsic motivation and enjoyment of learning DfMA concepts -Students appreciated the hands-on, collaborative, and active learning aspects, enhancing their learning experience and motivation
Manly, 2024	-Quantitative: causal effects of using multiple modalities in learning (LMS platform data)	-Multiple modalities (text, video, audio, interactive) had a positive, medium-large, and meaningful effect on student learning gains in an adaptive learning system -Results support UDL's principle of multiple means of representation and suggest incorporating different modalities into courses
Montgomery et al., 2024	-Mixed-Method: knowledge acquisition (students' perception; Likert scale); students' confidence	-Statistically significant changes from the beginning to the end of the course, suggesting that participants reported a significant impact on their progress -UDL-inspired adaptations improved student confidence in applying the scientific method and their perception of problem-solving abilities

Navarro et al., 2024	-Quantitative: collaborative work; interest in the subject; academic results	-Student-created video capsules improved academic performance in laboratory practicals -Enhanced collaborative work and interest in the subject, but no apparent influence on final exam results -The activity developed instrumental (e.g. procurar e gerir informação), interpersonal (e.g. relação com pares), and systemic competencies (e.g. aplicação de conhecimentos)
Redstone & Luo, 2024	-Mixed-Method: academic success; engagement; self-efficacy; perceived benefits and challenges by the teacher	-Significant effects on student self-efficacy and engagement, but no significant impact on academic results -The instructor was pleased with the UDL-redesigned course and plans to use it again
Qu & Cross, 2024	-Qualitative: most valued key factors (focus group)	-Students valued technologies, face-to-face support, motivating activities, and cultural/social diversity awareness, aligning with UDL principles
Seymour, 2024	-Mixed-Method: engagement; subject interest (focus group; survey)	-Course restructuring based on the Engagement principle improved student interest and involvement

Regarding the effectiveness of UDL implementation, although further research at the Higher Education level is warranted, existing evidence indicates a moderate impact on academic success. Notably, disparities have been observed between students who benefit from the model and those who do not, with the former advantaged through the reduction of barriers at both the curriculum and instructional levels (King-Sears, 2023). As confirmed by the previously cited meta-analysis, only 33% of the studies included in the review demonstrated intervention effects; however, these were positive in terms of academic achievement (Navarro et al., 2024; Manly, 2024), as well as in improving students' confidence and self-efficacy (Montgomery et al., 2024). Moreover, increased levels of engagement were reported, particularly among neurodivergent students when compared to their neurotypical peers (Durgungoz & Durgungoz, 2024).

4 Conclusion

The contribution of this exploratory study lies in the summarisation and organisation of the most recent practical examples from the literature, which serve as facilitator for the effective implementation of UDL. However, its efficacy is contingent upon a comprehensive institutional approach (Moriarty & Scarffe, 2019 *in* Hills et al., 2022). Indeed, without top-down initiatives (e.g. the recruitment of staff capable of providing implementation support; formalising UDL as an organisational practice; inclusion of UDL in internal policies) that ensure access to tools and infrastructure, UDL implementation is likely to be inconsistent, thereby perpetuating barriers to learning, particularly among disadvantaged groups and students with disabilities (Hills et al., 2022). In fact, only one of the reviewed studies referenced structured institutional support, underscoring a significant gap in faculty development. As emphasised by Seok et al. (2018), continuous professional development is essential for fostering intentional and effective UDL practices: promoting communities of practice, integrating UDL into staff training, and providing access to diverse pedagogical resources can catalyse a broader cultural shift within institutions. Furthermore, a cross-analysis of the strategies presented reveals a strong emphasis on active learning, with widespread use of gamification, collaborative tasks, and flexible assessment formats. These approaches, aligned with UDL principles, reflect a shared commitment to student engagement, autonomy, and accessibility, yet their full potential will only be realised through sustained institutional and pedagogical investment. This study presents limitations inherent to its exploratory nature and the limited number of examples covered. Additionally, future research must investigate the effects of UDL implementations also based on different subject areas.

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