A Critical Research Synthesis on Universal Design for Learning in Second Language Learning and Teaching

Uma Síntese Crítica da Investigação sobre o Desenho Universal para a Aprendizagem de uma Segunda Língua

Elena Sharafutdinova[1]

Abstract. Universal Design for Learning (UDL) aims to develop learning environments that are accessible to learners and accommodate diverse needs. Since the foundational work by Rose and Meyer in 2002, the literature on UDL has frequently emphasized its crucial role in creating instructional strategies that benefit not only students with recognized disabilities but also students of all kinds. UDL learning can offer learners —with or without disabilities—a variety of ways to learn and, consequently, a curriculum that is more accessible to all of them. However, the literature lacks systematic research syntheses focusing on UDL and second/foreign/additional language (L2) teaching and learning. To address this gap, this article employs a critical research synthesis approach—a qualitative alternative to meta-analysis—to integrate findings from ten studies on UDL in L2 classrooms and assess the existing literature's substantive and methodological characteristics.

Keywords: Universal Design for Learning, UDL, second/foreign/additional language, language learning/teaching

Resumo. O Desenho Universal para a Aprendizagem (DUA) tem por objetivo desenvolver ambientes de aprendizagem acessíveis aos alunos e que respondam a necessidades diversas. Desde o trabalho fundamental de Rose e Meyer, em 2002, a literatura sobre o DUA tem realçado frequentemente o seu papel crucial na criação de estratégias de ensino que beneficiam não só os alunos com deficiências reconhecidas, mas também os alunos de todos os tipos. O DUA pode oferecer aos alunos - com ou sem deficiência - uma variedade de formas de aprendizagem e, consequentemente, um currículo mais acessível a todos eles. No entanto, a literatura carece de sínteses sistemáticas de investigação centradas no UDL e no ensino e aprendizagem de línguas segundas/estrangeiras (L2). Para colmatar esta lacuna, este artigo utiliza uma abordagem de síntese crítica da investigação - uma alternativa qualitativa à meta-análise - para integrar os resultados de dez estudos sobre o DUA em salas de aula de L2 e avaliar as características substantivas e metodológicas da literatura existente.

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[1] California State University, Fresno; sher@csufresno.edu.

Introduction

In recent years, students' access and inclusion have increasingly become the focus of education. Many instructors have incorporated these two principles into their teaching to assist as many students as possible maximize their learning potential (Courey et al., 2012). For this purpose, the Higher Education Act, a United States law, has endorsed the Universal Design for Learning (UDL). The concept of UDL has its roots in the broader movement toward universal design in architecture and product design, aiming to make environments accessible to as broad an audience as possible. This philosophy was adapted to the educational sphere to address the diverse needs of learners, recognizing that variability is the norm, not the exception. The Higher Education Act's endorsement of UDL signifies a legislative acknowledgment of the importance of accessible education, further legitimizing the push toward inclusive educational practices.

UDL originated in education research and neuroscience (CAST, 2018). By utilizing all the versatility of digital technology, it strives to create learning settings that students with different demands can access (Meyer et al., 2014). The foundational work by Rose and Meyer (2002) introduced UDL as a framework to reduce barriers to learning and optimize individual learning experiences. Their research emphasized the importance of providing multiple means of engagement, representation, and action and expression to cater to the diverse needs of learners. Due to the realization that there are other types of educational barriers besides those relating to disabilities, this approach has gained more and more support to remove those barriers that lessen students' opportunities to get an education and become contributing members of society. This broadened understanding of barriers in education demonstrates the significance of UDL beyond special education, highlighting its relevance in addressing the varied needs of all learners, including those learning a second or foreign language.

Because of advancements in neuroscience, such as our understanding of neuro-variability and brain plasticity, we now better understand how people learn differently both over time and from one another (CAST, 2018b). Research has shown that the brain is composed of recognition, affective, and strategic networks, each playing a crucial role in how information is processed, engaged with, and acted upon (CAST, 2018b). These insights into learner variability, alongside the increasing power and adaptability of networked media, have further fueled the development of Universal Design for Learning (UDL). UDL has evolved into a dynamic educational approach that integrates these neuroscientific findings and technological advancements to create more inclusive learning environments (CAST, 2018b). In these two factors lies the development of UDL (Meyer et al., 2014), a system to enhance

and maximize everyone's opportunities for learning and teaching (CAST, 2018a). UDL is built around three learning networks: affective, strategic, and recognition. According to these principles, the best method to overcome learning obstacles is through instruction, providing various opportunities for representation, engagement, expression, and action (CAST, 2018a) (see Figure 1 below).

To stimulate students' engagement, teachers can encourage students by giving them a series of learning options to have more freedom in picking up the more pertinent option. Teachers can also give students challenging assignments, encourage collaboration, provide timely feedback, have defined objectives, and engage students through boost-motivation activities to promote self-learning. UDL gives students more options for representation, utilizing a range of media and techniques to support students' various perceptions. Lastly, action and expression are also at the core of the UDL method, which provides a variety of alternatives for increasing physical activity by using assistive technologies, navigation, etc.

Figure 1. *UDL Framework*
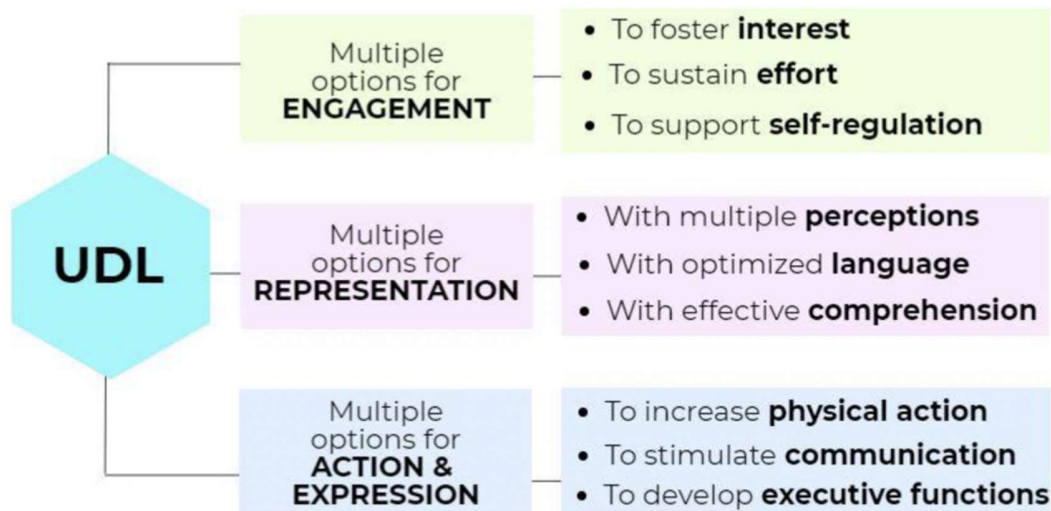
Note. From "Catering to Inclusion and Diversity With Universal Design for Learning in Asynchronous Online Education: A Self-Determination Theory Perspective," by Ismailov & Chiu, 2022, Frontiers in Psychology, p. 3

UDL principles can be effectively applied in second language acquisition to accommodate diverse learning needs and enhance language instruction. According to Rao and Torres (2017), UDL's multiple means of engagement principle involves creating engaging and supportive environments that leverage learners' cultural and linguistic strengths. This can include providing individual choices to enhance cultural relevance, tailoring challenges to build resilience, and incorporating self-assessment to boost motivation. The multiple means

of representation principle emphasizes the need for multimodal instructional supports, such as offering diverse formats (e.g., larger text, audio), explicitly teaching vocabulary and grammar, and using interactive digital tools like UDL Book Builder. Finally, multiple means of action and expression principle encourages using flexible digital tools for diverse language outputs, supportive structures for writing, and multimedia platforms for language practice. By integrating these strategies, educators can create inclusive, effective language learning environments that cater to the variability among learners (Rao & Torres, 2017).

UDL aims to provide learning environments that students with different needs can access (Meyer et al., 2014). Since Rose and Meyer (2002), literature on UDL has quite often emphasized how crucial it is to the development of instructional strategies not only for students with recognized disabilities but also for any student. UDL learning can offer learners —with or without disabilities—a variety of ways to learn and, consequently, a curriculum that is more accessible to all of them. Additionally, students now come from a wider variety of backgrounds than ever before. Therefore, instructors should prepare to interact with students with different needs.

Moreover, enrolling, maintaining, and keeping a diverse student body is becoming more common, especially in metropolitan settings. UDL is especially relevant since all students can benefit from it, as it increases motivation and engagement in a course, even for students without disabilities. However, the literature needs more systematic research syntheses focusing on UDL and second/foreign/additional language (L2) teaching and learning. The study aims to examine UDL effectiveness in L2 classrooms by synthesizing research in language learning and teaching to answer the research question of how effectively UDL enhances L2 learning.

Method

For synthesizing research on Universal Design for Learning (UDL) in second language (L2) learning and teaching, this paper employs a critical research synthesis as a qualitative alternative to meta-analysis (Mendoza & Phung, 2019). This approach extends beyond traditional literature reviews by emphasizing transparency, replicability, and a systematic method for integrating findings across qualitative studies. It involves conducting comprehensive database searches, establishing precise inclusion and exclusion criteria, and methodically coding study findings.

Searching the Literature on UDL and L2

The literature search was conducted across two major databases: Education Resources Information Center (ERIC) and Linguistics and Language Behavior Abstracts (LLBA). These databases were selected for their extensive coverage of peer-reviewed research in education and linguistics. To ensure a comprehensive collection of relevant studies, a combination of

keywords related to "Universal Design for Learning" and "language learning/teaching" was used, along with terms like "foreign/second/additional language."

This search strategy yielded an initial collection of 132 articles. The inclusion criteria focused on articles explicitly discussing UDL's application in L2 learning contexts and published in peer-reviewed journals in applied linguistics and education. Only studies published after the year 2000 were considered to ensure the analysis's relevance and timeliness. Exclusion criteria were applied to filter out studies not available through the university library, those not directly related to empirical investigations of L2 subjects, and non-empirical studies.

After applying these inclusion and exclusion criteria, the selection was narrowed down to 10 articles. These selected studies, detailed in Table 1, span five continents, using English (N=9) and French (N=1) as the target languages. This reflects the global applicability and interest in UDL within diverse L2 educational contexts. The studies included a range of participants, from all students to those with special educational needs (SEN), and were conducted in both UDL-based and traditional classroom settings. A UDL-based classroom is one where all instructional materials and activities are specifically designed to adhere to the three UDL principles: multiple means of engagement, representation, and action and expression. This means that every aspect of the curriculum is intentionally designed to offer various ways for students to engage with the material, understand the content, and express their knowledge. In contrast, a traditional classroom may incorporate some UDL principles, but these are not systematically or comprehensively integrated. For example, a traditional classroom might include some diverse presentation formats or engagement strategies, but these are not part of a fully designed UDL curriculum. Table 1 outlines the studies chronologically, providing details on the country of study, the L2 focus, participant demographics, teaching methods, and research methodologies. This organization facilitates an easy comparison of the approaches to integrating UDL across different educational and geographical contexts.

Table 1. *Studies examining UDL and L2*

Author(s) + year	Country	L2	Participants	Teaching method	Research method
Pellerin (2013)	Canada (North America)	FR	ALL	UDL-based	Qualitative research
Dickinson (2018)	Japan (Asia)	EN	ALL	UDL-based	Quantitative research
Kasch (2019)	Denmark (Europe)	EN	ALL	UDL-based	Qualitative research
Lintangsari & Emaliana (2020)	Indonesia (Asia)	EN	ALL (SEN)	UDL-based	Qualitative research

Barros del Río et al. (2021)	Spain (Europe)	EN	SEN	UDL-based	Quantitative research
Kakamad et al. (2021)	Iraq (Asia)	EN	ALL	Traditional	Mixed research
Giraldo Martínez & Ramos Carvajal (2021)	Columbia (South America)	EN	SEN	UDL-based	Qualitative research
Husin et al. (2022)	Indonesia (Asia)	EN	SEN	Traditional	Quantitative research
Yaqoubi et al. (2022)	Afghanistan (Asia)	EN	ALL	Traditional	Mixed research
Hu & Huang (2022)	Australia	EN	ALL	UDL-based	Mixed research

The selected studies encompass various educational settings, from primary schools to universities, reflecting UDL's versatility in catering to learners at different stages of their educational journey. This diversity demonstrates the framework's potential to address the varied needs of learners across the education spectrum. In terms of classroom settings, the studies are divided between those conducted in UDL-based classrooms and traditional classrooms. UDL-based classrooms were explicitly designed or adapted to incorporate all three core UDL principles—providing multiple means of engagement, representation, and action/expression. This approach signifies a deliberate effort to create an inclusive learning environment that acknowledges and accommodates the diverse ways students process information, express what they have learned, and engage with the content. In contrast, traditional classroom settings may incorporate elements of UDL to varying extents, with some adopting one or two of the UDL principles in their teaching practices. This variance in the application of UDL principles offers a unique opportunity to compare the outcomes and effectiveness of different levels of UDL integration in language learning environments.

The studies involve a mix of participants, including general student populations and students with special educational needs (SEN), showcasing UDL's commitment to inclusivity and its potential to enhance student learning outcomes. By focusing on a broad participant base, these studies contribute valuable insights into how UDL principles can be adapted to meet the needs of a diverse learner demographic, including those who may require additional support.

Regarding research methodologies, the selected studies employ a variety of approaches to explore the impact of UDL in L2 learning contexts. Four studies utilize qualitative research methods, offering in-depth insights into the experiences and perceptions of learners and educators in UDL-implemented classrooms. This qualitative approach allows for a nuanced understanding of the practical challenges and benefits of applying UDL principles in real-

world settings. Three studies take a mixed-methods approach, enriching their qualitative data with quantitative analysis to provide a more comprehensive view of UDL's effectiveness. This combination of qualitative and quantitative data offers a balanced perspective, highlighting measurable outcomes alongside subjective experiences. The remaining three studies rely on quantitative research methods, focusing on statistically significant trends and outcomes related to UDL implementation in language learning.

This synthesis examines the selected studies through these diverse methodological approaches to provide a holistic view of current research on UDL in L2 education. The findings from these studies, drawn from a wide array of educational contexts and research perspectives, underscore the adaptability and potential of UDL to enhance language learning experiences and outcomes for learners worldwide.

Coding and Analysis

The full text of each selected study was reviewed to ensure a comprehensive understanding of its epistemological stance and methodological approach, setting the stage for a detailed coding process. This in-depth evaluation was crucial for understanding the literature's varied perspectives and research paradigms on UDL in L2 teaching and learning.

Coding Process

A structured coding scheme was developed to analyze the studies systematically. The scheme was designed to capture key information across several dimensions:

- **Geographic Region (Country):** This code was used to catalog the studies based on their geographical location, enabling an analysis of regional trends and potential cultural influences on the implementation and outcomes of UDL in L2 education.

- **Target Language (L2):** Identifying the language of instruction or study focus was crucial for understanding the linguistic diversity within UDL research and its applicability across different language learning contexts.

- **Participants:** The participants code differentiated studies based on their focus groups (all students, students with special educational needs (SEN), parents, and teachers). This distinction provided insights into the breadth of UDL's impact across various stakeholders in the educational process.

- **Educational Level:** This code helped highlight how UDL principles are applied and studied across the educational spectrum by noting whether the research was conducted in school or university settings.

- **Classroom Setting:** Distinguishing between studies conducted in traditional versus UDL-based classrooms allowed for comparing outcomes and practices, shedding light on the effectiveness of UDL implementation.

- **Skills:** This code captured the specific language skills (e.g., writing, reading) assessed in the studies, offering a lens into the areas of language learning most influenced by UDL approaches.

- **Method:** Recording whether studies employed qualitative, quantitative, or mixed methods facilitated an understanding of the research designs predominating in the field and their contributions to knowledge on UDL in L2 education.

- **Operationalization:** This code examined how studies operationalized UDL principles within their research design, providing insights into the practical application of UDL in educational settings.

- **Research Aims and Findings:** Summarizing the objectives and outcomes of each study allowed for a synthesis of the core contributions of the research to the field of UDL in L2 education.

Analysis Approach

With the completion of the coding process, the studies were systematically analyzed to draw out patterns and themes. This analysis was structured around several key dimensions, including geographic region, target language, educational level, UDL context, and research methodology. Such an organization facilitated a nuanced understanding of the research landscape, highlighting prevalent trends and gaps in the literature.

Geographically, the studies spanned Asia, Europe, Australia, and the Americas, indicating a broad interest in UDL's applicability across diverse educational and cultural contexts. The dominance of English as a target language in nine out of ten studies points to a significant focus on English language learning within UDL research. However, the inclusion of a French-focused study suggests emerging diversity.

The analysis focused on UDL-based courses, particularly within higher education settings, underscoring the framework's relevance and applicability in advanced educational contexts. However, studies in traditional classrooms highlighted ongoing explorations of UDL principles within more conventional educational models.

By categorizing studies based on their instructional methods—UDL-based versus traditional—and delineating research aims within each category, the analysis offered a structured overview of how UDL principles are applied and evaluated in L2 education. This

dual perspective enabled a comparative analysis of student-focused and teacher-focused research, providing a holistic view of UDL's impact on language learning and teaching practices.

The synthesis of findings, guided by the coding scheme, illuminated the effectiveness of UDL in fostering inclusive, accessible, and effective L2 learning environments. By considering additional codes related to study outcomes, instructional strategies, and participant experiences, the analysis contributed a layered understanding of how UDL principles support diverse learners in achieving their language learning goals.

Results and Discussion

Research in Traditional Classroom Settings

The studies were conducted in traditional classrooms where teachers might extend the usage of three UDL principles. The three studies (Kakamad et al., 2021; Husin et al., 2022; Yaqoubi et al., 2022) examined how teachers utilize UDL in their classrooms and how it improves L2 learning. Each research was conducted in traditional classrooms where teachers might extend the usage of three UDL principles. The three studies (Kakamad et al., 2021; Husin et al., 2022; Yaqoubi et al., 2022) examined how teachers utilize UDL in their classrooms and how it improves L2 learning. Each research was conducted at the university level. The study's research aims in traditional classroom settings are summarized in Table 2. university level. The study's research aims in traditional classroom settings are summarized in Table 2.

Table 2. *Studies examining UDL in traditional classrooms*

Study	Participants & Education	Research aims
Kakamad et al. (2021)	University students	This study aimed to determine whether applying UDL to ESL classes would improve English language learning.
Husin et al. (2022).	University students	The study examines how UDL affects students' motivation to learn EFL and how UDL functions as a critical predictor of students' perception of EFL teachers' efficiency.
Yaqoubi et al. (2022)	University students	The study examines how to improve learning outcomes, inclusion, and equity in ESL classrooms by implementing UDL principles.

The studies were conducted to find out if UDL would improve learning outcomes (Kakamad et al., 2021; Yaqoubi et al., 2022), inclusion and equity (Yaqoubi et al., 2022), and increase students' motivation and their perception of EFL teachers' efficiency (Husin et al., 2022).

Kakamad et al. (2021) applied UDL principles to an ESL program for Kurdish and Iraqi students at Soran University. The study introduced student-centered methodologies, allowing for greater autonomy over learning goals and environments. Methods included surveys and interviews to gather feedback and recommendations for flexible learning materials and personalized learning paths. Students expressed a desire for more control over their learning and better preparation for academic studies. Resistance to curriculum changes was managed by demonstrating positive outcomes through pilot programs.

Husin et al. (2022) investigated the application of UDL in teaching English to students with diverse learning needs in Malaysia. UDL guidelines were used to design inclusive lesson plans and assessments, incorporating multiple means of representation and expression. Classroom practices included the use of multimedia tools, options for assignments, and collaborative learning. Increased motivation and better learning outcomes were observed. Teachers reported a more inclusive and engaging environment. Initial struggles with UDL implementation were managed through ongoing professional development and peer support.

Yaqoubi et al. (2022) conducted an analysis in Iran on the use of UDL at the collegial level to maximize learning outcomes and promote inclusion. UDL principles were used to redesign curricula and teaching methods, employing varied instructional methods like interactive lectures, group work, and digital resources. Enhanced student engagement and academic performance were observed. Teachers noted that the inclusive approach effectively addressed diverse student needs. Initial resistance from faculty and students was managed through training sessions on the benefits of UDL.

The student's motivation to learn L2 was evaluated using a 15-item scale survey, and the use of UDL and the efficiency of teachers were measured using 10-item scale surveys. Kakamad et al. (2021) and Yaqoubi et al. (2022) conducted mixed-method studies and included all students. Both studies used semi-structured interviews and structured surveys. The quantitative data were analyzed to provide descriptive statistics.

The findings of three studies revealed that teachers employed UDL principles in their classrooms to varying degrees. Implementing UDL in L2 courses was found to have a positive effect in all three studies. UDL principles help involve all students in learning to control their learning environment and set their learning goals and objectives (Kakamad et al., 2021; Yaqoubi et al., 2022). The practical implementation of UDL maximizes learning outcomes (Kakamad et al., 2021; Yaqoubi et al., 2022), inclusion, and equity (Yaqoubi et al., 2022) and motivates students to learn L2 (Husin et al., 2022). UDL teachers are perceived as more efficient in delivering the message and enhancing students' capacity to learn L2 (Husin et al., 2022).

Research in UDL-based Classroom Settings

The experiments were conducted in UDL-based classrooms where teachers implemented all three UDL principles. Studies were split into two categories based on the participants they focused on: student-focused studies and teacher-focused studies.

Table 3 shows student-focused research in UDL-based classrooms. The four studies (Barros del Río et al., 2021; Dickinson, 2018; Hu & Huang, 2022; Kasch, 2019) explored the UDL application in UDL-based L2 courses to determine if UDL would improve L2 learning. Three studies (Dickinson, 2018; Hu & Huang, 2022; Kasch, 2019) included all students, while one study (Barros del Río et al., 2021) was limited to students with educational needs. Two studies focused on specific language skills: Dickinson (2018) on writing and Kasch (2019) on reading. Two studies (Barros del Río et al., 2021; Dickinson, 2018) were carried out at the university level, and two (Hu & Huang, 2022; Kasch, 2019) at the secondary school level.

Table 3. *Student-focused research in UDL-based L2 courses*

Study	Participants & Education	Research aims
Dickinson (2018)	University students	This study investigates students' perception of the UDL-based L2 English course.
Kasch (2019)	School students	The study explores how a UDL-guided instructional design may enhance student engagement and language acquisition.
Barros del Río et al. (2021)	University students	The study explores strategies for providing SEN students with access to language learning through UDL.
Hu & Huang (2022)	School students	This study investigates the impact of UDL on the online learning proficiency of L2 English students.

Hu & Huang (2022) used a mixed method, Kasch (2019) opted for a qualitative method, and Barros del Río et al. (2021) and Dickinson (2018) utilized quantitative methods. Hu & Huang evaluated students' proficiency in English using school-based portfolio assignments that teachers scored. They also used semi-structured interviews with students and conducted classroom observations to describe how UDL might improve students' learning experiences. Dickinson (2018) administered a Likert scale survey to investigate learners' perceptions of the UDL-based course. Kasch (2019) used semi-structured interviews, and Barros del Río et al. (2021) used a 7-point Likert-type questionnaire to gather their data.

Pellerin (2013) explored the use of digital technologies to support inclusive teaching practices in Canadian early French immersion classrooms. The study focused on the

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implementation of interactive reading software and multimedia presentations, aiming to provide multiple means of engagement and representation to accommodate diverse learning needs. The findings indicated improved student engagement and language proficiency. Initial technical challenges were overcome through comprehensive training for teachers and ongoing support, ensuring the effective integration of digital tools into the learning environment.

Overall, the four studies (Barros del Río et al., 2021; Dickinson, 2018; Hu & Huang, 2022; Kasch, 2019) proved that UDL improves L2 learning and stimulates the acquisition for all learners. According to the findings, UDL has positive effects on the participants' writing skills (Dickinson, 2018), reading skills (Kasch, 2019), and overall proficiency (Hu & Huang, 2022). The UDL-based course on the online platform fosters English learning and supports inclusion and equality (Barros del Río et al., 2021). Kasch (2019) also noted that UDL fosters self-efficacy and motivation. Initial technical challenges in these studies, such as resistance to group work (Dickinson, 2018) and adapting to digital tools (Kasch, 2019), were managed through comprehensive training, gradual introduction, and additional support sessions.

Table 4 shows teacher-focused research in UDL-based classrooms. The three studies (Giraldo Martínez & Ramos Carvajal, 2021; Lintangsari & Emaliana, 2020; Pellerin, 2013) explored the application of UDL in UDL-based L2 courses to offer inclusive L2 instruction and improve L2 learning. In contrast to previous studies, the researchers took teachers' perspectives into account. Pellerin (2013) also included parents in his research and was the only one to examine a language other than English (L2 French). Two studies (Giraldo Martínez & Ramos Carvajal, 2021; Pellerin, 2013) were carried out at the school level, and one (Lintangsari & Emaliana, 2020) at the university level. While Giraldo Martínez and Ramos Carvajal (2021) did not specify the educational stage, Pellerin conducted the study at a primary school. Only one study (Giraldo Martínez & Ramos Carvajal, 2021) was limited to students with educational needs.

Table 4. *Teacher-focused research in UDL-based L2 courses*

Study	Participants & Education	Research aims
Pellerin (2013)	School students & teachers	This study investigates how UDL-based digital technologies can assist inclusive teaching methods in early French immersion classrooms.
Lintangsari & Emaliana (2020)	University students & teachers	This study explores using the UDL framework to provide inclusive education in EFL classrooms.
Giraldo Martínez & Ramos Carvajal (2021)	School students + parents & teachers	This study aims to establish how different strategies based on UDL principles affect the L2 English learning process.

Pellerin (2013) incorporated a collaborative research approach. Pellerin (2013) used digital documentation, classroom observation, and semi-structured interviews. Lintangsari and Emaliana (2020) used interviews, while Giraldo Martínez and Ramos Carvajal (2021) used surveys and research journals with observations. Overall, the three studies (Giraldo Martínez & Ramos Carvajal, 2021; Lintangsari & Emaliana, 2020; Pellerin, 2013) proved that UDL provides inclusive L2 instruction where all students (with and without SEN) are accepted and accommodated and improves L2 learning. Martínez and Ramos Carvajal also concluded that using multiple strategies based on the UDL principles enhances the students' executive function and self-regulation abilities.

Pellerin (2013) explored the use of digital technologies to support inclusive teaching practices in Canadian early French immersion classrooms. The study focused on implementing interactive reading software and multimedia presentations, aiming to provide multiple means of engagement and representation to accommodate diverse learning needs. The findings indicated improved student engagement and language proficiency. Initial technical challenges were overcome through comprehensive teacher training and ongoing support, ensuring the effective integration of digital tools into the learning environment.

Lintangsari & Emaliana (2020) focused on inclusive education services for blind students in university EFL courses in Indonesia. UDL principles were employed to create accessible learning environments, including providing materials in accessible formats and using assistive technologies. Differentiated instructional strategies, flexible grouping, and ICT-based media were key classroom practices. The blind student showed improved engagement and comprehension. However, teachers faced challenges with limited resources and a lack of training, which were addressed by seeking assistance from disability services and employing flexible teaching methods.

Giraldo Martínez & Ramos Carvajal (2021) explored teaching English online to students with disabilities in Colombia during the COVID-19 pandemic. UDL principles were applied to adapt online learning environments, ensuring accessibility and engagement. Various digital tools and platforms were used to provide multiple means of engagement and representation, with flexible deadlines and personalized feedback. The study reported positive feedback from students and improved learning outcomes. Technical issues and limited access to devices were common challenges, addressed through technical support.

Methodological Considerations

The methodological rigor of the six studies—spanning both quantitative and mixed-method research designs—demonstrates a commitment to providing transparent and detailed participant selection processes. Each study—Barros del Río et al. (2021), Dickinson (2018), Husin et al. (2022), Hu & Huang (2022), Kakamad et al. (2021), and Yaqoubi et al. (2022)—

has contributed extensive information regarding participant demographics and the procedures employed to recruit them. Such thorough documentation helps confirm that the research findings are based on a well-defined and appropriate sample population. Additionally, these studies have presented comprehensive descriptive statistics, offering a detailed quantitative summary of their data. This approach ensures that the foundational data effectively supports the conclusions drawn in the study outcomes.

Despite the thorough descriptive statistics offered, some concerns about the measurement instruments' validity do arise. Most of these studies have constructed their instruments by combining scales from previous research. This approach leverages established constructs and invites reflection on the composite scales' contextual suitability and overall validity. Future research might consider additional validation of these tools to enhance their applicability. Only Husin et al. (2022) have substantiated the reliability of their instruments through statistical measures such as Cronbach's alpha and composite reliability, highlighting a path that other studies could emulate to affirm the consistency of the measurement tools used.

Furthermore, including control groups is a recognized method for strengthening causal inferences in research. Hu and Huang's (2022) employment of a control group exemplifies a robust approach to isolating the specific effects of the UDL intervention, which could be considered more frequently in similar studies. The absence of control groups in the other studies does not diminish their contributions but suggests an area for enhancement in attributing results directly to the UDL interventions.

The common use of Likert scales, ranging from 5 to 7 points, to measure participants' agreement with various statements is widely accepted and provides a transparent methodological approach. However, exploring additional or alternative methods that could capture a wider array of responses might be beneficial, especially to avoid the central tendency bias often seen with neutral options on Likert scales.

The qualitative studies conducted by Giraldo Martínez & Ramos Carvajal (2021), Lintangsari & Emaliana (2020), Kasch (2019), and Pellerin (2013) provide a transparent explanation of their methodological choices, including study design, methodology, and sampling strategies. These approaches allow for the collection rich qualitative data through surveys and interviews. Improving the theoretical basis of survey questions and providing detailed explanations of these items can enhance the validation of collected data, ensuring that it accurately represents the concepts intended to be measured. This approach helps ensure that the survey outcomes are reliable and carry meaningful interpretations that align with the research objectives.

In summary, while the studies provide valuable contributions to understanding the application and outcomes of UDL principles in second language learning and teaching, these methodological considerations suggest pathways for refining research practices. Addressing these issues in future studies could enhance the reliability and validity of research findings, thereby offering stronger evidence for the effectiveness of UDL in second language educational practice.

Conclusion

The synthesis of ten studies reviewed in this critical research synthesis offers valuable perspectives on how the Universal Design for Learning (UDL) framework may enhance second language acquisition for diverse students, including those with special educational needs (SEN). These findings suggest that UDL's inclusive pedagogy could engage all students and foster a sense of ownership over their educational paths. However, it is essential to approach these conclusions with an understanding of the methodological constraints identified across the research spectrum.

The methodological concerns noted, such as challenges with the validity of measurement instruments, the infrequent inclusion of control groups, and qualitative data collection concerns—including undisclosed survey questions and a lack of a solid theoretical basis— highlight areas where further research could enhance our understanding and possibly validate the initial positive outcomes observed in these studies. Despite these considerations, the synthesis aligns with the broader educational discourse that UDL could improve learning opportunities and academic outcomes for all learners with and without disabilities.

This critical research synthesis, therefore, suggests a pathway for future studies. Continued research is encouraged to overcome noted limitations and expand the empirical base, especially in under-researched areas. Such studies could provide a more definitive understanding of UDL's effectiveness and ensure that educational practices are as inclusive and effective as possible.

Moreover, as reviewed in this paper, the research landscape indicates a predominance of studies focused on the English language, suggesting a need for further inquiry into the application of UDL principles in the context of other languages. Additional comparative studies contrasting UDL-implemented classrooms with traditional settings are needed to provide a clearer picture of the differential impact UDL might have. Moreover, there is a call for more quantitative research to bolster the qualitative findings, offering robust statistical evidence to support the qualitative insights into UDL's effectiveness.

While this critical research synthesis provides a comprehensive overview of UDL's impact on L2 learning, it has limitations. The scope of this review was confined to articles from two

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major databases dedicated to language education, which may not encompass all relevant studies in the field. Future research should consider a broader range of databases and include gray literature to ensure a more exhaustive coverage of the available research on UDL in L2 education. Future research should aim to validate the assessment tools used in these studies and incorporate control groups to isolate the effects of UDL interventions better. Expanding research to include a variety of languages and cultural contexts will also enhance our understanding of UDL's effectiveness. Considering these findings and the methodological considerations discussed earlier, this paper underscores the transformative potential of UDL in L2 education. It calls for educators to adopt and adapt UDL principles to meet the needs of their increasingly diverse student populations. As the educational landscape continues to evolve, so must our approaches to teaching and learning, with UDL providing a valuable framework for fostering inclusive and effective educational practices. Moving forward, the field would benefit from continued exploration into the nuanced impacts of UDL across different languages, cultures, and educational systems, thereby enriching our collective understanding of best practices in L2 instruction.

In conclusion, this critical research synthesis shows that the UDL framework can enhance second language acquisition for diverse students, including those with special educational needs. Although the reviewed studies have methodological limitations, their findings contribute valuable perspectives on inclusive language educational practices. Future research can aim to build on these findings, refine research methods, and expand the linguistic contexts explored. By recognizing the strengths and addressing the limitations of the current research, we can develop a more nuanced and inclusive approach to education. Such efforts will help ensure that all learners receive equitable educational opportunities, creating an environment where every student can succeed.

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