ASIA PACIFIC JOURNAL
OF EDUCATORS AND EDUCATION

Volume 40, Issue 1, 2025
https://doi.org/10.21315/apjee2025.40.1.10

Research Article:

Implementation of Universal Design Learning (UDL) towards Knowledge, Skills and Engagement among Inclusive Education Teachers in China's Inclusive Classroom

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ABSTRACT

Universal Design for Learning (UDL) is a scientifically validated framework that guides educators in designing inclusive and effective curricula for all learners. Despite its global recognition, the integration of UDL into China's educational system remains in its nascent stages, with limited research on its implementation. This study addresses this gap by exploring the perceptions and practices of UDL among inclusive education teachers in China. Using a quantitative survey design, data were collected from 185 questionnaires to examine teachers' knowledge, skills and engagement related to UDL. The findings reveal three key insights: First, inclusive education teachers demonstrated the highest level of proficiency in implementing multiple means of representation, though further refinement is needed to optimise its application. Second, teachers exhibited comparatively lower effectiveness in applying multiple means of action and expression, highlighting significant potential for improvement in this domain. Third, teachers displayed moderate competence in employing multiple means of engagement, indicating a need for continued development and reinforcement of these practices. Overall, the study underscores the necessity for targeted professional development and pedagogical enhancements to better integrate UDL principles into China's inclusive education system. These findings contribute to the growing body of literature on UDL implementation in non-Western contexts and provide actionable insights for policymakers and educators aiming to foster inclusive learning environments.

Keywords:: Universal Design for Learning (UDL), Inclusive Classroom, knowledge, skills, engagement, Inclusive Education Teachers

Published: 10 June 2025

To cite this article: Sun, Y., & Zaharudin, R. (2025). Implementation of Universal Design Learning (UDL) towards knowledge, skills and engagement among inclusive education teachers in China's inclusive classroom. *Asia Pacific Journal of Educators and Education, 40*(1), 193–214. https://doi.org/10.21315/apjee2025.40.1.10

INTRODUCTION

In the current global educational landscape, inclusive education is increasingly gaining prominence and recognition, gradually emerging as a dominant trend. However, in China, inclusive education remains in its developmental phase. Consequently, the question of how to accelerate the growth of inclusive education in China has become a pressing concern. Universal Design for Learning (UDL), initially proposed by the Center for Applied Special Technology (CAST, 2024), originated as a technical support center for students with special needs in Massachusetts, USA. As research progressed and theoretical frameworks evolved, CAST expanded its focus to encompass all learners, leading to the development and refinement of UDL theory (Wei & Li, 2020; Yan et al., 2023).

In this study, UDL is defined as the flexibility in the presentation of information, the methods by which students respond or demonstrate knowledge and skills, and the ways in which students are engaged (Coy et al., 2014). The three guiding principles of UDL—multiple means of representation, multiple means of action and expression, and multiple means of engagement (CAST, 2024)—provide a comprehensive framework for teachers to integrate ideas and practices that enhance their ability to think critically and act effectively. This framework supports the development of teacher competencies required for 21st-century education while addressing the diverse educational needs of all students (Hall et al., 2012; Rusconi & Squillaci, 2023).

The U.S. Higher Education Opportunity Act (HEOA) has mandated the incorporation of UDL into both pre-service teacher preparation and in-service professional development (Craig et al., 2019). It emphasises that qualified teachers must be capable of designing integrated instructional curricula that respond to the linguistic, cultural and cognitive diversity within classrooms, as well as the varied educational experiences of learners (Katz, 2014). The pivotal role of teachers in education is undeniable, with knowledge (Ng & Ahmad, 2021; Hosshan, 2022), skills (Turiman et al., 2020) and engagement being essential components of effective classroom practice.

The knowledge, skills and engagement of teachers are particularly critical in the implementation of UDL, as these elements align closely with its three core principles (Kumar & Wideman, 2014; CAST, 2024). In this study, teacher knowledge refers to the ability to design multiple means of representation, offering flexible approaches to presenting "what is taught" and "what is learned," thereby enabling students to effectively discern and comprehend information, ideas, and concepts (Hall et al., 2012). Given the significant variability in how learners perceive and process information, no single mode of representation is optimal for every student. Thus, it is imperative for teachers to provide diverse representational options (CAST, 2024). Teacher skills, in this context, involve designing multiple means of action and expression, providing students with choices for "how to learn" and "how to demonstrate their knowledge," and supporting them in planning, executing, and managing actions and skills (Hall et al., 2012). Since learners differ in how

they navigate learning environments, process information, and express their understanding, no single approach to action and expression is universally effective. Therefore, teachers must offer varied options to accommodate these differences (CAST, 2024). Finally, teacher engagement refers to the ability to design multiple means of engagement, offering flexible choices for "why to learn" and fostering students' ability to invest their minds and strategies in tasks, learning, and the world around them (Hall et al., 2012). Learners exhibit significant variability in the factors that motivate and inspire them, and no single method of engagement is optimal for all learners in all contexts. Consequently, teachers must provide diverse engagement strategies to address these individual differences (CAST, 2024).

However, the concept of UDL is still in its infancy in China. Compared to the extensive body of international research on UDL, there is relatively limited attention to UDL-related studies in China (Yan & Deng, 2014; Yan et al., 2023). Moreover, there is a significant gap in understanding how teachers' knowledge, skills and engagement align with UDL principles. Therefore, this research aims to investigate teachers' knowledge, skills, and engagement in the context of UDL, considering the broader landscape of inclusive education in China. Specifically, the study seeks to:

1. Investigate the inclusive education teachers' knowledge in implementing multiple means of representation in China.

2. Investigate the inclusive education teachers' skills in applying multiple means of action and expression in China.

3. Investigate the inclusive education teachers' engagement in employing multiple means of engagement in China.

BACKGROUND OF STUDY

Inclusive education, as an internationally influential educational movement, aims to provide specialised support for students with disabilities within the least restrictive environment (Ainscow & César, 2006). This pedagogical approach has made substantial advancements in theoretical frameworks, policy development, and practical implementation (UNESCO, 2017). The evolution of inclusive education has not only catalysed global educational reforms but also necessitated a paradigm shift in traditional teacher education systems, thereby imposing new professional competency requirements on educators (Duan, 2018). Given the heterogeneous nature of inclusive classrooms, teachers are required to possess both general pedagogical knowledge and specialised expertise in special education to comprehensively understand the physical, psychological and learning characteristics of both neurotypical students and those with disabilities (Guo, 2021). The development of this dual knowledge framework represents a fundamental challenge in teacher professional development within the context of inclusive education.

UDL represents a comprehensive framework for instructional organisation, grounded in the science of learning and centered around three core principles that guide educators in developing curricula that are both valid and inclusive for all learners (Meyer et al., 2014). The UDL guidelines are systematically organised around these three principles: multiple means of representation, multiple means of action and expression, and multiple means of engagement (Rose & Gravel, 2010; CAST, 2024). These guidelines have been developed through extensive research and empirical evidence, focusing on four fundamental elements of curriculum instruction: goals, assessment, materials and methods (Katz, 2014). The overarching goal of UDL is to foster learner agency that is purposeful and reflective, resourceful and authentic, as well as strategic and action-oriented (CAST, 2024) (as shown in the Appendix).

The term "universal" in UDL does not imply a "one-size-fits-all" approach (Crevecoeur et al., 2014; Edyburn & Gardner, 2009) but rather emphasises equitable access to learning materials and the provision of diverse methods for knowledge acquisition that accommodate individual learner characteristics (Hall et al., 2012). UDL is a scientifically validated framework for educational practice that (a) offers flexibility in information presentation, student response modalities and engagement strategies; and (b) reduces instructional barriers while providing appropriate accommodations, supports and challenges, maintaining high achievement expectations for all students, including those with disabilities and English language learners (Coy et al., 2014; Lyakurwa, 2018). Hall et al. (2012) posit that research on learning disabilities and the development of supportive learning environments formed the theoretical foundation for UDL principles. These principles align with three primary brain networks: the recognition network, strategic network, and affective network (Rose & Meyer, 2002), which play crucial roles in the learning process. The three fundamental principles of UDL are as follows (Hitchcock et al., 2002):

1. Multiple means of representation: This principle emphasises flexible approaches to presenting instructional content and learning materials, supporting recognition learning through diverse modalities.

2. Multiple means of action and expression: This principle provides varied options for demonstrating knowledge and skills, facilitating strategic learning through alternative response and expression mechanisms.

3. Multiple means of engagement: This principle focuses on generating and sustaining learner motivation through flexible choices in learning activities, supporting affective learning by addressing individual interests and preferences.

The Individuals with Disabilities Education Act (IDEA) mandates that general education curricula must be both accessible and generalisable to students with disabilities (Lipkin & Okamoto, 2015). As research progressed, CAST (2024) shifted its focus from addressing learning disabilities to designing universally accessible instruction. This paradigm shift led to an emphasis on leveraging student strengths rather than primarily compensating for weaknesses. In the context of China's inclusive education system, the application of UDL

principles in inclusive classrooms represents a crucial step towards creating more equitable and effective learning environments for all students.

Literature Review

UDL extends the principles of Universal Design (UD) from physical environments to educational contexts, emphasising the creation of flexible, inclusive learning experiences that accommodate the diverse needs of all learners. UD movement, which emerged from the architectural domain, is widely attributed to the pioneering work of the late Ronald Mace (Kumar & Wideman, 2014). Under Mace's leadership, a consortium of architects reached a scholarly consensus that physical environments and products should embody universal accessibility principles (Bronswijk, 2006). The fundamental objective of UD is to maximise usability for all individuals without necessitating specialised adaptations. Essentially, UD advocates for proactive design strategies that foster inclusivity (Kumar & Wideman, 2014). This paradigm aligns seamlessly with the inclusive ethos of educational practice. Although the 'user-first' philosophy originated in architectural and industrial design domains, its applicability extends significantly to educational contexts.

The seminal work of Orkwis and McLane (1998) established the theoretical foundation for applying UD principles in educational settings, highlighting their substantial pedagogical value. Notably, the Center for Universal Design at North Carolina State University, in collaboration with CAST, has played a pivotal role in operationalising these principles within educational frameworks to enhance accessibility for diverse learners (Courey et al., 2013). Mirroring the architectural philosophy of UD, which proactively addresses the requirements of individuals with disabilities through purposeful, intentional and considerate structural design, UDL similarly anticipates the heterogeneous needs of learners. UDL facilitates the development of comprehensive educational programmes that both challenge and support students, ensuring equitable access to meaningful learning opportunities that benefit all participants (Salend & Whittaker, 2017; Brown, 2020).

The development of high-quality inclusive education hinges on the construction of teacher teams, with teachers playing a central role (Norwich, 1994; World Health Organization, 2011; Ketenoğlu Kayabaşı, 2020). UDL, as a paradigm shift (Meier & Rossi, 2020), provides teachers with a design framework and practical guidance for inclusive teaching. Research indicates that UDL training enhances teachers' ability to develop accessible curriculum plans (Rusconi & Squillaci, 2023) and boosts the confidence of educators in inclusive classrooms (Spooner et al., 2007). Furthermore, Davies et al. (2013) found that weekly UDL training sessions and classroom observations significantly improved teachers' understanding and practical application of UDL principles, effectively bridging the gap between theory and practice. Rao and Meo (2016) helped teachers integrate UDL into standardized instruction. However, although some teachers already possess basic knowledge of UDL, more training and practice are needed to meet the diverse needs of students with disabilities (Almumen, 2020; Spooner et al., 2007). Teachers generally report needing

more time and relevant training to master the techniques and skills required to implement UDL principles, but time constraints and workload pressures pose significant challenges (Smith Canter et al., 2017). Therefore, although the importance and advantages of UDL are widely recognised, its effective implementation still requires systematic support and resource investment.

UDL works in inclusive classrooms to ensure that all students, including students with disabilities, have access to a high-quality general education. Research has shown that instructional strategies embedded in UDL can reach more learners than traditional instructional approaches (Klinger et al., 2009). King-Sears and Weiss (2019) summarised empirical research on UDL in enhancing academic achievement and classroom participation for students with disabilities, highlighting its importance in inclusive education. For example, Xu and Wang (2015) demonstrated the positive effects of UDL in an inclusive education setting in China through case studies, while Narkon and Wells (2013) incorporated UDL concepts into story maps and significantly improved students' reading comprehension. In addition, Hitchcock et al. (2016) utilised UDL-based assistive science techniques to effectively improve students' literacy skills. Together, these studies suggest that UDL not only supports students' academic development but also creates a more inclusive and productive learning environment for all students.

Currently, UDL in China remains in its nascent stage of development, with its principles and concepts yet to be widely disseminated. The understanding of UDL predominantly relies on foreign literature (Wei & Li, 2020). Although UDL was only introduced to China in recent years and many teachers remain unfamiliar with its terminology, its core principles have already been integrated into certain classroom teaching practices (Yan et al., 2015). Nevertheless, teachers encounter multiple barriers in implementing UDL, including resistance from traditional curriculum design paradigms (Yan & Deng, 2014; Jia & Xin, 2017) and regional limitations due to insufficient digital technology infrastructure (Yan & Deng, 2014). Furthermore, the widespread lack of systematic UDL training among teachers further constrains its dissemination (Jia & Xin, 2017).

Despite these challenges, existing UDL-based curriculum implementations have demonstrated significant pedagogical innovation. Liu and Hu (2024) highlight that UDL, through flexible curriculum design (Peng & Wang, 2017) and the integration of modern educational technologies, facilitates individualised instruction within group settings. This approach provides students with diverse methods of information representation, expression and engagement, while employing multi-faceted assessments tailored to individual benchmarks. Wen and Liang (2019) have developed a UDL-based personalised learning curriculum design model, offering practical guidance for teachers. The application of UDL is gradually expanding across various disciplines, showing notable efficacy in life language instruction (Wang, 2022), as well as in life mathematics (Du, 2023) and adaptive physical education (Guo & Ma, 2023), emphasising the alignment of student strengths and needs, flexible goal setting and differentiated evaluation.

By 2024, the increasing volume of research on UDL in China reflects a growing recognition and confidence in its potential. However, compared to international research standards, the adoption of UDL by Chinese teachers still faces challenges such as insufficient attention, superficial understanding and interpretative biases in research. There is an urgent need for further systematic training and practical support to address these issues. Although the number of studies on the application of UDL in inclusive education in China has increased, several research gaps remain. First, while existing studies frequently introduce the three principles of UDL, there has been no systematic or targeted investigation into teachers' understanding and application of these principles. Second, there is a lack of focused quantitative research in China, particularly studies utilising questionnaires to examine inclusive education teachers' knowledge, skills, and engagement in UDL. This study aims to address these gaps, providing new perspectives for the optimisation and development of inclusive education.

RESEARCH METHODOLOGY

This study adopts a quantitative survey methodology to investigate teachers' knowledge, skills and engagement with UDL. The survey was administered online via a widely used survey platform in China (https://www.wjx.cn), targeting inclusive education teachers in Shandong, Beijing and Shanghai. The authors used a cluster sampling technique to get a general idea of the respondents in each unit ahead of time and distributed it in clusters to teachers, some of whom may have been exposed to the UDL for the first time, some of whom may have had some initial knowledge or exposure to UDL but have not yet applied it in their teaching practice, or they may have already integrated UDL into their teaching. A total of 245 questionnaires were collected, with all items being mandatory and no missing responses in the returned surveys. Following rigorous validation procedures, 60 questionnaires were excluded due to response times under 180 seconds or evidence of repetitive patterns, resulting in 185 valid responses and a recovery rate of 75.51%. The sample consisted of 185 inclusive education teachers, comprising 25 males and 160 females. Additionally, 82 respondents held special education degrees, while the others had non-special education backgrounds.

The survey instrument was adapted from Wang (2022), incorporating items aligned with the three core principles of UDL. Specifically, items addressing the descriptions of these principles (labelled A1, B1 and C1) and about the level of confidence teachers would have if they had received more training in UDL (labelled A9, B9 and C9) were added. The questionnaire was structured into three sections: Section A (Multiple Means of Representation), Section B (Multiple Means of Action and Expression) and Section C (Multiple Means of Engagement), each containing nine items. To mitigate response bias, reverse-worded items and actual negatives were included (Alquraini & Rao, 2018). A five-

point Likert scale was utilised, with response options ranging from: Strongly Disagree, Disagree, Neutral, Agree and Strongly Agree, scored as 1 to 5, respectively.

The validity of the questionnaire was rigorously assessed through content validity and construct validity analyses. For content validity, the instrument was reviewed by special education professors with over 30 years of experience and seasoned frontline special education teachers, leading to the removal of redundant items. Construct validity was evaluated using statistical indicators, including the Kaiser-Meyer-Olkin (KMO) value, communality, variance explained, and factor loading coefficients. The KMO value of 0.920 and a significance level of $p = 0.000$ confirmed the questionnaire's robust validity, ensuring its reliability for measuring the intended constructs.

DATA ANALYSIS AND RESULTS

The data in this investigation were described using the mean and standard deviation. In order to obtain more accurate and realistic values, before the calculation of the values for each section, the reverse expressions of the questions in each section, that is, A2, B2 and C2, were flipped and the choices they contained were flipped to obtain the positive choices, which were aligned with the direction of the other positive responses. That is, turn the previous choice "1 = strongly disagree" into "5 = strongly agree ", "2 = disagree" to "4 = agree" and "3 = neutral" remains the same. The new data OA2, OB2 and OC2 are obtained, so that together with the other affirmative expressions, the researcher can continue to sort, analyse and summarise the data. What's more, according to the study by Joshi et al. (2015), the interpretation criteria for a 1-to-5 point Likert scale are as follows: 1.00–1.80 indicates "Very Low," 1.81–2.60 indicates "Low," 2.61–3.40 indicates "Moderate," 3.41–4.20 indicates "High," and 4.21–5.00 indicates "Very High." In addition, a relative comparative analysis between the values of the three principles of UDL will also be performed thus judging and researching.

Applying Multiple Means of Representation in China's Inclusive Classroom

From Table 1, the mean score for Section A exceeds 4.05, with a standard deviation of 0.304, indicating a consistently high level of performance. This suggests that teachers are effectively implementing multiple means of representation in their classrooms, demonstrating a great ability to adapt instructional methods to meet diverse student needs.

Table 1. Descriptive statistics results for Section A

Section A: Multiple means of representation	
Mean	4.05
N	185
Standard deviation	0.304

Table 2 reveals that the mean scores for individual items in Section A range from 3.26 to 4.28, reflecting an overall high level of proficiency. The two highest-scoring items are A7 ("I will break down the teaching content into multiple points of knowledge") and A8 ("I will use visual images (such as PowerPoint or board books) and retelling strategies to help students generalise and transfer their knowledge"), both achieving a mean score of 4.28. These results indicate that teachers frequently deconstruct complex content into manageable segments to enhance student comprehension and retention. Additionally, the widespread use of visual aids, such as PowerPoint presentations and board books, underscores their integral role in facilitating knowledge transfer and generalisation.

However, two items scored below 4, highlighting areas for improvement. The lowest-scoring item, OA2 ("I do not think that teachers providing multiple means of representation can provide students with different choices in how different information is presented"), received a mean score of 3.26. Similarly, A1 ("The principle of designing multiple means of representation focuses on 'what to learn'") scored slightly higher at 3.88. Both items pertain to the conceptual understanding of multiple means of representation, a core principle of UDL. The relatively low scores suggest that while teachers are adept at applying practical strategies aligned with this principle, their theoretical understanding of it may be limited. It is also worth noting that the low score for OA2 could be influenced by response bias, as it is a negatively phrased item.

Items A4 ("I will provide text-only, picture-only, or graphic combination instructional materials depending on student ability) and A5 ("I will prepare touchable physical teaching aids for students who need them") both achieved high scores of 4.19 and 4.21, respectively. These results reflect teachers' responsiveness to the varying abilities and needs of their students, as they tailor instructional materials—such as text, images, or multimodal combinations—to optimise learning outcomes. This adaptability demonstrates a strong alignment with UDL principles and highlights the effective application of multiple means of representation in practice.

Furthermore, Table 3 shows that the standard deviations for individual items range from 0.870 to 1.278. The lowest standard deviation corresponds to item A7 – "I will break down the teaching content into multiple points of knowledge," which also has the highest mean score. This indicates a high level of consensus among teachers regarding the effectiveness of this approach, suggesting that it is a widely accepted and consistently applied strategy in inclusive classrooms.

In summary, while teachers demonstrate a strong practical application of multiple means of representation, there is room for improvement in their conceptual understanding of this UDL principle. The high scores for items related to content deconstruction and the use of visual and tactile aids underscore the effectiveness of these strategies, whereas the lower scores for theoretical items highlight the need for further professional development to deepen teachers' understanding of UDL frameworks.

Table 2. Mean and standard deviations for each item in Section A (n = 185)

Items	Mean	SD
A7 (I will break down the teaching content into multiple points of knowledge.)	4.28	0.870
A8 (I will use visual images (such as PowerPoint or board books) and retelling strategies to help students generalise and transfer their knowledge.)	4.28	0.900
A5 (I will prepare touchable physical teaching aids for students who need them.)	4.21	0.952
A6 (I will prompt students to focus on the core knowledge points.)	4.20	0.960
A4 (I will provide text-only, picture-only, or graphic combination instructional materials depending on student ability.)	4.19	0.941
A9 (I believe that I can help students with knowledge after getting systematic training about UDL.)	4.11	0.899
A3 (I will change the size of the pictures or words presented to the students.)	4.05	0.943
A1 (The principle of designing multiple means of representation focuses on "what to learn".)	3.88	0.944
OA2 (A2: I do not think that teachers designing multiple means of representation can provide students with different choices in how different information is presented.)	3.26	1.278

Applying Multiple Means of Action and Expression in China's Inclusive Classroom

Table 3 reveals that Section B has a mean score of 4.00 with a standard deviation of 0.313, indicating that teachers' implementation of multiple means of action and expression is moderately effective but leaves considerable room for improvement. This suggests that while teachers are making efforts to design flexible methods for students to demonstrate their skills, there is still significant potential for enhancing their practices in this area.

Table 3. Descriptive statistics results for Section B

Section B: Multiple means of action and expression	
Mean	4.00
N	185
Standard deviation	0.313

As shown in Table 4, the mean scores for individual items in Section B range from 3.14 to 4.20, reflecting variability across different aspects of this UDL principle. Notably, item B4 ("I will optimise the use of relevant tools or assistive technology to facilitate student manipulation") and item B7 ("I will help students break down their long-term goals into actionable short-term goals") achieved the highest mean scores of 4.20 and 4.19, respectively. These results indicate that teachers are actively incorporating tools and assistive technologies to support diverse learners and are effectively guiding students in setting and achieving manageable learning objectives. The lower standard deviation for item B4 (0.869) compared to item B7 (0.957) suggests greater consistency among teachers in their use of assistive technologies, reflecting a shared recognition of their value in facilitating student engagement and learning.

However, item B5 ("I will use tools such as outlines or mind maps") – scored slightly lower, with a mean of 3.94, failing to exceed the threshold of 4. Similarly, item OB2—a reverse-coded item—recorded the lowest mean score of 3.14. This parallels the findings for item OA2 in Section A, suggesting that while some teachers are able to apply practical strategies aligned with the principle of multiple means of action and expression, their conceptual understanding of this principle remains limited. The low score for OB2 may also be attributed to response bias, as reverse-coded items often yield lower scores due to their negative phrasing. The moderate score for item B5 further indicates that teachers are cautious about employing tools such as mind maps or outlines in their classrooms. This hesitancy may stem from the complexity of using these tools effectively, as they require students to synthesize knowledge, identify connections between concepts and engage both hemispheres of the brain to develop critical thinking skills. Consequently, the successful implementation of such tools depends heavily on teachers' instructional expertise and their ability to adapt to students' varying cognitive and perceptual needs.

Additionally, Table 4 highlights that item B9 ("I believe I can help students with skills after getting systematic training about UDL") has the lowest standard deviation (0.813), indicating a high level of consensus among teachers regarding the importance of UDL-related professional development. This suggests that teachers recognise the value of systematic training in enhancing their ability to implement UDL principles effectively and are generally aligned in their views on the need for further skill development in this area.

In summary, while teachers demonstrate a moderate level of proficiency in applying multiple means of action and expression, there is a clear need for improvement, particularly in their conceptual understanding of this principle and their use of advanced instructional tools such as mind maps. The high scores for items related to assistive technology and goal setting reflect effective practices, whereas the lower scores for theoretical understanding and tool utilisation highlight areas for targeted professional development. The consistent agreement on the importance of UDL training further underscores the potential for growth through systematic skill enhancement.

Table 4. Mean and standard deviations for each item in Section B (n = 185)

Items	Mean	SD
B4 (I will optimise the use of relevant tools or assistive technology to facilitate student manipulation)	4.20	0.896
B7 (I will help students break down their long-term goals into actionable short-term goals)	4.19	0.957
B3 (In class, I will prepare different forms of answers such as written answers, multimedia operations and oral answers)	4.17	0.955
B8 (I will give progress examples such as before and after photos, videos or growth portfolios of the learning process)	4.12	0.925
B9 (I believe I can help students with skills after getting systematic training about UDL)	4.11	0.853
B1 (The principle of designing multiple means of action and expression focuses on "how to learn")	4.08	0.863
B6 (I will post the goal or process in a visible place such as: blackboard, desk and so on)	4.04	0.974
B5 (I will use tools such as outlines or mind maps)	3.94	1.046
OB2 (B2: I don't think that teachers designing multiple means of action and expression can help students to choose different ways to present what they have learned in the learning process)	3.14	1.285

Applying Multiple Means of Engagement in China's Inclusive Classroom

According to Table 5, the mean score for Section C is 4.00, with a standard deviation of 0.305, indicating that teachers' implementation of multiple means of engagement in the classroom is generally effective, though there remains significant potential for further improvement. This suggests that while teachers are making efforts to foster student motivation and engagement through diverse strategies, there is still room to enhance their practices in this domain.

Table 5. Descriptive statistics results for Section C

Section C: Multiple means of engagement	
Mean	4.00
N	185
Standard deviation	0.305

As illustrated in Table 6, the mean scores for individual items in Section C range from 3.15 to 4.20, reflecting variability across different aspects of this UDL principle. The lowest mean score of 3.15 corresponds to item OC2 ("I don't think that teachers providing multiple means of engagement will stimulate student interest, sustained effort, and self-adjustment to provide more options"). This finding aligns with the trends observed in Sections A and B, where reverse-coded items consistently scored lower. Like the knowledge and skills dimensions of UDL, while some teachers are able to apply practical strategies aligned with the principle of multiple means of engagement, their conceptual understanding of this principle remains limited. This underscores the need for targeted professional development to deepen teachers' theoretical knowledge of UDL. Additionally, the low score for OC2 may be influenced by response bias, as reverse-coded items often yield lower scores due to their negative phrasing.

Conversely, the highest mean score of 4.20 was achieved by item C3 ("I will provide different activities and materials to suit students' life experiences, ages, abilities, and so on"). This result highlights teachers' recognition of the diverse needs within inclusive classrooms and their efforts to tailor instructional materials and activities to accommodate varying levels of ability, life experiences and developmental stages. Such differentiation is essential for creating a curriculum that is not only more accessible but also more engaging and effective for all students.

The second-highest mean score of 4.17 was recorded for item C4 ("I will create an accepting, supportive classroom atmosphere"). This finding underscores the importance of fostering a classroom environment that is inclusive, non-discriminatory and emotionally supportive. Such an atmosphere is critical for promoting a sense of belonging and well-being among students, which in turn enhances their motivation and engagement in the learning process.

Furthermore, Table 6 reveals that the standard deviations for individual items range from 0.865 to 1.393, indicating varying levels of consensus among teachers. The lowest standard deviations were observed for item C3 (0.865) and item C9 (0.883), suggesting a high degree of agreement among teachers regarding the importance of adapting activities and materials to student diversity and the value of systematic UDL training. In contrast, item OC2 had the highest standard deviation of 1.393, reflecting greater variability in responses, likely due to the challenges associated with interpreting and responding to reverse-coded items.

In summary, while teachers demonstrate a generally strong ability to implement multiple means of engagement, there is a clear need for improvement in their theoretical understanding of this principle. The high scores for items related to differentiated instruction and supportive classroom environments reflect effective practices, whereas the low score for OC2 highlights the persistent challenge of addressing conceptual gaps and potential response biases. These findings emphasise the importance of ongoing professional development to enhance teachers' knowledge and application of UDL principles, ultimately fostering more inclusive and engaging learning environments.

Table 6. Mean and standard deviations for each item in Section C (n = 185)

Items	Mean	SD
C3 (I will provide different activities and materials to suit students' life experiences, ages, abilities, and so on.)	4.20	0.865
C4 (I will create an accepting, supportive classroom atmosphere.)	4.17	0.934
C9 (I believe I can help students with engagement after getting systematic training about UDL.)	4.14	0.883
C5 (I will create and conduct class routines.)	4.12	0.982
C8 (I will conduct activities so that students can get feedback and help them understand their progress.)	4.09	0.901
C7 (I will provide appropriate equipment, aids, and other tools to help students understand the changes in their learning process.)	4.05	0.905
C6 (I will draw all students into the classroom activities.)	4.04	0.914
C1 (The principle of designing multiple means of engagement focuses on "why to learn".)	4.01	0.903
OC2 (C2: I don't think that teachers designing multiple means of engagement will stimulate student interest, sustained effort, and self-adjustment to provide more options.)	3.15	1.393

Furthermore, as evidenced by the data in Tables 1, 3 and 5, Section A achieves a marginally higher mean score and displays the most consistent data distribution among the three sections. Although Sections B and C share identical mean scores, the data for Section B is characterised by greater variability. When considering only the mean scores, Section A demonstrates a slight advantage over Sections B and C in terms of performance.

DISCUSSION

Inclusive Education Teachers Demonstrated the Highest Level of Proficiency in Implementing Multiple Means of Representation

The findings of this study reveal that inclusive education teachers achieved an average score of 4.05 in Section A, indicating a relatively high level of proficiency in applying multiple means of representation. For students to effectively absorb knowledge, it is essential that they perceive and comprehend the information presented by their teachers. Given the diversity in students' learning styles, teachers must adopt varied methods to present information. The questionnaire results demonstrate that teachers are capable of flexibly implementing multiple means of representation in the classroom. This includes providing text-only, picture-only or combined graphic materials tailored to students' abilities, as well as offering visual, auditory or multisensory information based on individual student needs. These practices aim to accommodate each student's unique preferences for receiving and processing information, which aligns closely with the findings of Yan and Deng (2014).

However, the study also highlights areas for improvement. While some UDL guidelines have been effectively applied by teachers, there remains significant room for enhancement. Wang (2022) corroborates this finding, noting that while teachers demonstrate some effectiveness in presenting content through multiple means, further advancements are necessary. Furthermore, a significant proportion of teachers have not received formal training in UDL. Although they may have intuitively applied certain UDL-aligned strategies in their teaching practices, they often lack explicit awareness that these practices are embedded within the UDL framework. Additionally, some teachers exhibit misconceptions or possess an incomplete understanding of UDL, which may hinder its effective implementation. These findings align with the conclusions drawn by Alquraini and Rao (2018) and Wei and Li (2020), who similarly observed that teachers' limited familiarity with UDL often results in partial or inconsistent application of its principles. Additionally, the study identifies several challenges and barriers faced by teachers in implementing multiple means of representation, including factors such as students' varying levels of impairment, interest in lessons, unexpected behaviours and emotional outbursts. From the teachers' perspective, challenges include their ability to attend to each student's needs and the quality of collaboration among teaching staff. Addressing these issues requires sustained professional development and training, as emphasised by Bedir (2022), who argues that teachers need continuous training in knowledge, skills and attitudes throughout their careers. Furthermore, the questionnaire used in this study did not fully encompass all guidelines outlined in CAST (2024), which may have influenced the results.

Inclusive Education Teachers Exhibited Comparatively Lower Effectiveness in Applying Multiple Means of Action and Expression

The results indicate that inclusive education teachers scored an average of 4.00 in Section B, reflecting moderate proficiency in applying multiple means of action and expression.

Although this score appears satisfactory, it is comparatively lower than other sections, suggesting significant room for improvement. Teachers should strive to create conditions that allow students to express themselves through diverse means, extending beyond traditional methods such as paper and pen. Encouraging students to utilise various forms of media—such as drawing, illustration, music, dance, text and speech—can enhance their ability to demonstrate skills. The study found that teachers incorporate technology, such as interactive whiteboards or tablets, to provide students with multiple avenues for expression. For instance, competitive mini games on interactive whiteboards are used to assess students' mastery of learning content, a finding consistent with Yan and Deng (2014). Additionally, teachers document students' learning progress through photos, videos and growth charts, regularly assessing and adjusting Individualised Education Programs (IEPs) and Individualised Family Service Plans (IFSPs) to better support student development.

Despite these efforts, teachers participating in this study expressed the need for further improvement in applying multiple means of action and expression. Enhancing collaboration among teachers and strengthening professional skills are critical to addressing the diverse needs of students. Teachers must ensure that every student has the opportunity to express themselves effectively, which requires tailored support and individualised attention. This aligns with the findings of Coyne et al. (2010) and Wang (2022), who emphasise the importance of teacher collaboration and professional development in fostering inclusive practices. Furthermore, the study by Rusconi and Squillaci (2023) also demonstrates that UDL training can significantly enhance teachers' ability to design and implement accessible curriculum plans, thereby improving their instructional skills in creating inclusive learning environments.

Inclusive Education Teachers Displayed Moderate Competence in Employing Multiple Means of Engagement

The study found that inclusive education teachers demonstrated moderate proficiency in applying multiple means of engagement, with some classroom effectiveness but considerable room for improvement. Active student participation and positive interactions between teachers and students are key indicators of effective teaching. Teachers design multiple means of engagement to stimulate students› interest and motivation, tailoring lessons, activities and materials to align with students› abilities, ages and life experiences. This approach ensures that learning content is relevant and applicable to students' real-life contexts, enhancing their engagement and understanding. The findings also reveal that teachers excel in creating a positive classroom atmosphere. They consider students' preferences, organising small group or individual study sessions, and designing diverse engagement strategies. Teachers also engage with parents who may hold biases against students with special needs, fostering an inclusive and non-discriminatory classroom environment.

Nevertheless, challenges remain. Factors such as students' physical and emotional states, as well as teachers' well-being and collaboration, can significantly impact the effectiveness

of engagement strategies. For example, a student's illness or a teacher's poor state of mind can hinder classroom participation and engagement. These findings echo those of Binks-Cantrell, et al. (2012) and Applegate et al. (2014), who highlight the complex interplay of factors influencing classroom dynamics. Addressing these challenges requires ongoing professional development and support for teachers, as well as strategies to foster resilience and adaptability in both students and educators. Furthermore, inclusive education teachers also require additional practical experience to effectively implement UDL principles in classroom settings (Courey et al., 2013).

Research Limitation

First, the questionnaire distribution area of this research is mainly concentrated in Shandong, Shanghai and Beijing, which may have limited generalisability. The amount of data collected in the questionnaire research is relatively small compared to populations, and the findings may not be representative.

Next, the development of UDL in China is currently in its infancy, and there are limited references on UDL teachers. The number of references in this research is small, and in-depth research and study of a large amount of authoritative literature needs to be strengthened.

Further Recommendations for Future Studies

The data of this research mainly focus on the eastern part of China, and future research can distribute the questionnaire to other regions of China to enrich the scope of the research and get richer and wider research data, so that the results of the research can be a little more comprehensive.

More references to authoritative foreign literature can be of great help in selecting topics for future papers. Future research can interview more experienced teachers, and through communication can learn the attitude of different teachers towards UDL. In addition, a survey on the current level of knowledge of UDL among Chinese special education college students can be considered. They are the main force of the future special education industry in China, and their professional knowledge reserve, as well as professionalism, will play a very crucial role. Perhaps it is also an aspect worthy of in-depth study and exploration.

CONCLUSION

This study mainly investigated the current level of inclusive education teachers' application of UDL towards knowledge, skills and engagement. The findings provide valuable insights into teachers' knowledge, skills, and engagement in applying UDL principles within the Chinese inclusive educational context. First, inclusive education teachers demonstrated the

highest level of proficiency in implementing multiple means of representation, reflecting their ability to adapt instructional materials to diverse learner needs. However, further refinement is necessary to deepen their knowledge and enhance the effectiveness of these practices. Second, teachers exhibited comparatively lower effectiveness in applying multiple means of action and expression, indicating a need to strengthen their skills in providing students with varied ways to demonstrate skills. Third, teachers displayed moderate competence in employing multiple means of engagement, suggesting a need for continued development to improve their engagement strategies and foster student motivation.

These findings highlight the importance of targeted professional development to enhance teachers' knowledge, skills and engagement in UDL. By addressing these areas, policymakers and educators can better integrate UDL principles into China's inclusive education system, creating more equitable and effective learning environments for all students. This study contributes to the growing body of literature on UDL implementation in non-Western contexts and provides actionable recommendations for advancing inclusive education practices globally.

REFERENCES

Ainscow, M., & César, M. (2006). Inclusive education ten years after Salamanca: Setting the agenda. *European Journal of Psychology of Education, 21*(3), 231–238. https://doi.org/10.1007/BF03173412

Almumen, H. A. (2020). Universal design for learning (UDL) across cultures: The application of UDL in Kuwaiti inclusive classrooms. *SAGE Open, 10*(4), 215824402096967. https://doi.org/10.1177/2158244020969674

Alquraini, T. A., & Rao, S. M. (2018). Assessing teachers' knowledge, readiness, and needs to implement universal design for learning in classrooms in Saudi Arabia. *International Journal of Inclusive Education, 24*(1), 1–12. https://doi.org/10.1080/13603116.2018.1452298

Applegate, A. J., Applegate, M. D., Mercantini, M. A., McGeehan, C. M., Cobb, J. B., DeBoy, J. R., Modla, V. B., & Lewinski, K. E. (2014). The Peter Effect revisited: Reading habits and attitudes of college students. *Literacy Research and Instruction, 53*(3), 188–204. https://doi.org/10.1080/19388071.2014.898719

Bedir, G. (2022). Teachers' views on the practices of universal design for learning. *International Journal of Curriculum and Instruction, 14*(2), 1324–1342. https://files.eric.ed.gov/fulltext/EJ1340721.pdf

Binks-Cantrell, E., Washburn, E. K., Joshi, R. M., & Hougen, M. (2012). Peter Effect in the preparation of reading teachers. *Scientific Studies of Reading, 16*(6), 526–536. https://doi.org/10.1080/10888438.2011.601434

Bronswijk, J. E. M. H. V. (2006). Ronald L. Mace FAIA (1941–1998), inventor of universal design. *Gerontechnology, 4*(4), 242–243. https://doi.org/10.4017/gt.2006.04.04.011.00

Brown, K. E. E. (2020). Silver bullet or Trojan horse? A phenomenological exploration of universal design for learning and teachers' sense of self-efficacy in an inclusive classroom [Doctoral dissertation, University of La Verne]. ProQuest. https://www.proquest.com/openview/7e63d5177563a11f7852107749fcae3c/1.pdf?pq-origsite=gscholar&cbl=18750&diss=y

CAST. (2024). *Universal Design for Learning guidelines.* CAST. https://udlguidelines.cast.org/

Courey, S. J., Tappe, P., Siker, J., & LePage, P. (2013). Improved lesson planning with universal design for learning (UDL). *Teacher Education and Special Education, 36*(1), 7–27. https://doi.org/10.1177/0888406412446178

Coy, K., Marino, M. T., & Serianni, B. (2014). Using universal design for learning in synchronous online instruction. *Journal of Special Education Technology, 29*(1), 63–74. https://doi.org/10.1177/016264341402900105

Coyne, P., Pisha, B., Dalton, B., Zeph, L. A., & Smith, N. C. (2010). Literacy by design. *Remedial and Special Education, 33*(3), 162–172. https://doi.org/10.1177/0741932510381651

Craig, S. L., Smith, S. J., & Frey, B. B. (2019). Professional development with universal design for learning: Supporting teachers as learners to increase the implementation of UDL. *Professional Development in Education, 48*(1), 1–16. https://doi.org/10.1080/19415257.2019.1685563

Crevecoeur, Y., Sorenson, S., Mayorga, V., & Gonzalez, A. (2014). Universal design for learning in K-12 educational settings: A review of group comparison and single-subject intervention studies. *The Journal of Special Education Apprenticeship, 3*(2), 1–23. https://doi.org/10.58729/2167-3454.1036

Davies, P. L., Schelly, C. L., & Spooner, C. L. (2013). Measuring the effectiveness of universal design for learning intervention in postsecondary education. *Journal of Postsecondary Education and Disability, 26*(3), 195–220. https://eric.ed.gov/?id=EJ1026883

Du, W. (2023). Meeting the needs of individual students: Exploring the teaching strategies of mathematics in schools for intellectual disability under the concept of universal design for learning. *Primary School Teaching Research, 36*, 81–83.

Duan, Y. (2018). Reflections on teacher education of learning in regular class in the context of inclusive education. *Course Education Research, 02*, 11–12.

Edyburn, D., & Gardner, J. E. (2009). *Readings in special education technology: Universal design for learning.* Arlington, VA: Council for Exceptional Children.

Guo, G. (2021). Problems and reflections on the practice of pre-school children's learning in regular class in the context of inclusive education. *Journal of Educational Development, 07*, 17–22.

Guo, L., & Ma, J. (2023). Nurturing reflections on the integration of motor rehabilitation into the adapted physical education curriculum of Peizhi Education school-based on the universal design for learning. *Journal of Suihua University, 43*(10), 46–49.

Hall, T. E., Meyer, A., & Rose, D. H. (2012). *Universal design for learning in the classroom: Practical applications*. Guilford Press.

Hitchcock, C. H., Rao, K., Chang, C. C., & Yuen, J. W. L. (2016). TeenACE for science: Using multimedia tools and scaffolds to support writing. *Rural Special Education Quarterly, 35*(2), 10–23. https://doi.org/10.1177/875687051603500203

Hitchcock, C., Meyer, A., Rose, D., & Jackson, R. (2002). Providing new access to the general curriculum. *TEACHING Exceptional Children, 35*(2), 8–17. https://doi.org/10.1177/004005990203500201

Hosshan, H. (2022). Perspectives of teachers on supporting the participation of students with learning disabilities in inclusive secondary schools: A qualitative study. *Asia Pacific Journal of Educators and Education, 37*(1), 47–60. https://doi.org/10.21315/apjee2022.37.1.3

Jia, C., & Xin, W. (2017). Universal design of learning: Development, commentary and enlightenment. *Modern Special Education (Higher Education), 4*, 21–25.

Joshi, A., Kale, S., Chandel, S., & Pal, D. K. (2015). Joshi, A., Kale, S., Chandel, S., & Pal, D. K. (2015). Likert scale: Explored and explained. *British Journal of Applied Science & Technology, 7*(4), 396–403. https://doi.org/10.9734/BJAST/2015/14975

Katz, J. (2014). Implementing the Three Block Model of Universal Design for Learning: Effects on teachers' self-efficacy, stress, and job satisfaction in inclusive classrooms K-12. *International Journal of Inclusive Education, 19*(1), 1–20. https://doi.org/10.1080/13603116.2014.881569

Ketenoğlu Kayabaşı, Z. E. (2020). Teachers' opinions on inclusive education. *International Journal of Psychology and Educational Studies, 7*(4), 27–36. https://doi.org/10.17220/ijpes.2020.04.003

King-Sears, M. E., & Weiss, M. P. (2019). Universal design for learning: Revisiting its promise for students with disabilities. *Intervention in School and Clinic, 54*(3), 131–139.

Klinger, L., Campbell, W., & Knight, J. (2009). Universal design for learning: A novel perspective on school-based services. https://caot.in1touch.org/document/3906/OTNow_Nov_09.pdf#page=9

Kumar, K., & Wideman, M. (2014). Accessible by design: Applying UDL principles in a first year undergraduate course. *Canadian Journal of Higher Education, 44*(1), 125–147. https://doi.org/10.47678/cjhe.v44i1.183704

Lipkin, P. H., & Okamoto, J. (2015). The Individuals with Disabilities Education Act (IDEA) for children with special educational needs. *PEDIATRICS, 136*(6), e1650–e1662. https://doi.org/10.1542/peds.2015-3409

Lyakurwa, S. (2018). Universal design for learning towards achieving inclusive higher education in Tanzania [Doctoral dissertation, University of Oslo]. https://www.duo.uio.no/bitstream/handle/10852/66635/1/PhD-Lyakurwa-2019.pdf

Meier, B. S., & Rossi, K. A. (2020). Removing instructional barriers with UDL. *Kappa Delta Pi Record, 56*(2), 82–88. https://doi.org/10.1080/00228958.2020.1729639

Meyer, A., Rose, D. H., & Gordon, D. (2014). *Universal design for learning: Theory and practice.* CAST Professional Publishing.

Narkon, D. E., & Wells, J. C. (2013). Improving reading comprehension for elementary students with learning disabilities: UDL enhanced story mapping. *Preventing School Failure: Alternative Education for Children and Youth, 57*(4), 231–239. https://doi.org/10.1080/1045988x.2012.726286

Ng, H. Y., & Ahmad, M. Z. (2021). Secondary school English teachers' knowledge and practice on CEFR-aligned English curriculum. *Asia Pacific Journal of Educators and Education, 36*(1), 75–91. https://doi.org/10.21315/apjee2021.36.1.5

Norwich, B. (1994). The relationship between attitudes to the integration of children with special educational needs and wider socio-political views: A US-English comparison. *European Journal of Special Needs Education, 9*(1), 91–106. https://doi.org/10.1080/0885625940090108

Orkwis, R., & McLane, K. (1998). A curriculum every student can use: Design principles for student access. ERIC/OSEP Topical Brief. https://files.eric.ed.gov/fulltext/ED423654.pdf

Peng, X., & Wang, X. (2017). American preschool children's success curriculum under the background of inclusive education. *Chinese Journal of Special Education, 8*, 27–31.

Rao, K., & Meo, G. (2016). Using universal design for learning to design standards-based lessons. *SAGE Open, 6*(4), 1–12. https://doi.org/10.1177/2158244016680688

Rose, D. H., & Gravel, J. W. (2010). Universal design for learning. In *International Encyclopedia of Education* (pp. 119–124). https://doi.org/10.1016/b978-0-08-044894-7.00719-3

Rusconi, L., & Squillaci, M. (2023). Effects of a universal design for learning (UDL) training course on the development teachers' competences: A systematic review. *Education Sciences, 13*(5), 466. https://doi.org/10.3390/educsci13050466

Salend, S. J., & Whittaker, C. R. (2017). UDL: A blueprint for learning success. *Educational Leadership, 74*(7), 59–63. https://eric.ed.gov/?id=EJ1138127

Smith Canter, L. L., King, L. H., Williams, J. B., Metcalf, D., & Rhys Myrick Potts, K. (2017). Evaluating pedagogy and practice of universal design for learning in public schools. *Exceptionality Education International, 27*(1), 1–16. https://doi.org/10.5206/eei.v27i1.7743

Spooner, F., Baker, J. N., Harris, A. A., Ahlgrim-Delzell, L., & Browder, D. M. (2007). Effects of training in universal design for learning on lesson plan development. *Remedial and Special Education, 28*(2), 108–116. https://doi.org/10.1177/07419325070280020101

Turiman, P., Osman, K., & Tengku Wook, T. S. M. (2020). Inventive thinking 21st century skills among preparatory course science students. *Asia Pacific Journal of Educators and Education, 35*(2), 145–170. https://doi.org/10.21315/apjee2020.35.2.9

UNESCO. (2017). *A guide for ensuring inclusion and equity in education.* UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000248254

Wang, Q. (2022). Study on the status quo and influencing factors of life-oriented instruction in special school for intellectual disability-Based on the viewpoint of universal design for learning [Master's thesis, East China Normal University]. https://doi.org/10.27149/d.cnki.ghdsu.2022.002485

Wei, S., & Li, W. (2020). 2009–2019 empirical research progress and enlightenment of foreign Universal Learning Design. *Special Education in China, 7*, 3–9. https://doi.org/10.3969/j.issn.1007-3728.2020.07.002

Wen, H., & Liang, J. (2019). Personalized learning course design based on UDL universal design for learning theory. *Educational Information Technology, 10*, 56–60.

World Health Organization. (2011). World report on disability. World Health Organization. https://www.who.int/teams/noncommunicable-diseases/sensory-functions-disability-and-rehabilitation/world-report-on-disability

Xu, J., & Wang, Y. (2015). Research on the application of universal design for learning in inclusive education. *Modern Special Education, Z1*, 102–106.

Yan, T., & Deng, M. (2014). Universal design for learning in inclusive classrooms and reflections. *Chinese Journal of Special Education, 1*, 17–23.

Yan, T., Guan, W., & Deng, M. (2015). A comparative analysis of differentiated instruction and universal design for learning in inclusive classrooms. *Chinese Journal of Special Education, 2*, 3–9.

Yan, T., Hou, Y., & Han, F. (2023). From curriculum modification to universal design for learning: Reflections on the curriculum for high quality development in inclusive education. *Special Education in China, 8*, 18–23. https://doi.org/10.3969/j.issn.1007-3728.2023.08.003

APPENDIX

The Universal Design for Learning Guidelines (CAST, 2024)