A Study on the Significance of UDL-Based Teaching Practices for Students with Intellectual Disabilities

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Abstract: In recent years, the Universal Design for Learning to Support Students with Intellectual Disabilities (UDL) has been used as a methodological framework in our work with students with intellectual disabilities, providing a flexible developmental environment for integrated education and addressing the learning differences of students. It plays an important role in supporting and promoting learning in general education to all students, including students with intellectual disabilities. The concepts, implementation principles, and theoretical foundations of Universal Design for Learning are explored to reveal the practical implications of Universal Design for Learning as applied to students with intellectual disabilities.

To fully realize inclusive education, not only the physical space must complement each other, but also the curriculum and teaching level must be deeply integrated. Intellectual disabilities can be classified as mild, moderate, severe and very severe in terms of the degree of impairment. The development of the individual is further hindered by impaired intellectual functioning, impaired adaptive skills and limited individual learning ability. The main manifestation is that children with intellectual disability often struggle more than normal children to learn and have varying degrees of difficulty in understanding problems, verbal expression, logical thinking, memory and problem solving [1]. However, this does not mean that children with intellectual disabilities cannot learn, and as society has progressed, a number of special education concepts, educational principles, and teaching methods have emerged to help children with intellectual disabilities learn and develop. effective and inclusive curriculum for general and exceptional students. The purpose of this paper is to examine the concept of Universal Design for Learning (UDL), the principles that should be followed in its implementation and the theoretical basis for supporting inclusive education, and to explore its practical implications for supporting the development of inclusive education in order to promote the positive development of inclusive education.

1. Learning the concept and implementation principles of universal design

1.1. Learning the concept of universal design

Universal design is not about forcing elements into a product to meet certain requirements, but

about designing a product with the goal of accessibility and making the finished product more universal. According to the U.S. Center for the Application of Special Technologies, UDL is a personalized teaching model developed based on brain science and new media technology, which is widely used in the field of special education curriculum in the United States. Meanwhile, the promotion and implementation of UDL in general schools helps to ensure educational equity and promote the development of integrated education. In Taiwan, China, the UDL concept has been widely practiced in the front line of teaching for more than ten years and has achieved initial results. [2]

1.2. Learning the principles of universal design implementation

On the one hand, UDL is integrated into schools as an innovative approach to curriculum design that expands access to general education for students with intellectual disabilities, thereby fostering diverse learning abilities. On the other hand, UDL as a methodological framework provides a flexible developmental environment for inclusive education that balances the learning differences of students and plays an important role in promoting and supporting learning in general education to all students, including students with intellectual disabilities. UDL has three implementation principles: (1) Multiple representations approach, i.e., providing students with different ways to access information and knowledge. Since students have varying degrees of impairment, it is necessary to select appropriate teaching methods based on their level of cognitive development and physiological development to overcome learning difficulties due to perceptual deficits and other reasons as much as possible. (2) Multiple expressions, i.e., each student can express the knowledge and skills learned in different ways; the main expression commonly used in UDL is self-expression, which, as a form of self-determination, allows students with intellectual disabilities to recognize their strengths and weaknesses from various perspectives in multiple expressions. (3) The pluralistic approach of participation, i.e., creating a learning atmosphere according to students' personalities and needs, allowing students to freely choose learning tasks, and linking the fun of learning with forms of expression, thus effectively mobilizing students' initiative in learning.

2. Learning the theoretical basis of universal design

2.1. Brain Neuroscience

The principles of UDL proposed based on brain science concepts are (1) the multiple representation principle of the brain's cognitive system, which is about how students correctly identify information; (2) the multiple expression principle of the brain's planning system, which is about how students conduct effective learning methods and strategies; and (3) the multiple participation principle of the brain's affective system, which is about students' motivation to engage in learning, etc. When conducting UDL, it is important to have a clear understanding of the role of learning tasks on students' cognition, expression, and engagement.

Theories from brain neuroscience provide the theoretical basis for the instructional methods used in teaching. Students with different levels of impairment have different characteristics in terms of learning ability and interest in learning, and the three brain performance criteria of cognitive, affective and planning systems are also quite different for different individuals, which in turn leads to differences in students' learning outcomes. There are two main ways to process information in the brain: concept-driven and data-driven. Using the way the brain processes information, teachers can choose teaching resources, teaching methods and strategies according to their teaching needs. First, teachers should provide students with intellectual disabilities with multiple access to information in the teaching process to ensure that students with intellectual disabilities have the

same educational opportunities as ordinary students; second, teachers should provide sufficient background information on knowledge points and bridge the context in the teaching process to help students build bridges between old and new knowledge.

2.2. Theory of the nearest developmental zone

The nearest developmental zone theory refers to the area between the child's actual level of development in problem solving and the likely level of development in problem solving done collaboratively by others[3] . In the teaching process, students are provided with challenging learning content to motivate them and develop their potential. The most development is achieved within the most recent developmental area and is used as a starting point for the next developmental area.

Students with intellectual disabilities lag behind the average student in terms of learning ability, so teachers need to build "scaffolding" in some of the more delayed areas of intellectual development. It is important to note that while scaffolding in the learning process is important, it does not mean that more is better. Too much scaffolding can cause students to become "lazy" in their thinking and thus not achieve a sufficient sense of learning accomplishment. However, too little scaffolding or challenging tasks that are too difficult can cause frustration. For meaningful learning to occur, students' abilities and psychological characteristics must be clearly recognized and tailored to create a challenging, supportive, and meaningful learning environment. Because of the varying levels of impairment and students' learning abilities, approaches, and strategies, the development of instructional goals and the selection and use of instructional methods should also be differentiated from general education.

2.3. Multiple Intelligences Theory

Children with strong sensory discrimination skills show good academic performance, and their academic performance is positively correlated with their sensory discrimination skills. Traditional theories of intelligence do not take into account differences between social groups and cultural factors, are not innovative and lack ecological validity in terms of cognitive and intellectual development, and have limited applicability. Although students with intellectual disabilities have deficits in some areas of intelligence, other areas of intelligence can be fully developed, and the use of multiple intelligences theory in special education settings can effectively promote the development of education, build on strengths and avoid weaknesses, stimulate potential, and fully develop personality.

Therefore, educators and parents of children with special needs should not limit themselves to making up for the child's intellectual deficiencies, but should actively explore and develop the child's intellectual development strengths to make up for the deficiencies as much as possible and form a complementary and joint development [4]. In the theory of multiple intelligences, every student has a dominant area of intelligence, and through the implementation of appropriate education and the adoption of suitable educational methods, students with intellectual disabilities can be helped to develop to different degrees. UDL in the context of inclusive education effectively places students with intellectual disabilities in a sufficiently flexible environment to further increase their opportunities to participate in classroom activities among students without disabilities, thus assessing the abilities of each intelligence area in a holistic manner and providing students with intellectual disabilities with diverse curriculum learning resources to actively participate in learning activities.

3. Practical Implications of Learning Universal Design Applied to Teaching Courses for Students with Intellectual Disabilities

3.1. Localization of Learning Universal Design

UDL as a curriculum design concept has been fully applied in special education in the United States and other developed countries and has achieved rich practical results. It is of great practical significance to localize and apply UDL to the field of special education in China. Localization refers to the exchange and collision between foreign cultures and local paradigms of thinking.[5] The localization refers to the exchange and collision of foreign cultures and indigenous paradigms. China has only introduced the concept of Universal Design for Learning in the last decade or so, so many educators are still unfamiliar with the term "UDL".[6] Many educators are still unfamiliar with the term "UDL". With the development of the Internet, artificial intelligence, and other high-tech information technology industries and their use in education, China's educational resources and educational technologies are diversifying. The presentation of knowledge during teachers' lectures is no longer the traditional chalk and blackboard, but a variety of classroom teaching aids such as projectors, video players, human-computer interactive computer monitors and other multimedia technologies. Curriculum design and high-tech products are increasingly closely integrated, and digital teaching aids have effectively improved the teaching efficiency of the classroom and promoted effective teaching. At present, the help of technology for children with special needs is mainly reflected in various assistive technologies, such as intelligence testers, balance rehabilitation trainers, rehabilitation training robots and other instruments and equipment that help rehabilitation training, but there are few products related to the curriculum teaching design for students with intellectual disabilities.

3.2. Solving problems in real classrooms

In primary and secondary schools in some cities in China, the practice of UDL has taken the lead before its theory as educational assistive technologies and hardware such as computers and tablets have gradually deepened their application in the classroom. In the modern digital teaching classroom, by continuously exploring new application areas such as learning aids and mobile media, we have continued to provide students with more learning platforms and methods, driving China's integrated education land from ideal to reality. But from another point of view, how to combine curriculum and instructional design with technology so that the concept of universal design for learning can truly benefit all students is not yet well enough to give a response to the solution. To some extent, virtual classrooms, classrooms of the future, and informational classrooms are all buzzwords that cause educators to be more of a visual attraction than a consideration of the specific context of implementation. UDL focuses on the overall learning context, combining technological aids with digital courseware to assist exceptional students in integrating into the context of integrated instruction. However, in many schools, especially in economically underdeveloped, educationally backward and remote areas of the Midwest, students with intellectual disabilities have difficulty accessing digital informational classroom resources. It is critical to measure the cost of implementing new technologies and their educational impact for local students with intellectual disabilities, and it is not practical to discuss the capabilities of new media technologies while ignoring the cost of the technology required. On the other hand, it must be clear that no curriculum design or instructional approach is truly universal and that no matter how well designed, there are people who cannot use it[7] UDL is not a "one-size-fits-all" solution to all types of learning problems, and effective "universal" curricula still need to be further explored and developed.

3.3. Promote the reform and development of education in China

UDL is designed to meet the developmental needs of all students. By adapting and designing curriculum and instruction, varying the classroom environment, and designing instruction in a flexible and varied manner, the teaching environment will be more conducive to the development of students with intellectual disabilities. It is a fundamental requirement of quality education in China to adapt to the individual differences of different student groups and to improve the overall quality of education and teaching. The UDL philosophy means that the new curriculum system must move away from the old teaching model with a single goal of enabling students with intellectual disabilities to live a normal life, which is boring and tedious, so that every student, etc., can get the development they deserve. From the perspective of meeting students' interests and needs, UDL fits well with the characteristics of students with intellectual disabilities who are enrolled in classes, and provides teachable services that can be targeted. At present, China is vigorously promoting a new round of teaching reform in basic education, aiming to better reflect the concept of human-centered and student development-oriented education. The UDL-based curriculum design reflects the core concept of humanism, with the ultimate goal of "No Child Left Behind. If the general education curriculum and teaching can cover a wider range of content, including students with intellectual disabilities, teachers will have more room for adjustment in their teaching. As my reform continues to progress, curriculum decisions are gradually decentralized, and the development of local and school-based curricula provides the basis for practicing the UDL concept in the process of accompanying students with intellectual disabilities in China.

3.4. Meeting the diverse needs of students

The UDL framework is organized according to the three educational principles of the science of learning, providing flexible participation and appropriate learning support for inclusive education, reducing educational barriers, and ensuring the highest achievement of all students in learning. "Universal" is not a stereotypical catch-all term, but rather a flexible philosophy; UDL reduces the difficulty of learning for students, increases the efficiency of knowledge acquisition, and thus reduces burden. The most important thing is how students develop their own learning style, rather than receiving knowledge mechanically and passively. Human intelligence is multifaceted, and each child has different areas of intelligence. Teachers can help students learn effectively by organizing their instruction according to their existing knowledge base. When the knowledge taught is for the student's intellectual strengths, the student can easily complete the learning task. However, most current educational instruction is centered on improving students' weaknesses at the expense of areas of learning strengths. Therefore, there is a need to understand children's individual differences and potential abilities by assessing their abilities in various intellectual domains, identifying and utilizing differences, adding dimensions to classroom instruction, and individualizing education based on respecting differences in students' intellectual domains.

3.5. Promoting teachers' professional self-improvement

When designing the implementation of UDL, it is important to ensure that every student has access to educational opportunities. Teachers need to set different goals based on student characteristics, use materials appropriately, and design individualized assessment plans to maximize each student's inclusion in general education. The most obvious problem teachers encounter in integrated classes with students with intellectual disabilities is how to meet the diverse needs of the students. UDL uses IT-assisted instruction and digital media to create a variety of support systems that are accessible to teachers and provide them with more effective and flexible training. can select

appropriate teaching resources, tools, and methodological strategies as needed within the system. At the same time, pre-designed objectives, methods, and outcome assessments for students with intellectual disabilities develop a universal curriculum for learning that reflects individuality within commonality, allowing students with developmental delays in certain areas of intelligence to learn without barriers in an inclusive education environment. A deeper understanding of the role of UDL in curriculum instruction will help educators to integrate the concept of Universal Design for Learning well with classroom instruction.

Acknowledgements

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