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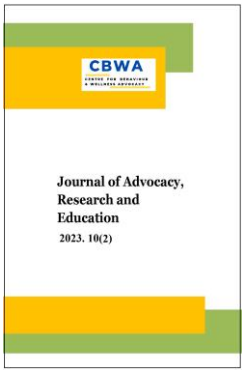

Instructional Design to Cultivate Expert Learners Using Universal Design for Learning: An Overview

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Abstract

An expert learner is one who is knowledgeable about how learning happens. Mastering the learning method and becoming a master of learning, rather than passively accepting it, is essential for 21st-century innovative talent. Universal Design for Learning aims to establish learning objectives, tool support, material content and assessment methods appropriate for individual needs at the beginning of curriculum design, thus eliminating learning barriers for each learner as far as possible and ultimately achieving the goal of expert learners. However, there are still many problems in applying the universal learning design framework. For example, applied research rarely points out how teaching interventions correspond to Universal Design for Learning principles. Based on the framework of Universal Design for Learning, combined with the understanding of expert learners, this study systematically designs teaching cases to provide a reference for practical applications of Universal Design for Learning and the cultivation of individuals with needs.

Keywords: expert learner, instructional design, overview, universal design for learning.

1. Introduction

Universal Design for Learning (UDL) was first proposed by the Center for Applied Special Technology (CAST) in 1998 (Dalton et al., 2012). It is a framework for improving and optimising teaching and learning for all, based on scientific insights into human learning styles. It aims to tailor and adapt teaching objectives, assessments, methods and materials to meet individual needs from the beginning of curriculum design. Scientific insights into how humans learn come from a comprehensive analysis of knowledge in the fields of education, cognitive science, psychology, and neuroscience. On this basis, three design principles of UDL were proposed around three groups of human brain learning networks (i.e. Recognition Network, Strategic Network, and Affective Network) (CAST, 2023). Referable instructional design guidelines and specific suggestions based on UDL guidelines are also given, as shown in Figure 1 (CAST, 2018).

Scholars and school teachers actively try to design teaching interventions according to UDL guidelines and apply them to classroom teaching. Research results showed that UDL can improve students' academic level and learning engagement (Rao et al., 2014), further confirming the effectiveness of the UDL teaching application. However, few studies have addressed the relationship between interventions and UDL principles, that is, how interventions are designed

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from UDL guidelines and how they reflect its ideas. These issues are rarely addressed in UDL-related practice articles. Although all researchers state that their application strategy is based on UDL ideas, detailed descriptions of how the components of the application strategy relate to specific principles vary widely (Min et al., 2016). Besides, no guidelines specify how the guidelines should correspond to the application strategy (Rao et al., 2014). Moreover, some UDL application cases lack specific descriptions of application strategies, further weakening their reference (Sokal, Katz, 2015; Watchorn et al., 2014).

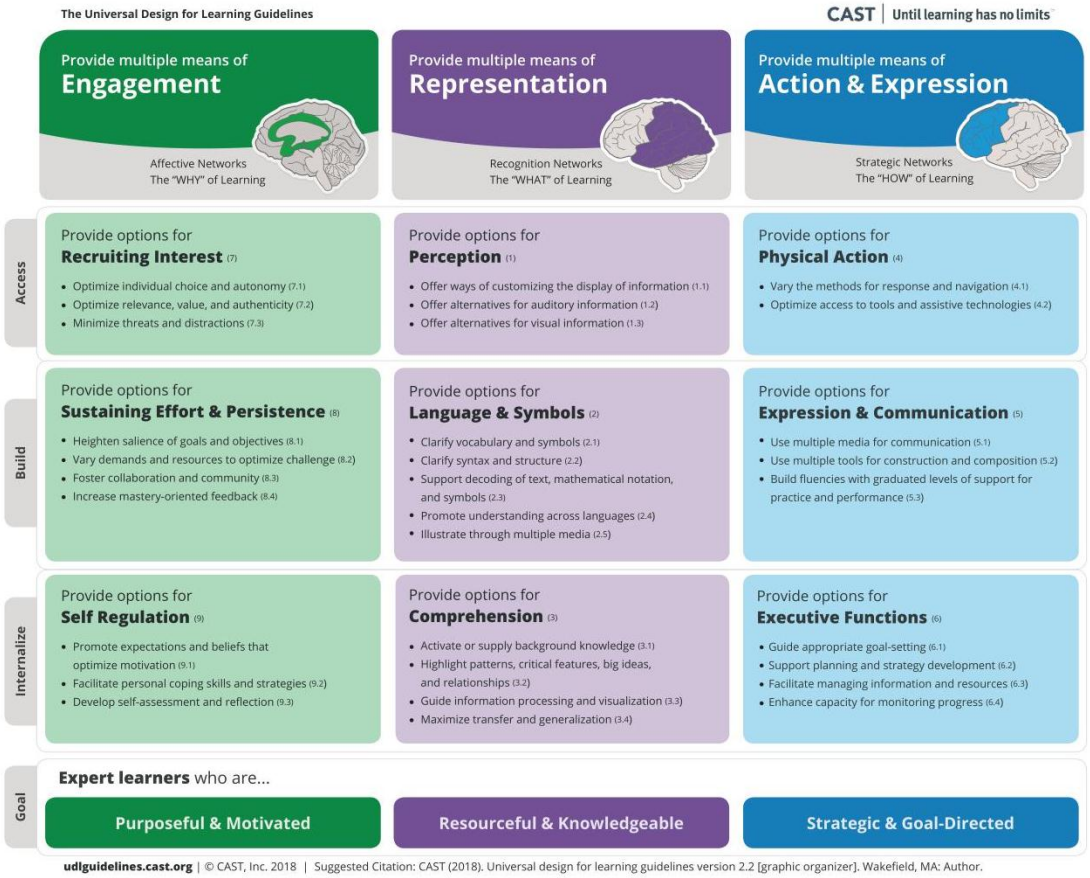

Fig. 1. Universal Design for Learning Guidelines Version 2.2

Figure 1 shows that CAST targets UDL at expert learners, that is, learners who are purposeful and motivated, resourceful and knowledgeable, strategic and goal-directed. Expert learners understand how learning happens and are good at creating conditions to support this process (Lambert, 2020). In other words, expert learners are constantly developing and motivated to learn more. Compared with novices, experts spend a lot of time in engineering practice searching for external information about the project, which novices ignore, resulting in a biased understanding of the nature of science (Peffer, Ramezani, 2019). The expert's problem-solving approach is to reason backwards from conclusions. At the same time, the novice is more inclined to reason from subjective inferences to conclusions, with different problem-solving processes and strategies. Experts adopt the scientific problem-solving process more gradually. Comparatively, novices cause problems, such as confusing sequences, merging steps, and missing processes, resulting in less clear, concise and efficient inquiry results than the former (Jeong, Kim, 2022).

Evidently, UDL understands all learners, recognises the wide range of differences among learners, and recognises all students as expert learners (Hartmann, 2015). It firmly believes that, regardless of the complexity or severity of differences and needs, everyone has the opportunity to grow as an expert learner. Although UDL considers the process of knowledge acquisition to be the growth process of expert learners, mastery of knowledge content is not the key (Dalton, 2017). According to Dalton (2017), how one understands and experiences life and transforms everyday experiences into opportunities for learning and development. One vital strength of UDL is that it transforms "one-size-fits-all" teaching into diverse and accessible learning opportunities that adapt

to changes in students (Quaglia, 2015). consciously plan multiple paths to the same learning goal, and maximise the participation of all types of students to improve education resources for all (Quaglia, 2015). However, on how to cultivate expert learners through UDL thought, the UDL guidelines only provide the framework and ideas, and the specific how to implement and develop expert learners are unclear. Thus, it is necessary to explore and analyse the connotation and characteristic development of expert learners to clarify the expert learner's development path and its relation with UDL principles.

2. Connotation, characteristics and development path of expert learners

Different authorities have offered the meaning and qualities of expert learners in several ways. Gagne believed that the core task of education is not to teach classified and systematic knowledge but to teach people the ability to think and use their reasoning ability to solve problems better (Jonassen, 2000). In 1996, UNESCO put forward the idea of "learning to learn". It was officially included in the Core Competencies and Values framework for Chinese students in 2014. It is also the core characteristic of expert learners. It is generally believed that expert learner refers to those who can learn effectively during the learning process (Rahman et al., 2010; Galkiene, Monkeviciene, 2021; Grant, Pérez, 2022). Alternatively, an expert learner is someone who can analyse, deal with problems and construct knowledge like an expert and has the characteristics of effective expert learning.

Furthermore, Ertmer and Newby described expert learners as students who are planning, controlling and reflective (Ertmer, Newby, 1996). These abilities can help them recognise skills they have or lack and then apply or acquire relevant skills using appropriate strategies. It has been pointed out that reflection on the learning process is a critical element in developing expert learners. As a result, students become aware of their learning process and can monitor and adjust their thinking strategies to improve their learning and gradually grow into expert learners. For instance, Zimmerman believed that expert learners would set reasonable learning goals for themselves and use efficient learning strategies to learn and grow in each stage of knowledge acquisition (Zimmerman, 2002).

Concerning the qualities of expert learners, Woolfolk identified three characteristics: concentration on learning material, commitment to an in-depth processing of information, and responsibility for their own learning. He believed these characteristics were not automatically constructed but achieved through deliberate planning and learning monitoring (Rahman et al., 2010). He suggested that both novice and developing expert learners need this deliberate effort and planning to build procedural knowledge on implementing and managing effective learning (Rahman et al., 2010). Similar to the views of the previous scholars, McDowell (2019) believes that expert learners understand their own learning needs, can set learning goals, and monitor their learning progress. Also, Duncan (2023), an associate professor in the Department of Cell and Developmental Biology who is passionate about improving the way science is taught, recalled her own experience of scientific inquiry and noted that expert learners can identify potential difficulties or obstacles and then seek strategies to avoid them before they arise. More importantly, they can learn from one failure to prevent similar problems in the future, even in other fields. However, due to a lack of experience, beginners are often unable to identify where errors may go, though sometimes they make mistakes. Due to a lack of awareness of the problems and failure experiences summarised, there is a high probability of making the same mistake next time.

To summarise the above scholars' understanding of expert learners in comparison to the features of expert learners in the UDL guidelines, although the wording is different, the views expressed are indeed similar. It not only further explains the understanding of the expert learner but also provides a reference for the cultivation of expert learners. Next, the three features of the expert learner in the UDL guidelines are matched to the features of the expert learner in the literature listed above, and an attempt is made to find a cultivation strategy for each feature.

Firstly, "purposeful and motivated" can be compared to "responsibility for their learning", "deliberate effort and planning", "understanding their own learning needs", and "can set learning goals" mentioned above. Expert learners can be considered active learners who are responsible for their own learning (Dalton et al., 2019). In the process of cultivation, their motives for learning will gradually change from external to internal motives, and their co-ordination, control, and primary responsibility for learning will gradually change from the external force of the teacher to the

management and responsibility of the student as the subject of learning (Sieglová, 2019). Therefore, the above-mentioned path to develop this characteristic can be summarised as "motivation arousal".

Secondly, "resourceful and knowledgeable" can correspond to "concentration on learning material", "knowledge construction", "identify potential difficulties or obstacles and then seek strategies to avoid them before they arise", and "learn from one failure to prevent similar problems in the future" mentioned above. It can be argued that expert learners should construct their cognitive structure and store knowledge in layers and categories for accurate and fast extraction (Peng, Chen, 2019). This characteristic is the biggest difference between expert and novice problem-solving. Therefore, the above-mentioned development path of this characteristic can be summarised as "cognitive construction".

Finally, "strategic and goal-directed" can correspond to "set reasonable learning goals for oneself", "planning, controlling and reflective", "deliberate planning and monitoring of learning", "can set learning goals", and "monitor their learning progress" mentioned above. It can be considered that expert learners can monitor their learning and adjust strategies in time, and this ability is consciously cultivated rather than automatically constructed (McDowell, 2019; Schwartz, Manning, 2018). Therefore, it can be summarised as "metacognitive cultivation."

3. Instructional Design model for expert learner cultivation from the perspective of UDL

Expert learners are the ultimate goal of UDL. The above describes the connotations of the UDL and features of expert learners, respectively. However, specific planning and design are still required between the two. Then, in the previous section of this study, the two were matched, and in the process, attempts were made to discover strategies for developing each trait of the expert learner. Drawing this cultivation path forms the instructional design model, as shown in Figure 2.

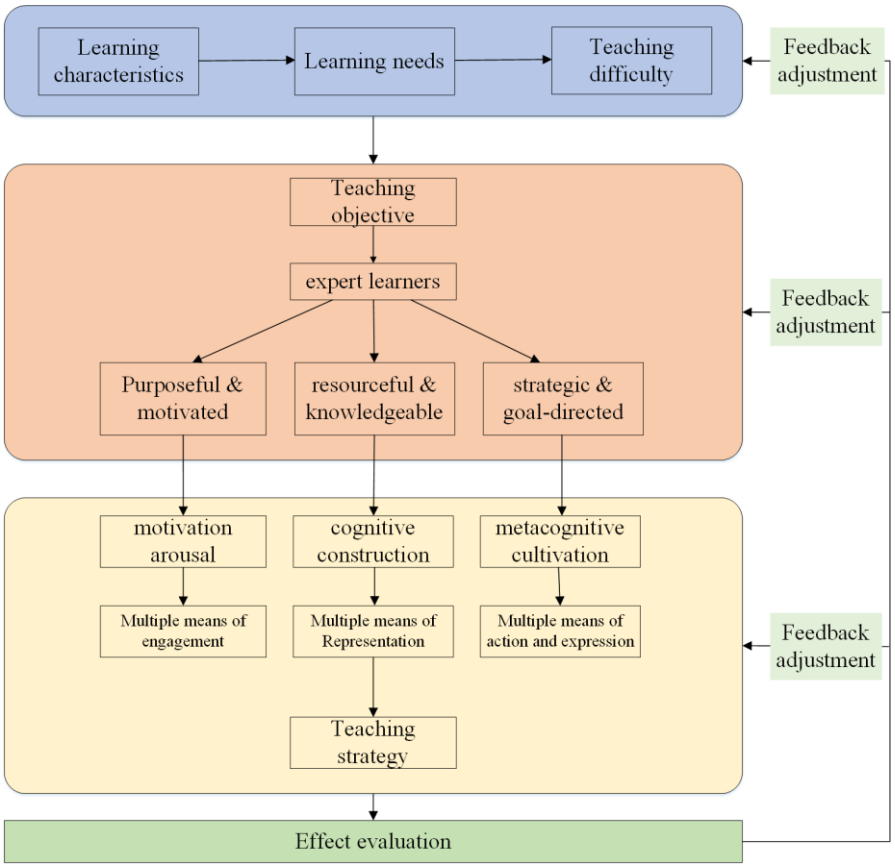

Fig. 2. An instructional design model for expert learner cultivation from a UDL perspective

This model starts with the learning needs of students, the cultivation of expert learners as the goal, the teaching strategy as the means, the effect evaluation as the starting point of the next round of teaching design to carry out the teaching design work, aiming at building flexible, independent, and supportive teaching strategies, as far as possible for every student to build scaffolding, meet learning needs and improve the quality and efficiency of learning.

The acquisition of learning needs

Learning needs acquisition is the first and key step in instructional design (Yatim et al., 2021). Only with an accurate and comprehensive understanding of a student's learning disability in a particular learning content can we design targeted teaching strategies. Learning needs are related to the content of learning itself and the student's own level of learning, intelligence, interest in learning, and other characteristics (Chiu et al., 2023). Therefore, to obtain specific information about learning needs, we should consider both perspectives of student learning characteristics and teaching content comprehensively. In terms of students' learning characteristics, students' growth environment, personality characteristics, interests, learning ability and other characteristic information can be obtained through questionnaires, interviews between teachers and students, classroom observation, self-summary of students, home visits of teachers and other ways (Permana, Utomo, 2021), and try to classify and summarise them from three aspects of human brain emotional network, recognition network and strategic network. In terms of teaching content, teachers can gather and summarise student learning difficulties and possible learning needs through their own teaching experiences, peer communication and online resources.

Teaching objectives

In contrast to traditional teaching objectives, this model focuses more on cultivating expert learners, emphasising that students should learn how to learn actively and become masters of learning rather than passively accepting. Compared to the two, the teaching objective of the expert learner is a further improvement over the one of traditional teaching. According to the above analysis and exploration of expert learners, expert learners can be described from three perspectives: motivation, cognition, and metacognition. In the design of a particular teaching case, the teaching objectives should be specifically and pertinently set according to the chapter content and the individual learning levels of the students.

Teaching strategies

Teaching strategy design is at the core of expert learner cultivation. As can be seen from the above and Figure 2, the purpose of "diversified participation methods" in UDL is to arouse students' learning motivation, especially intrinsic motivation. The purpose of "diversified presentation" is to promote students' absorption, internalisation and construction of knowledge content. The aim of "Diverse Behaviors and Expression" is to provide students with the opportunity and means to plan, monitor, regulate and reflect on their learning process. In this regard, the UDL guidelines propose specific ideas and methods to motivate student engagement in learning, promote knowledge construction, and foster metacognitive skills from three aspects: access, construction, and internalisation, as shown in Figure 1. This is certainly the basis and reference for teachers to implement UDL teaching and can create the environment and conditions for the development of expert learners. But the subject of learning is the student, and learning is ultimately about what happens to the student (Billett, 2010). In developing expert learners, scaffolding needs to be built to help students improve their learning skills in the immediate development zone (Reiser, 2018).

For the design and construction of scaffolding, we can learn from the "Five Why Method" in the field of problem-solving, also known as the "Five Questions Method", from the perspective of "motivation arousal." It is a self-questioning method used to solve practical problems, analyse, and investigate the causes of problems (Lin, Chang, 2022). It can be used to keep students asking questions about their motivation to learn, gradually finding out why they dislike learning and exploring why they want to learn. In terms of "cognitive construction", cultivation can be carried out by drawing cognitive maps. A cognitive map shows the inner mental model in a visual way, aiming to store knowledge in hierarchical classification and construct one's own knowledge context (Behrens et al., 2018; Sarah, 2019). In terms of "metacognitive cultivation", teaching can be carried out from the perspective of cultivating students to formulate learning objectives, plan the learning process and monitor learning effects.

Effect evaluation

The purpose of the evaluation is not to test the effectiveness of teaching but to obtain feedback necessary to improve teaching. Corresponding to the teaching objective, the effectiveness assessment in this study refers to the assessment of the achievement of the expert learner objective and the curriculum content objective. Specifically, it refers to the detection of student achievement of personalised goals and the improvement of goal setting based on the detection results. The subject of the assessment can be the teacher; that is, the teacher needs to make an objective and comprehensive assessment and grasp the achievement of the student's goals. It can be the student himself, i.e. the student needs to develop the ability to understand himself correctly. It can also be peer-to-peer, that is, peer-to-peer supervision and feedback. The assessment method should be the comprehensive application of summative and formative assessments, focusing on assessing students' learning ability and process.

4. Teaching case design for expert learner cultivation from a UDL perspective

Acquisition and analysis of learning needs

The Qingdao version of Seventh-Grade Mathematics, Chapter 7, Section 7.3, provides the first lesson of solving equations with one variable. The learning disability acquisition methods are mainly based on teacher summaries and references from online resources, and the specific contents are summarised as follows: ① The deformation of the equation is written as a continuous equality; ② When removing the denominator, the term without the denominator is omitted; ③ The polynomials on the score line are not bracketed after removing the denominator; ④ Do not pay attention to the rule of eliminating parentheses or missing multiplications when removing parentheses; ⑤ Change the number when transferring, or confuse the offset with the reduction; ⑥ When the same terms on both sides of the equation cancel, write the term that should be cancelled as "1"; ⑦ When the unknown coefficient is 1, the numerator and denominator are inverted; ⑧ 0 times a number equals that number; ⑨ Confusing the fundamental properties of fractions and equations.

Most of the learning needs mentioned above are caused by a fuzzy understanding of the equation-solving process, which belongs to an insufficient grasp and application of procedural knowledge of the problem-solving strategy. They belong to the "strategy network" of the human brain, corresponding to the third principle of UDL, namely, diversified behaviours and expressions. The lack of mastery and application of the strategy can be attributed to students' lack of understanding of the knowledge structure in this chapter, the failure to build a systematic knowledge network, and the failure to store knowledge in a hierarchical classification. As a result, problems such as extraction errors and confusion arise when knowledge is extracted. Again, the reason can be attributed to the fact that the student's objective in mathematics learning is unclear, and supervision is not strict, resulting in poor learning. Finally, from a motivation point of view, the reasons can be attributed to the lack of motivation of students to learn mathematics, the lack of a strong interest and inclination to learn mathematical knowledge, the failure to find the joy of mathematics learning, and the failure to experience their value in learning mathematics. Taken together, the above reasons can be attributed to the following assumptions: the storage of mathematical knowledge by students is not systematic and disorganised; mathematical learning objectives are unclear; there is no learning plan, and learning is not ideal; the motivation for mathematical learning is insufficient, and the goal is not strong.

Analysis and setting of the learning objective

The learning objective setting will be divided into two parts: the expert learner objective and the personalised objective. The former is an average standard for reference, while the latter is individualised for each student.

In this case, the goals of expert learners are set as follows: (1) to explore their interest in equation deformation law and their achievement in learning; ② Try to construct the knowledge network diagram of this lesson and the knowledge learned in this chapter and even this semester. The transfer rule and the specific process of summing up the unknown coefficients to one are summarised, and its relation to existing knowledge is analysed; ③ Learn to make learning plans, objectives, and timely monitor their learning progress and efficiency.

The setting of personalised goals should be based on individual factors such as the student's level of learning, which is appropriate for their area of recent development. High or low target expectations can reduce interest in learning. Goals can be set by both students and teachers. In the early stages, the teacher can lead the setting and gradually develop the student's ability to set goals so that the student can objectively understand his own learning level and ability to learn, and in the later stages, the student can set goals on his own.

Analysis and design of teaching strategies

Based on the acquisition and analysis of student learning needs in this chapter, the design idea of the teaching strategy will be carried out from three aspects: increasing motivation, planning learning, and mapping knowledge networks. To increase motivation, design should be carried out from the perspectives of optimising individual choice, improving autonomous ability, highlighting learning objectives and encouraging self-reflection (Pintrich, 2003; Wardani et al., 2020). The plan will be designed from the perspective of setting goals and learning plans, process monitoring, etc. (Hariri et al., 2021). The mapping of knowledge networks will be done from the perspective of simplifying the layout design of learning content, highlighting key information, visualising the presentation of knowledge content, and providing video learning materials (Flanagan et al., 2019; Ho et al., 2018). The following will be detailed regarding instructional preparation, task assignment, exploration rules, consolidation exercises, and introspective summaries.

The teaching materials to be prepared include the following contents: ① handout materials: redesign the teaching contents of this class according to the principles of concise layout, highlighting key information and emphasising correlation. ② Video explanation: prepare the video learning materials for the lesson. ③ Micro-video: according to the knowledge content, the video should be divided into several micro-videos. ④ Text explanation: prepare the text to explain the video content. ⑤ Knowledge structure chart: draw the knowledge structure chart of this lesson and mark its position in this chapter. ⑥ Background knowledge activation materials: provide interesting math stories related to the knowledge content of this lesson. ⑦ Cards: prepare cards marked with 0-9 and mathematical operation symbols. ⑧ Teaching process: a brief introduction to the main teaching process of this section. ⑨ Teaching objectives: define this lesson's learning objectives and expected results. ⑩ Assessment: Clarify the assessment methods and requirements for this class. The UDL principle embodied therein is mainly multiple means of representation, which are concretely reflected in multiple representation types of information content, highlighting key features, key points and their interrelationships, and explaining using multimedia.

Teachers' activities during the assignment phase are mainly divided into the following: the distribution of learning materials; informing students of the lesson's learning objectives, learning plan, and learning outcomes; based on the objectives, plans, and achievements of the class, each student is assigned to develop his/her own learning schedule for the class, including time, content, and outcomes, and is timely reminded of the completion of learning tasks along the way. Also, student activities are divided into the following phases: browsing for learning materials; setting learning goals that are appropriate for one's own learning level, and making a study plan. The UDL principles embodied therein are further categorised as follows: ① providing multiple means of representations, which are embodied in informing the learning objectives and the types of achievements in highlighting the learning objectives; ② providing multiple means of action and expression, which are embodied in guiding the setting of appropriate goals; helping with study planning; encouraging, guiding and monitoring the learning process.

During the exploratory rule phase, teachers' activities are divided into distributing cards, allowing students to freely combine the cards to form multiple univariate equations, and writing the combined equations in a notebook. Also, it includes encouraging students to work in groups or independently to explore their combinations of equation-solving processes, thinking about what your solution basis, idea, process is, articulating it and writing it down; checking whether the solution is correct and reasonable within the group, and summarising the rules; teachers observe the problem-solving process of each group and give timely instructions to solve the problem; the teacher summarises the student's problem-solving rules and explains the concepts, functions, and steps of the transfer rules and unknown coefficients into 1. Student activities can be divided into combining cards to form multiple types of linear equations with one unknown; analysing the

characteristics, differences, and similarities of different equations; exploring the solving procedures for linear equations with one unknown by groups or independently; checking the solution process peer to peer; reflecting on the solution process, summarising the existing knowledge used and exploring the laws of solving linear equation with one unknown; a complete and detailed description of the solution process and visualising the problem-solving process. The UDL principles embodied therein are as follows: ① providing multiple means of engagement, which are embodied in the free combination of cards to improve students' subjective participation and selectivity; cooperation and independent learning are encouraged to give freedom and flexibility in the way of learning; real-time feedback to improve the effectiveness of feedback; ② providing multiple means of representation, which are embodied in drawing the knowledge network diagram, visualising the problem-solving process, and understanding the correlation between different knowledge further.

The activities of the teacher during the consolidation exercise phase are mainly divided into encouraging students to solve the first exercise. Teachers inspect students to solve problems and give timely instruction. They allow group collaboration and self-inquiry in various ways and encourage students to solve the second exercise. The teacher inspects students to solve problems and gives timely guidance. Allow group work and self-inquiry in a variety of ways. The activities of the students are further divided into encouraging the students to solve the first exercise. For example, students are encouraged to consider whether it is hard to solve, where the difficulty lies, and what knowledge points relate to it. Students, during activities, are made to review and resolve these points. If the equation is solved smoothly, analyse the characteristics of the equation and the solution idea, reflect on the knowledge used in solving the equation, and ask if there are still doubts about the equation; encourage students to solve the second exercise. Reflect in the same way. The UDL principles embodied therein are as follows: ① providing multiple means of engagement, which is incorporated in encouraging reflection; ② providing multiple means of representation, which is also embodied in encouraging the exploration of the correlation between knowledge.

Additionally, the teacher's activities in the introspective summary phase include encouraging and guiding students to reflect on learning and summarising the common learning problems and their solutions. Students' activities further enable learners to reflect on whether they have grasped the learning objectives. If they master it, they are required to summarise their learning experience of the lesson. If not fully grasped, analyse what knowledge is not captured, what the problem is, and what the cause is; what questions should be addressed in the next class to improve learning efficiency, etc.; whether the learning plan of this class is carried out according to the plan; whether the learning plan is in line with my learning level and habits; whether I need to make adjustments. The UDL principles embodied therein are mainly as follows: ① providing multiple means of engagement, which is embodied in encouraging self-assessment and reflection on the learning process; ② providing multiple means of action & expression, which is incorporated in comparing learning objectives with learning outcomes, highlighting learning efficiency, and promoting students to monitor and adjust the learning process.

Evaluation and feedback of learning effects

On the one hand, evaluating the student's learning effect should test whether the student's learning objectives and plans are reasonable and can be effectively completed. On the other hand, it is necessary to check whether the student's knowledge, methods, and motivation meet the desired requirements. Pay attention to self-comparison and longitudinal investigation from the individual's own point of view; that is, avoid horizontal comparison from the point of view of others (Peteros et al., 2019; Syaifuddin, 2020). Assessment methods can be adopted in two ways: one is analysing and examining the completion of learning objectives and learning plans, and the other is assigning learning tasks to consolidate and examine students' knowledge mastery. The assessment subjects can firstly be self-assessment, then investigate and learn among peers, and finally make a summary evaluation supplemented by the teacher.

5. Conclusion

Compared to traditional teaching designs, the teaching strategies designed by this research could be more autonomous and optional, with more diverse learning support. Furthermore, it provides guidelines for clearer learning objectives, more emphasis on process evaluation, and

clearer learning content. Nevertheless, instructional design does not apply all the guidelines in UDL nor meet all the learning needs of every learner in the class. On the one hand, learning needs cannot be exhausted or fully explored; on the other hand, the design and production of learning support needs to be continuously revised and improved to more effectively meet the needs of students. The shortcoming of this study is that it fails to collect the learning needs of each student, nor does it provide targeted interactive tool support based on each learning disability. Instead, it designs a universal strategy based on the three principles of UDL. Future studies should focus on the suitability and individuation of learning disability acquisition and strategy formulation, as well as the effectiveness and existing problems of strategies in actual teaching, to provide ideas for revising and improving teaching design.

6. Recommendation

Each student is unique, born into different families, exposed to different groups of people, with different personalities, learning habits and styles, etc. These are worthy of consideration in curriculum and instruction design. Every individual with differences should be the focus of teaching, not the illusory unified "average" individual (Hollingshead et al., 2022). Based on this understanding, UDL tries to meet learners' diverse needs and preferences as much as possible, thus improving the quality and efficiency of learning. This is also the core idea of UDL. UDL is an instructional design framework and an unsatisfiable ideal state. Key to its implementation is the design and development of corresponding application strategies. At present, this work is still in its infancy, and most of it is developed individually by teachers according to the learning needs of the class. Besides, problems such as unsystematic, unspecific, and weak references have to be fixed (AlRawi, AlKahtani, 2022; Rao et al., 2014).

The following suggestions can be referred to:

The teaching application of UDL should build a community of teachers and invite relevant departments, such as educational institutions, enterprises and institutions, to participate in developing strategies (Orndorf et al., 2022). According to the characteristics of the application object, systematically organise and classify.

The developed application strategy improves the generalizability of UDL application cases (Torres, Rao, 2019). The relationship between application strategies and the three principles of UDL is clearly described, which facilitates further in-depth research by researchers on UDL applications. References and references from other teachers' concrete application strategies (Ok et al., 2017; Rao et al., 2020), which are conducive to the application of strategies in the classroom, improve the value of reference and provide a starting point for UDL application evaluation (Cook, Rao, 2018).

7. Declarations

Ethics approval and consent to participate

Ethics approval was granted by the Tianjin Academy of Educational Science, China, with informed consent from all participants.

Consent for publication

Not applicable.

Availability of data and materials

Data and materials associated with this study are available upon request.

Conflict of interest statement

The authors of the manuscript declare that there is no conflict of interest, and all reference materials were duly acknowledged.

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