RESEARCH ARTICLE

Exploring the Connotation and Teaching Strategies of Deep Learning in Early Childhood Education

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Abstract: In response to global trends in early childhood education, Chinese early childhood education have recently shifted from emphasizing 'what to learn' to 'how to learn', which was viewed as a means to enhance the efficiency of children's learning and development. Accordingly, as a problem-solving-based learning process, deep learning has progressively drawn the interest of ECE researchers and practitioners. This study presents the definition and connotation of deep learning in early childhood education, as well as the teaching strategies that foster high-quality learning.

Keywords: early childhood education, deep learning, teaching strategy

1. Forward

Exploring the deep learning of education has significant theoretical and practical relevance in the context of teaching and learning reform focused on core skills. As the foundation of learning abilities like lifelong learning, independent learning, and knowledge innovation, deep learning has become the new standard for people in the development of the new era, it is the global direction of developing talents in the 21st century, and the practical guide of teaching from the core perspective. In the filed of education, deep learning has become a crucial topic for preschool researchers and practitioners, which offers significant support for enhancing the caliber of young children's learning and teaching abilities.

According to a number of earlier studies, rather than the complexity of the subjects in early childhood education, the emphasis on deep learning for young children should be on the learning process. This study defines and discusses the meaning of deep learning, and teaching strategies to promote deep learning in early childhood education..

2. Deep Learning in Early Childhood education: a Definition

Conceptually, the concept of deep learning was not originated from the field of education, but from machine learning. With the application and development of deep learning, it was been gradually introduced into the field of artificial intelligence (AI) and education.

Bloom (1956) was the one who initially put forth the idea of deep learning in education. He defined six cognitive objectives in his 'Taxonomy of Educational Objectives', noting that each student approaches learning differently and that the learning process necessitates a certain depth of study. Knowledge, comprehension, application, analysis, synthesis, and evaluation are the six strands he used to categorize cognitive objectives. These six objectives were later modified in 2001 by Anderson's team to remember, understand, apply, analyze, evaluate, and create. To some extent, Bloom's theory served as the pre-theoretical basis for the application of deep learning in the field of education, until (Marton and Säljö, 1976) described deep-level and surface-level processing in experiments in which students read and recalled academic texts. Learning is highly contextual and at the core of every learning process lie two fundamental concepts that worth mentioning: deep learning and surface learning. Deep learning is a committed approach to learning where the learner uses higher-order cognitive skills to master academic content, work collaboratively and think and interact critically and actively with the content being learned. It's crucial to remember that deep learning and surface learning are complementary concepts rather than rivals. Although surface learning has a more passive learning style and sometimes involves mechanical memorization, it serves as the foundation for deep learning. In addition to surface learning, deep learning is more active, demonstrates critical thinking and problem-solving skills, and enhances learning effectiveness and significance. Table 1 lists a number of distinctions between surface learning and deep learning.

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Table 1 Differences between deep learning and surface learning

Characteristics	Surface learning	Deep learning
Motivation	Externally motivated, goal-oriented learning	Internally motivated, learners are positively motivated to learn
Cognitive Objectives	Aim to understand	Aim to complete learning tasks
Knowledge Structure	Does not link new knowledge to prior knowledge	Link the new knowledge to prior knowledge
Way of Learning	Learn in a mechanical way, with short persistence	Understands problems as a whole and identifies connections between parts of the learning materials
Way of Thinking	Does not pay attention to the authenticity of the learning content, learns in isolation	Thinks critically about the authenticity of the learning content
Transfer-ability	Does not produce transfer-ability	Easily produces transferability
Meta-cognition	Does not use meta-cognitive skills	Uses meta-cognitive skills

Theories related to deep learning were introduced to China in 2005 by Shanghai Normal University's researchers He Ling and Li Jiahou, and has aroused attention from many preschool experts since the educational practice has gradually been changed in recent years from focusing on 'what to learn' to 'how to learn'. In the filed of early childhood education, we can combine the definitions of deep learning for young children put out by by (Tian and Yang, 2017), (Wang and Liu, 2020), and (Ye, 2022). When viewed as a whole, deep learning in early childhood education refers to a learning process in which children engage with the environment over an extended period of time while being guided and supported by teachers, focusing on difficult subjects, incorporating their own special learning methods, actively engaging themselves wholeheartedly, actively learning new knowledge and experiences, and exploring the environment (including the natural, social, and physical environment). Children learn to integrate knowledge and experience into their original cognitive structures and transfer it to new contexts using higher-order thinking skills during this process, which helps them build their problem-solving skills and other multifaceted learning abilities. Young children's deep learning and surface learning are inextricably linked because surface learning serves as the foundation for deep learning and deep learning is an improvement of surface learning. One of the educational goals is to help young students progress from a basic level of cognition and comprehension to a sophisticated level of application of what they have learned to tackle real-world issues, including applying, analyzing, synthesizing, evaluating, and even creating. Additionally, the 'depth' of young children's deep learning differs from the trend of primary school and is not as profound in terms of content, esoteric, or challenging learning material that exceeds children's cognitive ability. It focuses on the learning process of determining if children are engaged in deeper

thinking and the application of cognitive activities in the learning process, addressing operational and implementable information based on children's original cognitive level and experience.

3. The Connotation of Deep Learning in Early Childhood Education

Young children's deep learning is focused on problem-solving, motivated by pleasant emotions, encouraged by peer cooperation, occurring in context, and threaded by evaluation and reflection, according to (Wang, 2020) and (Ye, 2022). They gave teachers instructions on how to conduct in-depth instruction that will actually result in deep learning.

3.1 Problem-solving oriented
Deep learning is a type of problem-solving-based learning that calls for kids to be able to use their own experiences and previous knowledge to solve actual problems in specific circumstances.

3.2 Positive emotions as motivation
Young children must be very driven to learn, and they must be enthusiastic and interested in what they are doing. Numerous scientists have confirmed how emotions influence young children's motivation for mental activity.

3.3 Taking place in context
Young children's deep learning happens in context, when they use their prior knowledge and experience to the current circumstance to resolve the problems.

3.4 Supported by interpersonal harmony
Numerous research conducted both domestically and internationally have supported the helpful role that peer cooperation plays in education. For instance, using a cooperative recall task, (Manion and Alexander, 1997) discovered the crucial significance of peer collaboration in the effective application of cognitive strategies and meta-cognitive development. A study done by Shamir et al with 64 children in different learning contexts, which showed that children learn more effectively in peer

cooperative learning situations as opposed to independent learning situations by exploring the meta-cognitive development. Peer effect on children's deep learning, which includes both emotional and strategic assistance in addition to teacher support and guidance, was significant. Children engage in verbal and physical interactions with one another while participating in the activities, which not only increases their excitement for learning but also fosters their ability to deal with difficulties.

3.5 Evaluation and reflection as the overarching theme

A problem-solving-based deep learning model by (Zhang, Jiarui Xie, and Guohua, 2017) proposed a generic process model of deep learning that included: attention and acceptance, recall of learned knowledge, transfer application, and problem solving. Evaluation and reflection will recur in deep learning that is problem-oriented. Children consistently think when identifying difficulties and fixing them, and through this consistent thinking and reflection, they will eventually be able to solve problems. Dewey, who proposed 'reflective thinking,' defined it as thinking repeatedly and reflexively. Five steps are involved in reflective thinking: situation - question - hypothesis - inference - verification. These steps are also present in young children's profound learning processes.

4. Teaching Strategies to Promote Young Children's Deep Learning

Many academics have stated teaching strategies to encourage deep learning for young children in what ways good quality teaching is present, based on the special connotation and characteristics of deep learning in early childhood education. The ten teaching strategies listed below (Cai, 2021; Chen , 2021; He , 2020; Hua, 2021; Qin & Sun, 2020) are summarized as follows:

4.1 Clarifying teacher's role as a scaffolder rather than an intervenor

Based on observation and documentation, teachers who scaffold should uphold the appropriateness of either implicit or explicit scaffolding. For instance, they should increase the games' complexity and difficulty; develop environments and materials that cater to kids' interests and formative experiences; or accompany kids at the right times and 'exit' them at the right times with a flexible presence. They can also combine various independent games naturally, letting the previous game become the next game's 'experience.'

4.2 Clarifying the role of child as a leader

Redefining the role of early learners, shifting away from passive learning, and making young children the center of learning are some key strategies for encouraging young children's deep learning. Teachers should allow the children to decide on their own how, what, and whom to play with during the independent play.

4.3 Recognizing children's interests and seizing educational opportunities

The rationale for deep learning for young children holds that it is driven by pleasant feelings. When a child is engaged in something they are passionate about, they are more likely to be driven to learn. Young children's interests shift frequently and abruptly, so it's critical to capture the moment when you can. To encourage children's deep learning, teachers should quickly determine their interests and expectations.

4.4 Reconstructing the steps of play activities

First of all, for kids, the knowledge obtained from one game can serve as the foundation for the next, and the difficulties and obstacles they faced in the prior game can serve as important milestones in their "zone of proximal development." Teachers should pay attention to both the support provided before and after play as well as the issues that arise during it. In order to encourage children to learn independently through autonomous play, teachers must first expertly construct the scaffolding before the game. To do this, they must carefully consider and modify the materials they choose and the atmosphere they establish.

Secondly, the teacher should be an observer, collaborator, and supporter of the game, assisting children in problem-solving and problem-finding, and engaging them in high-quality and effective interactions in line with the various scenes.

Thirdly, the teacher should encourage and move forward after the game, for instance by insisting on active conversation with children to grasp their opinions and game-playing experiences and to further deepen learning.

4.5 Constructing appropriate 'scaffolds' to promote children's 'zone of proximal development'

According to Vygotsky's theory of 'zone of proximal development', a demanding environment is beneficial for children's cognitive development. In order to encourage children's imagination and creativity, teachers should design environments that are adaptable to their requirements and free for them to replicate or incorporate.

4.6 Adjusting and coordinating time and space to maintain the flexibility of play

In autonomous play, time and space are crucial components of the environment. Since deep learning is problem-solving-focused learning, a lot of it is difficult and continuing, even for young children, who must try it repeatedly. In order to help young children's profound learning, it needs enough time.

4.7 Asking 'high-level' questions

Deep learning for young children is problem-oriented learning. Asking questions is also one of the professional competencies of early childhood education. One of the professional competencies of preschool teaching is questioning. Teachers should ask challenging questions during autonomous play to get kids thinking and feeling deeper, to help them blend their prior experiences and knowledge with new experiences and newly acquired knowledge, and to make the questions more important and meaningful. Additionally, it is how experience 'assimilation' and 'adaptation' are realized. The 'high level questions' mentioned here are not hard questions, but rather open-ended questions that children can respond to in their own way; questions that inspire children to reflect and broaden their horizons; questions that encourage children

to play and explore thoroughly without taking over their play; questions that challenge children to critically think, imagine, evaluate, and create; and questions that prompt children to engage in meaningful dialogue at the appropriate time.

4.8 Encouraging peer collaboration to promote cooperation

Deep learning focuses on problem-solving that can be promoted through effective interaction and teamwork. Peer cooperation in deep learning activities refers to the process of two or more children dividing and cooperating to solve problems that arise in the activity and to achieve the activity's objectives.

4.9 Promoting reflections

To encourage 'reflective thinking,' children should be encouraged to assess and reflect on their own actions as well as those of others during this process. First and foremost, teachers should conduct ongoing assessments to ensure that feedback is relevant and useful. Besides, teachers should provide multiple methods of evaluation, such as teacher evaluation, children's self-evaluation, and peer evaluation.

4.10 Enhancing professional development

Early childhood education is essential and the cornerstone of all education, which is important for children's lifelong learning and counter-continuous growth.

Promoting children's deep learning can be difficult because of a variety of barriers, including inadequate guidance, excessive freedom, excessive guidance, game dominance that benefits the teacher rather than the students, inappropriate guidance, poor timing for intervention and environment building, a lack of high and low levels of questioning, inaccurate guidance, poor observation and analysis skills, and a failure to recognize children's learning styles. Teachers need to continually receive training in enhancing teaching strategies for quality education.

5. Conclusion and Limitation

The majority of research on deep learning in early childhood education has focused on its definition, characteristics, and instructional practices. However, there is no specific theoretical framework in place. The assessment and evaluation system should be further investigated and developed in order to provide a substantial logical framework to comprehend, analyze, and evaluate children's learning outcome and process.

Conflict of Interest

The authors declare that they have no conflicts of interest to this work.

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