

Research on the Teacher Education Training System Under the Perspective of Deep Learning

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Abstract: *In the context of informatization, deep learning has become an important way of education and teaching. In order to implement the requirements of the reform of the teacher education training system in the new era and meet the social demand for high-quality teachers, this paper explores the teacher education training system under the perspective of deep learning. Taking university teacher education as the research object, through a preliminary investigation of the university teacher education training system, the current status of the teacher education training system is grasped as a whole, and through literature combing and content analysis, the theoretical interpretation of deep learning is explored, and the research on the teacher education training system under the perspective of deep learning is explored, so as to establish and improve the teacher education training system and respond to national policies to build a high-level teacher training system.*

Keywords: Deep learning, Teacher Education, Training system.

1. Introduction

In 2022, the Ministry of Education formulated the "New Era Basic Education Teacher Strengthening Plan" to implement the "Opinions of the CPC Central Committee and the State Council on Comprehensively Deepening the Reform of Teacher Team Building in the New Era", which emphasized the need to establish an open, collaborative, and interconnected teacher education and training system. The "Implementation Measures for the Certification of Normal Majors in Ordinary Higher Education Institutions (Interim)" issued by the Ministry of Education proposed to put the certification of normal majors on the right track. Therefore, it is necessary to explore and reform the talent training system for normal education professionals in the context of promoting the core literacy education of teachers.

Deep learning has become a hot topic in the field of subject teaching this year. It is a major challenge to teachers in the era of information technology, the explosion of knowledge and the rapid dissemination of knowledge. In the book *Deep Learning: Towards Core Literacy*, Liu Yuexia proposed that deep learning is an inevitable choice for China to comprehensively deepen curriculum reform and teaching reform in the information age, and is also an important way to cultivate core literacy. Deep learning, which focuses on improving core literacy, emphasizes a deeper understanding of knowledge content, rather than just mechanical memory and simple application [1]. At present, research on deep learning is mainly reflected in the exploration of teaching models in various disciplines. Teachers are the key to leading students in deep learning. Deep learning requires giving full play to the leading role of teachers, thus posing new challenges to the teacher training system. Education reform requires paying attention to the cultivation of students' core literacy, changing teaching methods and cross-disciplinary integration, which will have an impact on teacher training in terms of teacher role transformation, continuous learning and professional growth, and teacher evaluation and incentive mechanisms. Under the perspective of deep learning, it is proposed that teachers should have four key abilities: general competence, subject integration ability, digital survival ability and lifelong learning ability [2]. Therefore, under the urgent

need for deep learning to reform the teacher training system, research on the teacher education training system under the perspective of deep learning was carried out to put forward valuable suggestions for establishing and improving the teacher training system in colleges and universities.

2. Concept Definition and Research Overview

2.1 Deep Learning Related Research

2.1.1 Deep Learning Concept Definition

In the 1950s, foreign countries began to conduct research on deep learning. The concepts of deep learning and shallow learning were first proposed in the book "The Essential Difference in Learning: Process and Outcome" jointly published by Ference Marton and others in 1976. By investigating the learning process of students when responding to reading tasks, learners were divided into deep level processors and shallow level processors according to the way learners acquire and process information, and the two concepts of deep learning and shallow learning were proposed. Chinese scholar Zhong Qiquan believes that "deep learning" is a general term for learners to actively participate in teaching. Different from the fragmentation of knowledge and simple memory of knowledge in shallow learning, deep learning emphasizes the connection between knowledge and experience [3]. Li Jiahou believes that deep learning emphasizes that learners connect facts and ideas through their own critical thinking. Different statements by different scholars all mention the common characteristics of deep learning, such as understanding and criticism, association and construction, transfer and application [4].

2.1.2 Overview of Deep Learning Theory

Deep learning mainly covers three perspectives: subjectivity, dialogue, and collaboration. It emphasizes giving full play to the subjectivity of learners in learning, making them the masters of learning and giving full play to their initiative in learning. It also creates connections of knowledge through dialogue with the outside world, and helps them understand, consolidate, and master knowledge through collaboration and

mutual assistance. Based on these three characteristics, two theoretical foundations of deep learning are proposed.

(1) Theory of human knowledge construction

The process of human knowledge construction contains five characteristics. First, knowledge is constructed by human initiative and is constructed on the basis of existing knowledge. It depends on the subject area and is affected by natural conditions. At the same time, human understanding activities depend on the social and interpersonal context. Once knowledge is constructed, it is difficult to reconstruct it naturally. Therefore, in the process of building their own knowledge structure, people need to accumulate knowledge continuously, generate knowledge links through thinking and judgment, and apply them in different social environments to form a complete knowledge system.

(2) Constructive Interaction Theory

Due to the fact that once people construct knowledge, it is difficult to reconstruct it naturally in the theory of knowledge construction, learners deepen their understanding through interaction with others. One-way teaching and receiving are difficult to produce different understandings of knowledge, leading to one-sided views of problems and forming their own limitations, and unable to continuously develop knowledge construction. Constructive interaction emphasizes the collision between different views on the same problem in the same context, so as to deepen the understanding of knowledge and break the limitations of solidification and preconceived knowledge.

2.2 Research on the Teacher Education Training System

2.2.1 Definition of the concept of training system

The primary school teacher training system is a system that is composed of pre-service training, induction education, and post-service training for primary school teachers [5]. The junior high school normal student training system is based on five perspectives: colleges and universities, families, society, local primary and secondary schools, and the government. The Wuxi Municipal Education Bureau proposed to build a general high school training system and adhere to the five developments, namely priority, innovation, connotation, characteristics, and open development. The training system is "a series of contents such as goals, objects, methods, means, organizational forms, and quality evaluation set for training, which constitute an organic whole that is interconnected, mutually restricted, and mutually promoted"; "according to a certain purpose, the close connection between related education and training elements constitutes a whole that promotes its sustainable growth" and is "the sum of methods and means taken to achieve specific training goals under the guidance of certain educational theories and educational ideas. The training system is a complex system, which is composed of training goals, curriculum systems, training methods, resource coordination, quality evaluation, and other elements" [6].

2.2.2 Research on the Training System of Teacher Education

In its exploration of building a practice-oriented teacher training system, Zhejiang Normal University mentioned the need to build practice-oriented training goals. The training goals of excellent teachers are determined from the perspective of the teacher's professional quality structure. In order to achieve the training goals, attention should be paid to coordinating the relationship between various courses in the curriculum setting. It is proposed to define the teacher education training goals as cultivating excellent educators and high-quality teachers with the potential to become future educators [7]. Beijing Normal University proposed to build core general education courses, optimize professional core course settings, and reduce the proportion of subject basic courses. Chinese scholars proposed to develop a competency-based curriculum group, clarify the practical orientation of course content, provide a virtual practice field, and build a three-dimensional evaluation index; build a gradient curriculum system, build integrated general education course content, and form a curriculum element with "soul";

In 2022, Guangdong Province proposed to optimize the master's training model and carry out on-campus training for master of education; innovate the personality-based primary school teacher training model; create a new rural teacher education training model based on demand; when meeting the requirements of the internal quality structure, it is appropriate to adopt the "differential development, comprehensive training" training model; student-centered normal student training model [15]; normal colleges with basic education coherence and organic integration of all disciplines, "integrated" normal education practice teaching model; build cross-border training model, integrated training model, collaborative sharing training model, as well as practice-based training model, research-based training model and research-based training model; implement diversified open collaborative and co-driven training model [8]. Northeast Normal University's UAS "three-in-one" collaborative training; South China Normal University's "university-local government-primary school" three-in-one reciprocal teacher professional development "learning, training and research" community. The "UGBS" collaborative innovation model proposed by Chinese scholars has formed an excellent teacher talent training model with "government policy guidance, higher normal colleges leading, Internet company technology support, and basic education application feedback" [9].

3. Discussion on Teacher Training Model from the Perspective of Deep Learning

3.1 Problems with the Traditional Teacher Training Model

3.1.1 Insufficient teaching practice

Based on the theory of deep learning knowledge construction and constructive interaction theory, the traditional teacher training model is often too standardized and homogenized, ignoring the individual differences of teachers and the needs of professional development, and failing to put theoretical knowledge into different social contexts to deepen the understanding of knowledge. Hatano Yoshiyufu distinguishes two types of proficient people: one is the "stereotyped

proficient person" who can solve a certain type of familiar problem as quickly as possible; the other is the "adaptive proficient person" who can flexibly organize knowledge and skills to point to a new realm when encountering a novel situation [10]. Due to the standardized and homogenized training system, simple, one-way theoretical knowledge is imparted, and there is insufficient support for actual teaching practice, which leads to difficulties for teachers in actual teaching and makes it impossible for them to become adaptive proficient people who can flexibly apply knowledge in different environments.

3.1.2 Teaching philosophy lags behind

The traditional teacher training model often focuses on knowledge transfer and basic teaching skills, while ignoring the updating and innovation of teachers' educational concepts, teaching methods and educational technologies. In the traditional teaching perspective, teachers are mechanical knowledge indoctrination and loyal curriculum implementers. Traditional teaching of knowledge transfer pays too little attention to students' comprehensiveness and development, ignoring the scientific knowledge construction method that deep learning can bring to students, and the cramming-style shallow learning brings various adverse consequences of knowledge fragmentation. Secondly, traditional teaching methods mainly use lecture-style teaching, class notes and homework assignments, ignoring the interaction and knowledge construction in the teaching process, and cannot enable students to complete deep learning and thinking. Finally, in the context of digitalization, teachers are required to use digital technology to complete a series of teaching tasks such as learning and communication, which is an important means to implement deep learning. This is often ignored in the traditional teacher education training system.

3.1.3 Lack of interdisciplinary knowledge

The key competencies of teachers under the perspective of deep learning emphasize general competence, subject integration, and lifelong learning. However, the traditional teacher training model lacks the cultivation of interdisciplinary knowledge and comprehensive literacy, and cannot meet the needs of improving personal abilities and guiding students in interdisciplinary teaching [11]. Teachers' general competence enables them to continuously absorb, analyze, and judge through their own accumulation when guiding students to deep learning, and give good feedback and guidance. Disciplinary high-order thinking requires subject integration teaching. In the context of the continuous development of society, teachers are required to have the ability to continuously learn to improve the quality of teaching. This is an objective requirement of the learning society for the teaching profession. Similarly, the teacher evaluation mechanism only focuses on academic achievements and teaching effects, and lacks consideration of the comprehensive ability of individuals.

3.2 Design of Teacher Training Model based on Deep Learning

3.2.1 Deep reflection and practice

First, the theoretical basis. The design of the teacher training model needs to be based on a deep understanding of the theoretical basis of the knowledge learning perspective, including an in-depth understanding of theoretical knowledge in related fields such as pedagogy, psychology, and teaching methods. These theoretical knowledge can provide guidance and support for the design of the teacher training model. Practical experience. The design of the teacher training model also needs to consider the accumulation and summary of teachers' practical experience [12]. Secondly, by studying and drawing on the practical experience of excellent teachers, valuable practical experience and cases can be provided for the design of the teacher training model. Finally, teacher needs. The design of the teacher training model needs to fully consider the needs and characteristics of teachers. Teachers of different types and stages may have different training needs, so different types of training models need to be designed according to actual conditions. Teaching methods. The design of the teacher training model needs to consider the use of a variety of teaching methods, including theoretical learning, practical teaching, case analysis, group discussion, and other forms to improve teachers' learning effects and training quality. The design of the teacher training model also needs to consider the establishment of a scientific evaluation mechanism to conduct a comprehensive evaluation of the teacher training process and results, identify problems in a timely manner, and make adjustments and improvements.

3.2.2 Deep Learning Community Building

The deep learning community mainly has several characteristics, such as rich resources, mentor system, platform interaction, and resource sharing. Rich and diverse learning resources, including textbooks, courses, papers, teaching videos, etc., to meet the needs of different learners; the mentor system provides learners with personalized guidance and counseling [13], helping learners solve problems and confusions in learning and strengthening the guiding role; the construction of the learning platform allows learners to communicate, discuss, share experiences and resources with each other, and promote interaction and cooperation among learners; in the learning community, learners are encouraged to share their learning results and experiences, forming an atmosphere of resource sharing and benefiting together. Building a deep learning community provides teachers with a platform for communication and sharing, promoting teachers' in-depth understanding and communication of knowledge, and growing together. Establishing a good training model provides learners with all-round learning support and services, and promotes learners' all-round development and growth.

3.2.3 Interdisciplinary knowledge integration

Teachers need to integrate and associate interdisciplinary knowledge, deeply understand and apply knowledge, and cultivate comprehensive literacy and interdisciplinary teaching ability. First, in the process of knowledge construction, the knowledge that teachers need to master should be deeply disassembled, the internal structure and logic of knowledge should be analyzed, and teachers should be helped to deeply understand the essence and connotation of knowledge. Secondly, the cultivation of deep thinking should

be carried out by guiding teachers to think deeply and explore, so as to cultivate teachers' ability to deeply understand knowledge and improve their ability to abstract and generalize knowledge. In terms of interdisciplinary course setting, courses covering multiple disciplines such as deep learning, computer vision, natural language processing, data science, statistics, engineering, biomedicine, etc. should be designed to help learners understand the connections and intersections between different disciplines [14]. In terms of interdisciplinary project practice, interdisciplinary project practice activities should be organized to allow learners to apply deep learning technology in actual projects to solve interdisciplinary problems, such as medical image analysis and the application of natural language processing in bioinformatics [15].

4. Reform of the Teacher Training System under the Perspective of Deep Learning

Under the background of deep learning education, the reform of the teacher training system can enable teachers to adapt to the needs of knowledge updating. With the continuous updating and development of knowledge, the content and form of education are also constantly changing. Teachers need to have the ability to deeply understand knowledge in order to better adapt to the development trend of education. The teacher training system needs to cultivate teachers with the ability to deeply understand knowledge.

4.1 Reform Strategies for Teacher Training System under the Perspective of Deep Learning

First, strengthen the cultivation of subject knowledge and educational skills. Through deep learning methods, help teachers deeply understand subject knowledge, master teaching skills, and improve teaching level. Cultivate teachers' deep understanding and internalization of subject knowledge, as well as flexible use of teaching methods. Secondly, interdisciplinary knowledge integration. In the process of teacher training, strengthen the integration and application of interdisciplinary knowledge, cultivate teachers with interdisciplinary teaching ability, and be able to integrate knowledge from different disciplines into teaching practice. Deep reflection and practice. Encourage teachers to conduct deep reflection and practice, help them combine theoretical knowledge with practical teaching, promote teachers' deep understanding and internalization of teaching practice, and improve teaching quality. Thirdly, innovate teaching methods. Encourage teachers to try new teaching methods, including intelligent teaching assistance systems based on deep learning technology, use advanced technical means to provide personalized teaching support, and promote innovation and optimization of teaching methods. Support for teacher professional development. Establish a sound teacher professional development support system, including providing professional training, teaching guidance, teaching resource sharing and other support, to help teachers continuously improve their professional quality and teaching ability. Finally, the effect evaluation and feedback mechanism is established. Through data analysis of teachers' teaching effects and students' academic performance, the effect of teacher training programs is evaluated, and personalized teaching feedback and guidance are provided to teachers to

promote teachers' professional growth and improve teaching quality. Under the perspective of deep learning, the reform of the teacher training system is promoted, teachers' professional quality and teaching ability are improved, teachers are better adapted to the needs of educational development, and innovative development of education is promoted.

4.2 Implementation and Effect Evaluation of Teacher Training System Reform

4.2.1 Implementation steps

Formulate a reform plan; clarify the goals, content, implementation steps and timetable of the reform, and establish the guiding ideology and principles of the reform. Teacher training and education: provide relevant training and education for existing teachers so that they can adapt to new teaching concepts and methods. Teacher selection and recruitment: optimize the teacher selection and recruitment mechanism to ensure the training of excellent teachers who are more in line with educational needs. Teacher professional development support: establish a sound teacher professional development support system, including providing professional training, teaching guidance, teaching resource sharing and other support. Teacher teaching effectiveness evaluation: establish a scientific teacher teaching effectiveness evaluation system, and evaluate the teaching effectiveness of teachers through various methods, including student academic performance, teaching feedback, teaching observation, etc. [16].

4.2.2 Effect evaluation index

Teachers' teaching level: evaluate teachers' teaching level and teaching effect through teaching observation and teaching evaluation. Students' academic performance: evaluate teachers' teaching effect through students' academic performance and academic progress. Teachers' professional development: evaluate teachers' professional development in teaching concepts, teaching methods, curriculum design, etc. Utilization of teaching resources: evaluate teachers' rational use of teaching resources, including teaching materials, multimedia teaching equipment, etc. Teaching innovation ability: evaluate teachers' innovation ability and practical ability in teaching methods and teaching means. The above indicators can help evaluate the implementation effect of the reform of the teacher training system, so as to find problems in time and make adjustments and improvements. At the same time, feedback from teachers and students can be collected through regular follow-up surveys and questionnaires, so as to more comprehensively evaluate the effect of the reform. Through the brief implementation steps of the teacher training system and the overview of the effect evaluation, it provides certain guarantees and support for the reform of the teacher training system under the perspective of deep learning, which still needs more scientific research and analysis.

5. Conclusion

The teacher education training system under the perspective of deep learning needs to focus on the research and practice of practice orientation, teaching community and interdisciplinary literacy to meet the learning needs of

different students and improve teaching effectiveness. Research shows that teacher education needs to pay more attention to the professional development of teachers, including the improvement of teaching skills, the application of educational technology and the cultivation of innovative ability to meet the needs of modern education. Secondly, teacher education needs to promote the integration of interdisciplinary knowledge and cultivate teachers with comprehensive literacy and interdisciplinary teaching ability to better adapt to the needs of future educational development. Practice and reflection are important theoretical manifestations of deep learning. Teacher education needs to focus on the combination of educational practice and reflection, and cultivate teachers with critical thinking and problem-solving skills so that they can better adapt to the complex and changing educational environment.

These conclusions provide guidance for the teacher education training system under the perspective of deep learning, which will help promote the reform and innovation of teacher education to cultivate teachers with more innovative capabilities and adapt to future educational needs. The teacher education training system under the perspective of deep learning is developing in a more personalized, technological and innovative direction. Colleges and universities need to constantly update teaching methods and curriculum settings to adapt to new educational needs. At the same time, teacher education also needs to work closely with the science and technology industry and educational practice to jointly explore the application of deep learning and artificial intelligence technology in the field of education, and contribute to the cultivation of teachers with more innovative capabilities and adapt to future educational needs. The government and education departments also need to increase support and investment in teacher education to promote the reform and development of teacher education.

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