Study on the Teaching Design of Flipped Classroom Based on the Theory of Deep Learning

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Abstract. With the continuous integration of information technology and education, the pattern of teachers’ teaching and students’ learning has also fundamentally changed. As a new form of teaching organization, flipped classroom promotes the transformation of thinking model of traditional classroom. Based on the theory of Deep Learning and the theory and practical research of flipped classroom, this paper analyzes the nature and connotation of flipped classroom from the perspective of Deep Learning, the design concept of teaching organization and management, the design concept of teaching evaluation and other issues.

1 Introduction

With the advent of the information age, information technology is continuously integrated into classroom teaching, affecting teaching methods for teachers and learning styles for students, and providing necessary technical support for the reform of classroom teaching structure. As a form of teaching organization developed under the support of information technology, the flipped classroom has changed the teaching form of traditional classroom, brought about the transformation of teaching and learning, influenced the process of knowledge internalization for students, and improved the utilization efficiency of teaching time to make the classroom teaching more efficient in recent years. As a teaching method to effectively build the relationship between teacher and student, flipped classroom teaching has been widely appreciated and recognized by academic circles and educational circles, contributing to create the student-centered learning environment, improving the learning ability of critical thinking and self-direction (Mason et al., 2013; Zhong Xiaoliu et al., 2013), which is one of the important approaches to break through the disadvantages of traditional teaching models and explore the diversification of classroom teaching implementation. However, there is no consensus on what kind of flipped classroom can bring better learning effect, especially for the issues on design, implementation, evaluation and others of flipped classroom (Butter, 2012; Blair et al., 2015; Verleger, 2013; Lu Qiang, 2013; Liu Yun et al., 2018).

At the same time, several studies on Deep Learning for scholars at home and abroad are not consistent in terms of research background, research direction, etc. Deep Learning is essentially a kind of learning that is oriented by understanding and characterized by understanding the depth, and aims to cultivate the high-level ability of students. The flipped classroom aims to make students move from superficial learning to deep learning and from primary understanding to deep understanding. It can be understood that Deep Learning is the essential requirement of flipped classroom.

The paper is designed to solve the following three questions: What is the meaning of flipped classroom based on the Deep Learning? How to carry out the teaching organization design of flipped classroom based on the Deep Learning? How to conduct the design of teaching evaluation?
2 The Meaning of Flipped Classroom Based on Deep Learning

2.1 What is Deep Learning?

The concept of Deep Learning has been proposed since the 1970s. It has been applied in many fields including education, such as AI field and neural network field. Scholars at home and abroad have conducted multi-perspective discussions and analysis on the theory of Deep Learning (Ference Marton. Roger Sajie, 1976; Li Jiahou, 2005; Bao Lei, 2009; Guo Hua, 2016). In recent years, with the development and popularization of blended learning, and the possible "hotbed of surface learning" (Zhang Hao et al., 2012), and other issues have been increasingly concerned by academic circles and educational practice circles. The essence of flipped classroom lies in the substantive Deep Learning rather than the formal flipping. The essence of Deep Learning is in line with the objective of flipped classroom and provides a new perspective of research (Zhang Kangli, Chen Mingxuan, 2017).

2.2 Deep Learning in flipped classroom teaching

For the teaching in colleges and universities, the introduction of blended teaching online and offline has played an active role in supplementing the original curriculum system and knowledge structure and sharing the quality resources on one hand. On the other hand, the "fragmented" knowledge system for blended learning has pros and cons. The micro-foundation of blended learning lies in the realization of Deep Learning in the flipped classroom. From the point of macroscopic view, the flipped classroom can be thought as a learning style which is the combination of online and offline; from the point of microscopic view, the flipped classroom can be regarded as a classroom teaching method, which is the realization of flipped teaching in class by preparation and practice for knowledge points online before class. Thus, students are the subject of classroom learning and teachers dominate to enlighten and guide the thinking from students. "Fragmented" knowledge can be achieved mastery through a comprehensive study to cultivate and improve students' ability.

Compared with the traditional classroom, organizational relationship and structure among the factors including teachers, students, curriculum and learning environment have obviously changed under the conditions of time and space for teaching before and during class in the flipped classroom. These changes reflect the inherent nature of the flipped classroom: first, learning-centered classroom teaching focuses on deep internalization of knowledge for students; second, teaching promoted by information technology creates a personalized learning environment and realizes the "organizational" personalized learning and the "individualized" collective learning to focus on students' self-regulated learning; third, teaching process is the process of students' knowledge internalization encouraged by teachers.

3 The Design Concept of Teaching Organization for Flipped Classroom Based on Deep Learning

Learning should be a coherent process consisting of online learning, offline learning, before and after class and in class. Learning should not be limited in class, but there is no doubt that the class is the most critical part of enlightening and guiding students for teachers.

3.1 Knowledge points are accurately classified

From the perspective of teaching design, the realization of Deep Learning is firstly originated from the clear and accurate cognition and recognition of knowledge points for teachers. What knowledge points can be classified in the entire knowledge system? What are the forms of presentation of each knowledge point? What is the connection among knowledge points? What knowledge points can be completely studied before class, which knowledge points need to be completely studied in class, and which knowledge points need to be completely studied before and
in class? And many more questions need to be solved. Teachers' deep understanding and grasping of knowledge points is the most important basis to guide students for Deep Learning.

3.2 Organization and management of class
Class needs to be managed. Many functions, including planning, organization, implementation, control and evaluation, should be performed, as if managing a company. Plan the teaching contents and objectives of a class, organize students to participate in class learning and discussion with individuals or groups, design the implementation process of questions, discussions and others, correct the discussion of possible "off the point" in time and give feedback and evaluation on students' performance in class in various ways. There is no time and opportunity to be absent-minded for teachers and students both during the implementation of this procedure.

3.3 Respect the individual differences for students and pay attention to the stimulating point and interest point of students
Each student is an independent individual because of differences in gender, personality and preferences. How to find the exact position of each individual in class and immerse in it? The key is the grasping of individual differences for teachers.

4 Design Concept of Teaching Evaluation of Deep Learning in the Flipped Classroom
From the perspective of teaching, we should not only enable each student to actively participate in learning activities in class, but also pay attention to what they are doing, especially, what kind of roles and effects on learning the relevant knowledge points in these activities. Teaching evaluation is an indispensable part of teaching activities. In the case of teaching evaluation of Deep Learning in the flipped classroom, it mainly involves orientation, content, subject, standard, etc.

4.1 Evaluation orientation for the assessment of learning
As a learning-centered classroom, the fundamental objective of flipped classroom with Deep Learning is to stimulate and promote students' deep learning and facilitate the continuous improvement and development of students' cognitive structure. Therefore, the fundamental objective of teaching evaluation is not to differentiate students according to academic performance only, but to encourage students to achieve effective learning considerably and promote students' progress and development. In the flipped classroom, by obtaining the feedback information of learning process and learning outcomes for students before and in class, the teaching evaluation mainly determines students' existing learning competence, evaluate students' learning outcomes and find out students' existing problems on understanding, mastery and comprehensive application of knowledge points, so as to take relevant remedial measures, timely adjust and improve the teaching, help students regulate their own learning process and achieve the final value propositions of evaluation for facilitating students' learning.

4.2 Multi-dimensional evaluation content
Multi-dimensional evaluation content refers to the content of teaching evaluation of flipped classroom not only involves students' learning outcome on knowledge, but also includes students' self-regulated learning ability, teamwork, creativity, practical ability and learning attitude embodied in the knowledge learning process. Appropriately enrich and expand the teaching evaluation projects, examine teachers' teaching and students' learning in multiple dimensions and obtain real feedback information, so as to evaluate the teaching effect and students' learning competence in a more comprehensive, accurate and effective manner, obtain personalized evaluation results and help teachers to further improve the teaching pointedly.
4.3 Diversified evaluation subjects

Teaching activities in the flipped classroom with Deep Learning emphasize on students' self-evaluation and peers' evaluation on the basis of teachers' evaluation. Students' self-evaluation is actually a process that students actively carry out the self-interpretation and self-reflection on their own learning behavior. Peers' evaluation is a process that provides students with the opportunities to express themselves and interprets the peers' performance from the perspective of learners. It is beneficial to activate students' thinking, encourage students to put forward their own opinions and deepen the analysis and understanding of problems. In addition, the process of students' self-evaluation and peers' evaluation provides relevant feedback information on students' learning for real and comprehensive understanding for teachers, effectively supplements the information that teachers can't detect or is easily overlooked from the perspective of educators, so as to make the evaluation result of teaching more comprehensive and accurate.

4.4 Multi-level evaluation standard

Flipped classroom emphasizes on personalized learning and respects individual differences among students. It helps teachers evaluate students' learning condition and learning outcome by teaching evaluation in a clear and accurate manner, so as to constantly adjust and improve the teaching for teachers. At the same time, it is convenient for students to conduct self-evaluation and peers' evaluation to be explicit on compliance situation, reflect and improve the learning for students. We can develop multi-level evaluation standard from the aspect of students' learning. It should be pointed out that teachers' teaching and students' learning are interactive; therefore, evaluation standards between teachers' teaching and students' learning are mutually complement and promotion.

5 Conclusion

The flipped classroom has attracted the extensive concern in the fields of educational practice and theory, and has become a hot spot in global teaching reform. As a new form of teaching organization that “the foresight of future of education”, it breaks the time and space of teaching in the traditional classroom, provides the opportunity for realization of students' personalized learning and promotes the transformation of thinking model of classroom teaching. More and more universities at home and abroad have joined the ranks of the practice and exploration of flipped classroom. They try to use the flipped classroom to break through the bottleneck of reform of classroom teaching and improve the quality of classroom teaching. Based on the inherent nature of classroom teaching, this paper analyzes the innovation of teaching organization of flipped classroom compared with traditional classroom, clarifies the meaning of flipped classroom with Deep Learning and proposes the relevant design concept of teaching organization and teaching evaluation, which is the continuation and deepening of previous research. In the follow-up research, we will pay attention to the application of research findings in teaching practice. The research findings will be verified by rigorous empirical research to improve and perfect the teaching design. In addition, this study does not specifically aim at different disciplines and grades, conduct targeted teaching design and fully integrate different cognitive levels of different grades of students into features and requirements of different disciplines. Further research needs to be conducted to improve the practical guidance of this study.

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