CSCanada
Canadian Social Science
Vol. 17, No. 4, 2021, pp. 6-11
DOI:10.3968/12284

ISSN 1712-8056[Print]
ISSN 1923-6697[Online]
www.cscanada.net
www.cscanada.org

Investigation and Research on the Implementation Effect of Flipped Classroom With S Province as a Case

ZHU Wenhui[a],*

[a] Associate professor. Department of Education, Northeast Normal University, Changchun, China.
*Corresponding author.

Received 22 May 2021; accepted 9 August 2021
Published online 26 August 2021

Abstract

At present, the research on the connotation extension, advantages and mode design of the newly emerging reverse teaching mode of the flip classroom is rich and thorough, but the research on its implementation effect is almost vacant. In view of this, taking 44 schools in S province that are conducting exploratory experiments of flipped classroom as the survey object, By means of questionnaire survey, this paper investigated and studied the learning effects of students in the three stage of pre-class learning, in-class activities and after-class consolidation of flipped classroom. By means of classroom observation and in-depth interview, this paper investigated and studied teachers' burnout, teaching and research ability and teaching philosophy in flipped classroom, so as to observe the effectiveness of flipped classroom as a foreign product in the context of Chinese education from these two aspects. The survey results show that the implementation of flipped classroom has a positive impact on 13 secondary indicators of students in three stages to varying degrees, and can reduce teachers' sense of burnout, improve teachers' teaching and research ability, and improve teachers' teaching philosophy.

Key words: Flipped classroom; Pre-Class learning; In-Class activities; After-class consolidation

Zhu, W. H. (2021). Investigation and Research on the Implementation Effect of Flipped Classroom With S Province as a Case. *Canadian Social Science, 17*(4), 6-11. Available from: http://www.cscanada.net/index.php/css/article/view/0000
DOI: http://dx.doi.org/10.3968/0000

1. ORIGIN OF RESEARCH

As a newly emerging teaching mode, the flipped classroom reverses the order of knowledge imparting and knowledge internalization in the teaching process, and realizes the reverse innovation of the teaching process: "The process of teacher teaching is placed before classroom teaching, supervised by parents and students learn related resources independently, including watching instructional videos and e-books, etc.; Classroom teaching time is mainly used for teachers and students to work together to answer questions, interactive communication, collaborative inquiry and other activities; After class, the teacher assigns specific exercises to reinforce the new knowledge" (Zhang, Wang, Zhang, et al, 2012). Therefore, some researchers call it "the biggest revolution in our educational field since the establishment of class-based teaching system".[1] Many researchers have conducted a lot of textual research and sufficient research on connotation and extension, advantages and advantages, pattern design of flipped classroom. Many front-line teachers also actively put flipped classroom into practice with the help of theoretical researchers. However, in stark contrast to the above studies, there is almost no research on the implementation effect of flipped classroom. Good original intention and feasible theory cannot replace the verification of the implementation effect of flipped classroom. Only through the test of practice, can flipped classroom enable more front-line teachers to join the "flipped camp" and take root in China's education soil on the basis of continuous improvement and revision. In view of this, we take S province as an example and 44 schools in 11 prefecture-level cities under its jurisdiction that are conducting exploratory experimental research on flipped classroom as the investigation object, through

[1] Koller Daphne.The online revolution:Education for everyone[EB/OL]. (2012-10-15) [2018-03-02]. http://www.nebhe.org/info/pdf/events/conference/october2012/ppt/Ng_10-15-12.pdf.

questionnaire survey, classroom observation, in-depth interview and other methods to verify the implementation effect of flipped classroom, hoping to take this as a case to observe the adaptability and effectiveness of flipped classroom, a foreign product, in China's education soil.

2. DESIGN OF RESEARCH

2.1 Selection of Research Objects

In recent years, in order to adapt to the development of information society and conform to the trend of education reform, S province encourages and guides schools within its jurisdiction to carry out characteristic construction. Among them, 44 schools will implement the flipped classroom as the starting point for the development of school characteristics, and hope to achieve a great breakthrough in teaching quality and school characteristics through the innovation of teaching mode. In order to better promote the implementation of flipped classroom, S province also updated the teaching facilities of these 44 schools, such as multimedia equipment and computer classrooms, and provided technical training and concept guidance for teachers participating in the flipped experiment. Since 2013, these 44 schools have officially carried out exploratory practices in flipped classroom, and each school has set up two flipped classroom experimental classes with a capacity of 54 students. To this end, we chose these 44 schools as research objects to verify the effectiveness of flipped classroom in the implementation process. It is worth noting that we mainly verify the influence of flipped classroom on students' learning effect by means of questionnaire survey, and verify the influence of flipped classroom on teachers' professional development by means of classroom observation and in-depth interview. The survey began in September 2015 and ended in July 2016. A total of 4,752 student questionnaires were distributed, 4,752 of which were collected and 4,522 of which were valid, with an effective recovery rate of 95%. Also from September 2015, we have observed and recorded more than 130 flipped classes covering Chinese, mathematics, English, physics, chemistry, politics, history and other disciplines, and conducted in-depth interviews with 44 teachers.

2.2 Adoption of Research Tools

The questionnaire used in this study is a self-designed questionnaire designed on the basis of the classic structure of flipped classroom, which is divided by pre-class learning, in-class activities and after-class activities proposed by Professor Robert Talbert of Franklin Institute.[2] First, on the basis of Professor Robert Talbert's theory of "three-stage" of flipped classroom, and based on our team's previous research results and relevant literature, we preliminarily constructed the basic evaluation index of the implementation effect of flipped classroom. Then, by using Delphi Method and through multiple rounds of feedback from eight experts and scholars in the field of teaching design, the main evaluation index of the implementation effect of flipped classroom is formed. Finally, the operability and availability of the main indicators were considered and adjusted for many times, and the evaluation index system of the implementation effect of flipped classroom including three stages and 13 dimensions was finally formed.

In the pre-class learning stage, we mainly investigated whether the amount of knowledge, exercise and teaching resources is appropriate, whether the difficulty of knowledge is appropriate, and whether the knowledge is well mastered, the form and frequency of pre-class communication, whether students develop other learning resources independently in the pre-class learning stage, and the willingness of students in the pre-class learning stage, to explore the learning effect of students in the pre-class learning stage of flipped classroom. For the activity stage in class, this study mainly investigated from five aspects, including knowledge acquisition, practice time and proficiency, frequency of classroom interaction and communication, problem solving and solutions, pertinence of the content and form of the activities in class, and completion of classroom tasks. In the consolidation stage after class, we mainly carried out investigations from three aspects, including solutions to the problems left in class, consolidate the number, pertinence and completion of exercises, and the active degree of interaction between teachers and students. The questionnaire contains 30 multiple-choice questions, which are scored according to the Likert scale. In this study, the Cronbach's alpha was used to test the reliability of the questionnaire, and the internal consistency coefficient was 0.932, indicating that the questionnaire had high stability, consistency and reliability. The Factor Analysis Approach was used to test the structural validity of the questionnaire. The test results showed that there was a low degree of correlation between each dimension and a high degree of correlation between each dimension and the questionnaire, which indicated that each dimension was relatively independent and could well reflect the content to be measured.

In terms of data processing, we have combined the methods of cluster analysis and other data analysis. First, in the initial data processing stage, we recoded the reverse problem and filtered, corrected and deleted the collected abnormal data. In order to ensure the validity and scientificity of the sample data, we also softened and unified the data. Furthermore, k-means, the classical method of cluster analysis, is applied to the mathematical processing in the initial stage, so as to explore the different secondary indicators in the three stages of pre-

[2] Robert Talbert.Inverting the linear Algebra Classroom[EB/OL] (2014-08-01)[2018-01-21]. http://prezi.com/dzorbkpy6tam/inverting-the-linear-lgebra-Classroom

class learning, in-class activities and after-class activities of flipped classroom. Finally, Microsoft office excel 2003 was used to analyze the different secondary indicators in the three stages of flipped classroom, so as to explore the effects of different secondary indicators.

3. RESULTS AND ANALYSIS OF THE RESEARCH

3.1 Learning Stage Before Class

3.1.1 Whether the Amount of Knowledge, Practice and Teaching Resources Is Appropriate

According to the survey results, no matter in the three dimensions of knowledge, practice or teaching resources, most of the surveyed students think it is appropriate, accounting for 76.93%, 78.84% and 76.92%, respectively. This shows that students in 44 schools are quite satisfied with the amount of knowledge, practice and teaching resources provided by teachers in the pre-class learning stage.

3.1.2 Whether the Difficulty of Knowledge Is Appropriate and the Degree of Mastery Is Good

According to the survey results, 77.31% of the students believe that the difficulty of knowledge is appropriate, indicating that the video recorded by the teacher is relatively consistent with the learning level of most students. For 16.15% of the students who think it is difficult or 6.54% of the students who think it is easy, they also say that they can flexibly adjust the progress of teaching videos according to their own learning needs, so as to overcome the problem of difficult and easy knowledge, which is also the advantage of flipped classroom teaching mode. After adjusting the progress of teaching video, 89.46% of the students can master new knowledge better and achieve a good effect of pre-class learning.

3.1.3 Form and Frequency of Communication Before Class

According to the survey results, 95 percent of the students used social media including WeChat, QQ and SMS, while only 3 percent said they could communicate with teachers and peers on the relevant learning resources. This at least shows that the resource library plays a very small role in the communication between teachers and students. S province and relevant schools should strengthen the construction and use of the learning resource library. In terms of communication frequency, 44% of students are active in interaction with teachers and peers, while 56% have little or general interaction. It can be seen that more opportunities and channels are needed to improve students' communication activity. Therefore, S province and relevant schools urgently need to build and expand the communication platform between students and students, teachers and students.

3.1.4 Whether Students Can Independently Develop Other Learning Resources in the Pre-Class Learning Stage

According to the results of the questionnaire survey, 63.46% of the students said that they only looked for other learning resources occasionally, and more than one fifth of the students would not actively look for learning resources other than those assigned by the teacher. However, the survey results of the amount of basic knowledge, the amount of practice and the difficulty of knowledge before class have shown that it is appropriate for most students. Therefore, it is unlikely that the amount of knowledge and the difficulty are too great for students to carry out extended learning. From the semi-open question in the 13th question of the questionnaire, we found the reasons for the question: Only when students watch the teaching video can they have access to the computer. In addition, the school does not provide an open network system and mobile terminal for students to use. As a result, even under the premise of motivation, students are lack of necessary conditions to find other learning resources for extended learning.

3.1.5 Students' Willingness to Study Before Class

According to Benjamin Bloom, "the emotional readiness of students, that is, whether they are willing to participate in the learning of new knowledge, directly determines the effect and sustainability of learning" (Qiu, Wang, and Xia, Trans., 1987). Similarly, from the survey results, 64% of the students believe that the pre-class learning stage of flipped classroom is time-saving, indicating that most students use the pre-class learning stage of flipped classroom to improve learning efficiency. 64% of the students like the pre-class learning mode of flipped classroom, indicating that most students are willing to participate in the pre-class learning stage of flipped classroom. While another 36% of students think that the pre-class learning stage is time-consuming and they don't like the pre-class learning stage of flipped classroom, mainly because of the lack of communication channels, platforms and resources, as well as the lack of convenient network system and mobile terminals.

3.2 Activity Stage in Class

3.2.1 Knowledge Acquisition, Practice Time and Proficiency

From the survey results of in-class activities, it can be seen that more than 69.23% and 96.15% of the students have a more comprehensive and deeper grasp of the knowledge they have learned through in-class activities and become more proficient in practice. Therefore, in the activity stage of flipped classroom, it is ideal for students to absorb and internalize knowledge. But at the same time, 53.84% of the students believed that the teacher gave less practice time in the activity stage of the class. Therefore, how to allocate the time of activities in class in a more

scientific and reasonable way is one of the problems that must be considered in the in-depth development of flipped classroom.

3.2.2 Frequency of Classroom Interaction

From the results of the survey, it is not difficult to see that there are more interactions between teachers and students, students and students in the activity stage of flipped classroom. More than 92% of the students participated in the total interactive communication, and 92% of the students participated in the small-scale interactive communication. To some extent, this also indicates that flipped classroom, which embodies the spirit of inquiry and cooperation in modern teaching, can fully mobilize the enthusiasm of students in learning and enable them to fully participate in the interactive communication in the activity stage of class.

3.2.3 Problem Solving and Solutions

One of the advantages of flipped classroom is that teachers can have a clear understanding of the learning problems and new knowledge that students encounter in the pre-class learning stage, and then they can set specific inquiry and cooperative activities in class, and can also purposefully explain the key and difficult points in the new knowledge. According to the survey results, 88.53% of the students believed that the teacher explained the problems encountered in the pre-class learning stage. It can be seen that teachers in 44 schools have a better understanding of students' learning situation before class and prepare lessons for students' problems in learning, thus improving the teaching efficiency. In this aspect, in the activity stage of flipped classroom implemented by these schools, the teaching effect of teachers is relatively obvious.

In addition, according to the survey results, students mainly adopt the way of communicating with classmates to solve the problems before class, followed by reviewing the learning materials and then consulting teachers. These learning methods are in accordance with the spirit of independent learning, cooperative learning and inquiry learning advocated by the new curriculum reform. It can be seen that the teaching mode of flipped classroom increases the ways for students to solve problems encountered in learning and provides students with more new problem-solving strategies.

3.2.4 Pertinence of Activity Content and Appropriateness of Form in Class

In-class activities are the core of flipped classroom, the pertinence of its content and the appropriateness of form plays a crucial role in mobilizing students' interest in learning and improving their participation. If the content of the activities in class is the knowledge that students are familiar with or completely unfamiliar with, or the form of the activities in class makes students feel boring, then the learning enthusiasm and participation degree of students will be reduced, and the learning effect will not be satisfactory. Our survey shows that 95.8% of the students believe that the content of activities in class is highly targeted, that they can think positively and master and internalize knowledge on the basis of understanding. 95.89% of the students think that the form of classroom activities is very appropriate, they are very interested in, also can take the initiative to participate in interactive communication. It can be seen that teachers in 44 schools set the content and form of activities in class reasonably, which can fully reflect students' subjectivity, attract students' attention, and enable students to actively participate in learning.

3.2.5 Completion of Class Tasks

The most important embodiment of classroom teaching effect is the completion of students' classroom tasks. According to the survey, 96.10% of the students can finish the class tasks better. Among them, 17.32% of the student could not only complete the task well, but also complete the self-selected task. 78.78% of the students can well complete the classroom tasks and operate skillfully on the basis of understanding as required. Less than 4% of the students said they did not perform well in class. It can be seen that the classroom task completion and even teaching effect in the activity stage of flipped classroom are very good.

3.3 Consolidation Stage After Class

3.3.1 Solutions to Problems Left in Class

As the last part of the flipped classroom, the after-class consolidation stage is of great significance for students to smoothly reorganize, revise, integrate and internalize the knowledge acquired in the activity stage in class, so as to continuously expand and optimize their cognitive structure. According to the survey results, 89.53% of the students can effectively solve the problems left over from the class during the consolidation stage after class. In addition, the measures taken by students to solve the remaining problems in the activity stage in class mainly include communicating with classmates, consulting teachers and reviewing video, then all three measures accounted for about 33%.This also shows to some extent that most students in 44 schools are able to take various measures to solve the learning problems left over from the activity stage in class.

3.3.2 The Number, Pertinence and Completeness of the Consolidation Exercises

As a newly emerging reverse teaching mode, flipped classroom does not reject the arrangement of exercises in the consolidation stage after class, but only reconstructs the form of exercises: from traditional repeated training and mechanical memory to less but better, targeted and interesting explorative exercises. The exercises assigned by 44 schools are all inquiry-based, which can help students to achieve deep learning: "from passive learning to active learning; from focusing on knowledge

to focusing on problem solving; Gradually deepen understanding in the process of learning, constantly reflect on their learning objectives and strategies; achieve internalization of knowledge through participation and completion of tasks" (Zhu, 2015). It is not difficult to see from the survey results that 82.09% of the students think the number of consolidation exercises assigned by 44 schools is appropriate. 79.15% of them thought it was highly targeted. 94.05% of the students think their degree of completion is better.

3.3.3 The Active Degree of Interaction Between Teachers and Students

The frequency of communication in the consolidation stage after class almost continues the situation in the learning stage before class: 40% of students think that they communicate more frequently with teachers and other peers, while those who thought less communicated with teachers and other peers reached 35%.The communication mode in the after-class consolidation stage is also similar to that in the pre-class learning stage: 95% of students use social media such as WeChat, QQ or SMS. This also once again illustrates the necessity and urgency of building online learning communities and developing online course resources in S province and relevant schools, so as to establish more communication platforms between teachers and students and open up communication channels between teachers and students.

4. CONCLUSIONS AND DISCUSSION OF THE RESEARCH

Since 2013, 44 schools in S province have been implementing flipped classroom for four years. In the past four years, these schools have achieved another leap in the history of school development. In the words of one principal, "when the development of our school has entered a plateau period, flipped classroom provides a strong grasp for us to break the bottleneck and constraints of development. The most intuitive effect is that after implementing the flipped classroom teaching mode, most students in our school have greatly improved their academic performance and have a firmer and more flexible grasp of knowledge. Students' ability to learn actively, analyze and solve problems, and communicate have been improved. The students and even the whole school have taken on a new look." Based on this, we can basically conclude that for these 44 schools, compared with the traditional teaching form, the flipped classroom can enable students to achieve the purpose of learning new knowledge in the pre-school learning stage; in the activity stage, students can achieve the goal of internalizing knowledge; The purpose of knowledge transfer can be realized in the consolidation stage after class.

The implementation of flipped classroom not only has a positive impact on students, but also plays a significant role in promoting teachers' professional development. Through interviews, we find that the learning of flipped classroom concept and the application of technology also play a powerful role in promoting the professional development of teachers. It is mainly reflected in the following aspects: firstly, after the implementation of flipped classroom, teachers' sense of burnout and work pressure are reduced. In traditional routine classroom teaching, teachers play the role of instrumentalization and victimization. "All he has to do is pass on the knowledge from the textbook to the students intact. The teaching work of yesterday, today and tomorrow is highly similar and procedural (Zhu, 2011). It is in this self-repeating teaching life that teacher burn out their teaching enthusiasm. After the implementation of flipped classroom, the role of teachers has changed, mainly reflected in organizing students to solve problems through cooperative discussion and giving timely and appropriate guidance when students need help. The change and transformation of role have greatly stimulated teachers' teaching enthusiasm and reactivated their teaching enthusiasm. Secondly, flipped classroom improves teachers' teaching and research ability. After the implementation of flipped classroom, many teachers reflected that they were not only more proficient in multimedia technology and the production of micro-video, but also able to take the initiative to reflect on the problems encountered in the implementation process and correct them in time. For example, in the process of making micro-videos, influenced by traditional teaching ideas, many teachers have moved many knowledge points from the "teaching plan" in the class to the "micro-video" before class. Therefore, micro-video is not only overloaded in capacity, but also presented in the way of teacher teaching. This change from "human instillation" to "machine instillation ", from " instillation in class" to " instillation before class", not only cannot mobilize the enthusiasm of students to watch teaching video, but also seriously affects the learning effect of students due to the lack of "teacher monitoring" in the pre-class learning stage. Under the influence of our "U-G-S" teacher development model (Jiao, 2017), some teachers took the initiative to introduce Mahmumov's "problem teaching" theory (Mahmutov, 1994) of "scenario setting -- problem discovery -- trying to solve -- seeking the optimal solution" into the production of "micro-video", and received good results. Finally, the implementation of flipped classroom improves the teaching concept of teachers and improves the character of classroom teaching. At the beginning of the implementation of flipped classroom teaching mode, many teachers stuck to the fixed process created by the introducer of flipped classroom, but there was a problem of acclimatization. With the deepening of the research, we continue to develop and discard the process of flipped classroom teaching mode on the basis of "student-based mixed

learning strategy" (Zhu, Guan, and Qiu, & 2015), the key and core of "flipped classroom", so as to make it more consistent with the actual teaching and education of our school.

Of course, the implementation of flipped classroom in these schools is not smooth. Whether in the pre-class study period, the in-class activity stage or the post-class consolidation stage, these schools have encountered many problems and dilemmas. First of all, in the pre-class learning stage, limited by the teaching equipment and the level of teachers, and flipped classroom as a new thing, the time introduced into China is still short, so the production of teaching "micro-video" is a big problem in front of many teachers. The contradiction between micro video production technology, time capacity and teaching content, and how to enhance the attractiveness of video are problems to be further solved. Secondly, in the activity stage of class, how to respect students' subjectivity and ensure the integrity of the knowledge system, how to solve the problems encountered by different students in learning and how to ensure the fairness and justice of teaching, how to stimulate students' interest in learning and how to improve the quality of teaching at the same time have become problems to be overcome. Finally, in the after-class consolidation stage, students are not allowed to use the public network and mobile devices in some schools, which seriously restricts students' enthusiasm to find teaching video and other learning materials. In addition, the lack of specialized communication equipment, communication platform and learning resources also limits the communication and interaction between students and teachers. Only by overcoming the above difficulties in time, can flipped classroom take root in our educational soil and create new prospects and more possibilities.

REFERENCES

[Su] Mahmutov (1994). *Problem teaching* (Y. G. Wang, Trans.). Nanchang: Jiangxi Education Publishing House.

[US] Qiu, Y., Wang, G., & Xia, X. C. (Trans.) (1987). Bloom. *Educational evaluation* (pp.474-475). Shanghai: East China Normal University Press.

Jiao, P. C. (2017). The construction and practice of the teaching model of "Trinity Inter-school Linkage". *Educational Theory and Practice,* (1), 41-44.

Zhang, Jinlei, Wang, Ying, Zhang, Baohui, et al. (2012). Research on the teaching mode of flipped classroom. *Journal of Distance Education,* (4), 46-51.

Zhu, W. H. (2011). Collaboration in colleges and universities: Analysis of causes and functional analysis. *Jiangsu Education Research*, (19), 19-23.

Zhu, Z. T., Guan, Q. Q., & Qiu, H. Z. (2015). Domestic application practice and reflection in flipped classroom. *Electro-Educational Research*, (6), 66-72.

Zhu, Z. T., Guan, Q. Q., & Qiu, H. Z. (2015). Domestic application practice and reflection in flipped classroom. *Electro-Educational Research*, (6), 66-72.