

# *Practical Exploration of the "Rain Classroom-Flipped Classroom" Mode in Basic Chemistry Course*

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**Abstract**—In this study, the teaching reform practice of “Rain Classroom-Flipped Classroom” was conducted in the basic chemistry course taking the 2018 medical students of Weifang Medical College as an example. Using the rain classroom, the data generated by the learning behaviors of different individuals were analyzed and compared while the factors such as learning foundation, learning attitude, teacher-student relationship were also considered. In order to assess the effect of reform, a survey was conducted. The results show that the academic performances of the students in the teaching reform group are improved to a certain extent compared with the traditional teaching group, and the teaching reform is generally welcomed by students. In order to achieve better teaching effect, the problems existing in the current teaching will be further comprehensively sorted out in the follow-up study, and the “rain classroom-Flipped Classroom” teaching mode will be rationally promoted according to the actual teaching practice and the students' suggestions.

**Keywords**—Rain Classroom; Flipped Classroom; basic chemistry course; reform

## I. INTRODUCTION

In the background of "Internet+", smart classrooms have become a hot topic in the field of educational technology and teaching reform with the rapid development of network technology and the increasing popularity of mobile terminal devices [1].

The Outline of the National Medium- and Long-Term Education Reform and Development Plan (2010-2020) clearly states: "Education is the foundation. Education is the cornerstone of national rejuvenation and social progress. It is

the fundamental way to improve the quality of the people and promote the all-round development of people. It is the hope of hundreds of millions of families for a better life. A strong country must first be strong. Giving priority to the development of education and improving the level of education modernization is of decisive significance for realizing the goal of building a well-off society in an all-round way and building a prosperous, strong, democratic, civilized and harmonious state." [2]

Information technology has a revolutionary impact on education development and must be given high priority. Currently, information technology has penetrated into economic development and social life in all aspects. Quality education, personalized learning and lifelong learning have become important features of the development of education in the information age [3-6].

The rise and fall of the national movement is tied to education; education is revitalized and the whole people are responsible. In the overall work of the party and the state, education must always be placed in a position of priority development. In accordance with the requirements of modernization, world-oriented and future-oriented, we should adapt to the needs of building a well-off society in an all-round way and building an innovative country, adhere to the principle of educating people, take reform and innovation as the driving force, focus on promoting fairness, and focus on improving quality. We will implement quality education, promote the scientific development of education at a new historical starting point, and accelerate the progress of a big education country to a strong education country, from a human resource country to a

human resource power country, and make greater contributions to the great rejuvenation of the Chinese nation and the progress of human civilization [7-9].

Therefore, the colleges and universities should conform with the development of the times, combine advanced information technology with higher education, deepen education and teaching reform, innovate education and teaching methods, promote the deep integration of information technology and higher education, establish a new teaching model, and promote the modernization of educational content and teaching methods.

**II. INSUFFICIENT AND CONTRADICTIONS EXISTING IN BASIC CHEMISTRY TEACHING**

In the curriculum system of medical colleges, basic chemistry is a compulsory course of freshman medical students, and it is the very important part of whole medical course. At present, the teaching of basic medical courses is limited by the teaching conditions and teaching conditions, so large classes are used usually.

Nowadays, in the era of informationization and networking, students have a mobile phone and a lot of interesting information on the Internet. Once the classroom cannot effectively attract them, students can easily use mobile phones for non-learning activities such as entertainment and shopping [10].

In terms of actual teaching effects, the following problems often exist:

*B. Lacking the guide of the big data in teaching*

In the lectures, whether the traditional "full house irrigation", or the new teaching mode such as MOOC and sandwich teaching, the teacher mainly relies on personal experience to judge the classroom response to the students to control the teaching rhythm. the teacher cannot comprehensively and timely grasp the learning dynamics of the students. It is difficult to carry out teaching scientifically and reasonably.

*C. Difficult to promote deep learning*

Deep learning emphasizes the acquisition of tacit knowledge (such as critical thinking, problem solving, reflection, etc.), which is the basis and guarantee for innovation and development. The student's learning process mainly involves "information transfer" and "absorption internalization". In the traditional teaching mode, it is limited by the time of study, and more emphasis is placed on "information transfer" through teacher teaching and neglecting

*A. Student acceptance is different.*

The basic situation of the students was investigated in the 1-3 classes (clinical excellent class) of the 2018 class, 7-9 classes (clinical normal classes), and 1-2 Oral professional classes (non-clinical classes) in Weifang Medical College. The results showed that the age of the three groups and the rate of the only child were close. All of the clinical 1-3 classes were from Shandong Province, all of them were Han nationality, and the proportion of female students in the total number of students was lower than the other two groups. The number of students from 7-9 classes and 1-2 classes in the province accounted for about half of the total, and there were ethnic minorities. After the college entrance examination reform, the provinces have different college entrance examination policies. For example, Zhejiang and other provinces and cities do not have a liberal art, candidates can choose subjects. In a separate interview for the students, it was found that students who did not take the subject exams had only studied the subject for one year, while the students of Shandong Province had studied the subject for three years. This caused the students in the same class to have a significantly different learning foundation. It is an urgent problem to be studied. According to the different situations of each class, the teacher can make full use of the rain classroom platform to publish different levels of learning materials and use the private letter function of the rain classroom for personalized counseling, taking into account the different basic students, it is a good way of solving the different acceptance of student.

TABLE I. SURVEY DATA OF STUDENT BASIC SITUATION

Survey contents	Class		
	1-3 clinical classes	7-9 clinical classes	1-2 Oral professional classes
Average age	18.05±0.56	18.42±0.69	18.38± 0.70
Single child rate (%)	44.32	43.42	42.39
Female students as a percentage of the total number of students in the class (%)	35.23	51.98	55.43
Proportion of Shandong Province (%)	100	60.53	53.26
Proportion of Han nationality (%)	100	95.39	97.83

"absorbing internalization" for students themselves. The guidance of the process makes it difficult for students to carry out in-depth learning.

*D. Reform basic investigation*

We conducted a survey of students' attitudes to teaching reform in the pilot class. The results showed that 71.69% of the students in the three groups had a positive attitude to the teaching reform, indicating that the teaching reform had a good foundation for development.

**III. TEACHING REFORM IMPLEMENTATION PLAN**

In view of the above problems, we build a basic chemistry curriculum model of "Rain Classroom-Flipped Classroom" based on the Internet, combined with the advantages of rain classroom and Flipped Classroom, and explore the teaching reform.

Before the class, the teacher pushes the video, courseware and other learning materials to the student mobile phone

through the rain classroom platform, clarifying the learning tasks and guiding the students to self-study. Students can feedback the knowledge point to the teacher in time by clicking “do not understand” when they do not understand, so that the teacher has a preliminary understanding of the student's learning foundation before class, so as to make targeted adjustments to the content of the lecture. This kind of pre-class push can urge students to self-study and fully mobilize students' enthusiasm and participation.

In the class, teachers use the learning behavior data collected before the class to explain the key points and difficulties in a targeted manner. The teacher guides the students to conduct group discussions, and can also use the barrage and submission functions of the rain class to organize students to conduct efficient class discussions in a short period of time. Using the topic push function of the rain class to conduct time-limited classroom tests to improve the attention of the students and helps the teachers to know the overall situation. Combine the rain classroom with the Flipped Classroom, use the big data to fully reflect the learning effect, feedback and guide the teaching arrangement, so as to guide the students to achieve deep learning better.

After class, teachers use the group discussion function of the rain class to answer questions and discuss groups, further helping students to complete the process of “absorbing internalization” and guiding them to deep learning. Personalized tutoring for students were done through functions of “private letter”.

#### IV. DISCUSSION ON TEACHING REFORM

Rain Classroom-Flipping classroom teaching mode is conducive to solving the problem of traditional teaching.

##### A. *Use the rain classroom to solve students' acceptance of differentiated contradictions*

The materials on the rain classroom platform can be learned easily and repeatedly. For those students who are weak in foundation and who have difficulty in receiving knowledge, they can learn independently and repeatedly to reach the same starting point before class; after class, they will not fall behind after class. For students who have the ability to learn, teachers can provide extended learning materials for further research. The private letter function of the rain class can also allow students to get more personalized counseling.

##### B. *The “Rain Classroom-Flipped Classroom” mode effectively expands the communication channels between teachers and students*

Using the rain classroom platform, students can click on the “do not understand” report to the teacher for the content that is difficult to understand. The flip teaching mode enables more student-student and teacher-student discussion opportunities in the classroom. The “barrage” function can realize online real-time group discussion, and the “group discussion” function facilitates group discussion in the class. For those students who need a lot of tutoring or who are embarrassed to ask a teacher in person, they can also communicate with the teacher separately through the functions of “sending submission” and

“private letter”. This kind of mixed teaching mode not only pays attention to the overall participation and learning efficiency of the classroom, but also takes into account the differences of individual students. It covers the pre-course, course and after-school activities and expands the communication channels between teachers and students. It can achieve personalized learning under the large class system.

##### C. *Rain class can provide guidance with big data*

The rain class's in-class time-limited exercises, “do not understand” buttons, “bounce-style” discussions and push learning materials can automatically collect all learning behavior information generated by students during use. These data are integrated and analyzed and then pushed to teachers. It helps teachers to quantitatively understand the learning effect of students, grasp the trajectory of students' learning, and enable teachers to evaluate their teaching process more comprehensively, and then adjust their teaching strategies. These data, which are not visible in traditional class, will facilitate the transformation of teaching from “experience-driven” to “data-driven”, allowing teaching to enter the “data age”.

##### D. *The “Rain Classroom-Flipped Classroom” mode is conducive to students' deep learning*

Bloom's educational goals are divided into six low-to-high levels of knowing, understanding, application, analysis, synthesis, and evaluation. According to the educational goal, the characteristics of deep learning can be summarized as understanding and criticism, connection and construction, and migration application. By flipping the pre-class self-study in the classroom, the time for discussion in the class is more abundant. Students can carry out in-depth understanding of knowledge under the guidance of teachers, critically treat problems through classroom discussion, and build a more complete discipline framework by summarizing the internal associations of knowledge points. Make knowledge transfer and application by analyzing the principles of knowledge and the nature of phenomena. The “Rain Classroom-Flipped Classroom” model is conducive to cultivate medical students' independent thinking ability and innovation, and lay a solid foundation for their future research work.

#### V. EVALUATION OF THE EFFECT OF TEACHING REFORM

After the end of the final assessment, an anonymous questionnaire was sent to the teaching reform group. A total of 88 questionnaires were distributed and 88 copies were recovered. The recovery rate was 100%. The survey results show that more than 95% of students believe that the new model is more efficient than the traditional classroom method, indicating that the teaching reform has been widely welcomed by students. The students believe that the rain classroom is conducive to increasing teacher-student exchanges and attracting themselves to keep up with the rhythm of the classroom. However, students' satisfaction with self-study and classroom performance needs to be improved, indicating that teachers need to further adjust the teaching mode to improve teaching effectiveness. At the same time, the students also put forward a lot of ideas and suggestions in the questionnaire,

which provided a basis of the establishment and adjustment of our follow-up “rain classroom-Flipped Classroom” teaching mode.

TABLE II. COMPARISON OF RESULTS BETWEEN THE TEACHING REFORM GROUP AND THE TRADITIONAL TEACHING GROUP

Group	Student number	Final grade	t	P
Teaching reform group	88	76±7.2	3.2166	0.001
The traditional teaching group	92	72±9.3		

Compare the scores of the students' experimental test scores of the 2018 medical students teaching mode group and the traditional teaching mode group. The results are as follows (TABLE II). The difference between the exam scores of the two groups of students is statistically significant ( $P < 0.05$ ). After the reform, the students' basic chemistry courses exam scores have improved, and the reform has received certain results.

## VI. SUMMARY

This practice is an active exploration of the integration of higher medical education with computer technology, multimedia technology, network technology, and mobile communication technology under the background of "Internet +" strategy.

The “Rain Classroom-Flipped Classroom” mode is an important practice of our school on the wisdom classroom. This model can better solve the differences in student learning foundation, lack of learning initiative, and carry out teaching in the current class of basic medical courses in medical colleges. The lack of big data guidance and formative evaluation are difficult to cover the whole learning process, the limited communication channels between teachers and students, and the difficulty of promoting deep learning. It has important reform significance for improving the basic medical curriculum education level of large class teaching.

The “Rain Classroom-Flipped Classroom” mode has enabled our school to enter the “data age”, which is conducive to the realization of mobile learning and personalized learning for medical students in our school, which is conducive to promoting the deep integration of information technology and higher education in our school. It is conducive to the cultivation of innovative and high-quality medical talents in the background of the new medical reform.

Later, after the practice is mature, we will promote the “Rain Classroom-Flipped Classroom” mode to more courses in our school, and also will communicate with other institutions to make the model more widely used and promoted. The “Rain Classroom-Flipped Classroom” mode provided a useful reference for the wisdom teaching reform of other brothers. The quality of higher medical education has been improved.

In the follow-up study, we will further comprehensively sort out the problems existing in the current teaching, and rationally adjust the “rain classroom-Flipped Classroom”

teaching mode according to the actual teaching practice and the students' suggestions. We will also use the big data in the rain class to analyze, process, and compare the data generated by the different learning behaviors of pre-class, in-class and after-school activities of different individuals, and examine the factors such as learning foundation, learning attitude and teacher-student relationship. Under the influence of learning behavior in the process of self-study, classroom performance, up participation, etc., we further attempt to guide students to self-study from various ways, and better carry out the flipping classroom.

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