

Exploration of 5E Smart Classroom Teaching Mode Based on Cloud Platform

Xiao Wang* and Ya-lin Yin

Jiangnan University, Wuhan, Hubei, China

*Corresponding author's e-mail:
1711335396@qq.com

Abstract

With the widespread application of information technology in the education industry, a large number of high-quality smart education cloud platforms have emerged, providing an effective way for the intelligent reform of classroom teaching in universities. This study takes the application of English classroom teaching in universities as an example, and uses the learning and education cloud platform as technical support. Starting from analyzing the concepts of education cloud platform and 5E teaching mode, it explores the framework and ideas of combining education cloud platform with 5E smart classroom teaching mode, and explores the feasibility and effectiveness of this mode through comparative empirical research and data analysis. The research results indicate that there is a significant difference in teaching effectiveness between the experimental class and the control class. Under the combination of the educational cloud platform and the 5E exploratory teaching mode, students' autonomous learning ability, scientific inquiry ability, and communication and cooperation ability can be significantly improved. This study provides a case study of 5E smart classroom teaching based on cloud platforms, with the aim of providing valuable reference for the implementation of smart classrooms in the intelligent era and truly realizing the transformation of teaching and learning methods.

Keywords

5E; Education cloud platform; Teaching mode; Smart Classroom in Universities

Cite This Article

Wang X and Yin Y L. Exploration of 5E Smart Classroom Teaching Mode Based on Cloud Platform. Education Theory: Teaching and Learning. 2023,3:12-20. <https://doi.org/10.55571/ettl.2023036>

Copyright

© 2023 by The Authors. Published by Four Dimensions Publishing Group INC. This work is open access and distributed under Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).



Received: July 3 2023 / Accepted: July 11, 2023 / Published: July 25, 2023

Introduction

The Education Informatization 2.0 Action Plan issued by the Ministry of Education pointed out that "we should build a Internet plus education platform, promote the reform of education service supply mode, teaching and management mode, and adhere to innovative talent training mode" [1-4]. With the continuous deepening of curriculum reform in higher education and the further innovation of classroom teaching models in the new situation, how to better explore students' learning potential and achieve intelligent and personalized education and teaching goals is a serious issue faced by the reform of higher education and teaching in the new era. Therefore, it is necessary to promote the integration of education and teaching with various new technologies and vigorously promote the development of smart education. The implementation of smart education needs to rely on the application and continuous optimization of smart education cloud platforms. The popularity of smartphones has gradually made it a trend to use mobile phones for classroom teaching. Therefore, building a smart classroom teaching model based on cloud platforms in universities is of great significance.

Literature Review

Smart Education Cloud Platform

The Smart Education Cloud Platform is the result of research and application on smart education and educational development. It is a comprehensive service platform that integrates smart education, smart learning, smart resources, smart management, and smart services. Yang Xianmin pointed out that the smart education cloud platform is the basic environment for smart education, an evolving massive high-quality teaching resource library, an intelligent education platform, an education informationization ecosystem, and an operational mechanism for the sustainable development of smart education.

In terms of related research, research on cloud computing technology in foreign countries started early and has become relatively mature. Many countries have used educational cloud platforms to support teaching and learning, such as the United States, Singapore, Japan, and so on. However, the research on education cloud platform in China is relatively late. At the annual meeting of China Education Technology Association in 2008, Professor Li Jiahou of Shanghai Normal University took the lead in proposing two concepts of "cloud computing assisted instruction (CCAI)" and "cloud computing assisted education (CCBE)" [5]. Afterwards, scholars gradually invested in the research of cloud computing in the field of education, and related education cloud platforms also developed rapidly with the assistance and advocacy of the country.

5E teaching model

The 5E teaching model is an exploratory teaching model based on constructivist theory, proposed by the American Biology Curriculum Research Society (BSCS) on the basis of the Atkin Karplus learning loop. It mainly consists of five stages: Engage, Explore, Explain, Elaborate, Evaluate, that is, introduce, explore, explain, transfer, and evaluate [6]. This model focuses on problem exploration, advocating for students to boldly express and deeply explore their own ideas, and emphasizing the combination of their previous experiences. Compared to traditional teaching models, it can better cultivate students' problem-solving ability, scientific exploration ability, and innovative thinking ability.

In terms of related research, foreign research achievements focus on the theoretical research methods of the "5E" teaching model, continuously improving and perfecting the theory of the "5E" teaching model. The focus of domestic research is to apply foreign research results to teaching practice

in various disciplines, making the teaching effect more significant, without further localization of the 5E teaching model [7]. At the same time, there is not much research on its application in classroom teaching in universities, both domestically and internationally, and there is also a lack of research related to the integration of educational cloud platforms.

A Framework for 5E Smart Classroom Teaching Mode

From the above analysis, it is not difficult to see that in smart classrooms, the application of 5E exploratory teaching based on cloud platforms can better promote the development of students' various abilities. In view of this, this study takes the education cloud platform as the core, 5E exploratory teaching as the basic architecture, and aims to develop students' abilities. It integrates the education cloud platform into 5E exploratory teaching, and designs a 5E smart classroom teaching mode based on the cloud platform, as shown in Figure 1:

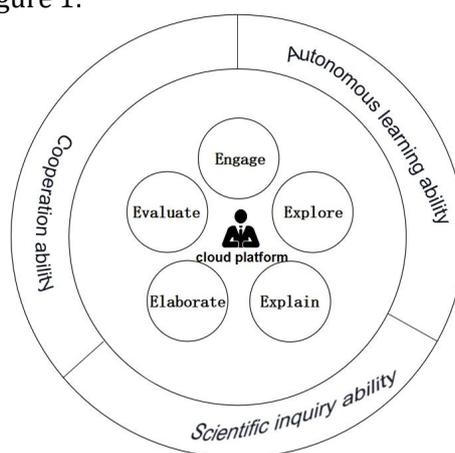


Figure 1. Framework of 5E Smart Classroom Teaching Mode

This teaching model organically integrates education cloud platform and 5E exploratory teaching, and applies education cloud platform in smart classrooms, making "introduction" more effective, "exploration" more flexible, "explanation" more thorough, "transfer" more extensive, and "evaluation" more multidimensional, thereby better promoting the development of students' self-learning ability, scientific exploration ability, and communication and cooperation ability. The most important aspect is to develop students' scientific inquiry ability through alternating problem exploration.

In addition, due to the diversity of content in various disciplines, flexible selection and adjustment should be made based on the different characteristics of each subject's content when conducting practical 5E exploratory teaching, and the teaching sequence should be reasonably arranged: if there are many and scattered exploration points, multiple 5E cycles can be set up; If the exploration activity is more complex, it can span several classes to complete the 5E teaching process; If there are many intermediate stages in the exploration activity, the "Exploration Explanation" section can be repeated multiple times. This requires teachers to have a certain level of teaching control ability, which can be combined with the education cloud platform to reasonably design and effectively organize and guide teaching activities.

Teaching Design Case

Practice objects and methods

In terms of practical objects, through cooperation and communication with college English course teachers, we selected Class 1 and Class 2 students of Jiangnan University's 2021 Master of Education as the research objects, of which Class 1 of Education is an experimental class (18 people), and Class 2 of Education is a control class (20 people). All of them are full-time graduate students of our school. There is no significant difference between the two classes in terms of age, enrollment performance, pre test scores after school commencement, etc. ($P>0.05$), And both the control class and the experimental class are taught by the same English teacher.

In terms of research methods, this study mainly adopts comparative research method. Conduct comparative teaching experiments between experimental and control classes in English classrooms, and then analyze and study the experimental data to explore its teaching effectiveness. In terms of teaching methods in the two classes, the control class adopts traditional teaching methods, where teachers focus on teaching vocabulary and texts; The experimental class adopts the 5E smart classroom teaching mode based on the education cloud platform for teaching, with problem exploration as the main thread and emphasis on the combination of online and offline resources.

Additionally, it should be noted that the smart education cloud platform used in this study is Superstar Learning Pass, with an experimental period of one month. The teaching content consists of four units and is divided into four class hours, including Unit 2 "Happy Holidays", Unit 3 "Education Enlightenment of Mind", Unit 4 "Do as Romans Do", and Unit 5 "Acts of Kindness". The teaching effect is displayed by students' pre test scores and one month later post test scores, as well as teacher observation. Given the limitations of the article's length, the next step is to select one of the units to showcase the entire teaching process through a case study.

Front end analysis

This article selects the fourth unit of the graduate listening and speaking course textbook, "Do as Romans Do", as a specific content case, with the theme of "diverse cultures".

1. Analysis of teaching content

The teaching content of this unit is mainly divided into two parts:

(1) Listening for content: Listen to two recordings of the text, which are American Barbie culture and Chinese calligraphy culture.

(2) Speaking for communication: Present oral presentations on issues related to the text.

2. Analysis of learning objectives

(1) Knowledge and skills: Able to read and spell relevant new words, including: component, mold, aspiration, etc.

Master the basic concepts and elements of culture, including spirit, attitude, values, etc.

Master relevant knowledge of Barbie culture, including its development history, trends, etc.

Master relevant knowledge of calligraphy culture, including development history, concepts, etc.

(2) Process and Method: Improve resource collection and problem-solving abilities during the interactive exploration process.

Improve the ability of language expression and Critical thinking in the process of group presentation.

(3) Emotional attitude and values: Appreciate the breadth and depth of Chinese and foreign cultures, resonate with relevant Chinese cultural traditions, and inspire patriotism.

3. Analysis of learning resources

All parts of the school are equipped with campus networks, where you can log in and collect various learning materials and information online.

In addition, the corresponding course resources pushed by teachers to the Learning Communication platform mainly include: PowerPoint presentations on major cultural introductions between China and the United States, supplementary materials for texts, listening audio materials, classroom exercises, etc.

Preparation in advance

Before class, the teacher posted the learning objectives of this class on the bulletin board of the Super Star Learning Pass course, pushed the corresponding learning materials, and pushed the Warm up listening practice questions (as shown in Figure 2) to better understand the students' cognitive level. In addition, the teacher released two pictures containing culture in the discussion area, namely Barbie doll and Calligraphy, to let students know the main learning content of the new lesson in advance, and then answer the question: What culture do these pictures represent respectively? What are the characteristics of these cultures? During the entire preview stage, the teacher can monitor the entire learning process of students, grasp the learning trajectory of each student, including the number of pages that students watch the preview courseware, the total time spent, and the analysis of practice question answering results. Students can also post key issues encountered during the pre class preview process in the discussion area. In this way, teachers can better design classroom teaching activities based on students' learning situation before class. In addition, teachers can also divide study groups in advance in the "group" section of the Learning Pass.

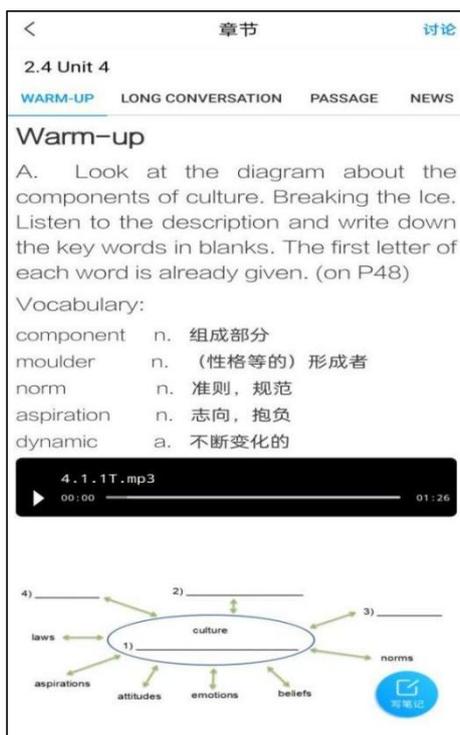


Figure 2. Warm up exercise questions

Practical process

Based on the previous analysis of the 5E smart classroom teaching process based on cloud platforms, the front-end analysis of the teaching content of this unit, and pre class preparation, the practical teaching process in this lesson is divided into five teaching stages, as shown in Figure 3:

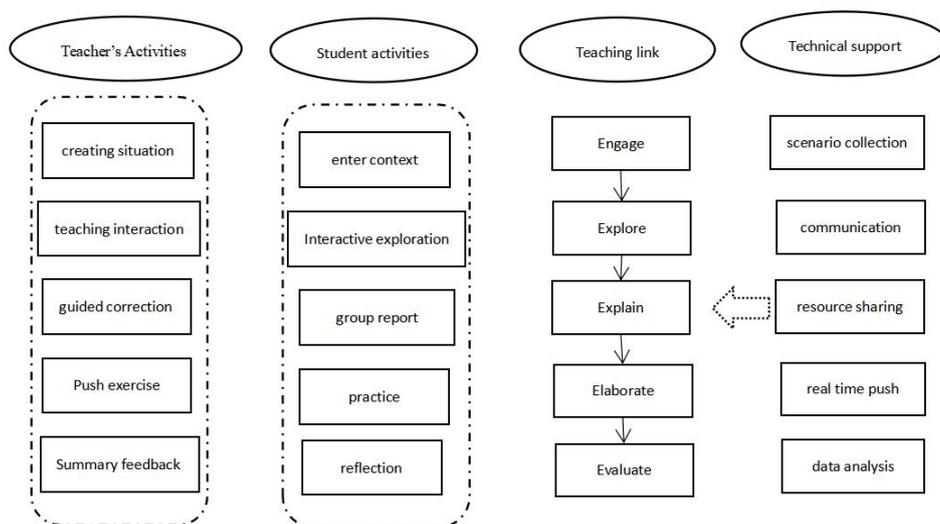


Figure 3. Step diagram of teaching process in class

Step 1: Introduction. After students' pre class preparation, the introduction stage is more effective than the traditional teaching mode. The teacher brings the most representative questions related to the course objectives posted by students in the pre class discussion area to the classroom for discussion. Based on the questions posted by students, the following three questions were selected for discussion: (1) What is the development process of Barbie culture? (2) What is the development process of calligraphy culture? (3) What are the differences between Chinese and foreign cultures? Students can raise their hands to express their opinions, thereby allowing them to enter the learning context of the new lesson.

Step 2: Exploration. Most of the opinions expressed by students are that Barbie culture is no longer popular, but they are not clear about the overall development of Barbie culture; Believing that calligraphy culture is a continuous stream without much innovation.

At this point, the teacher asked the students to open the listening audio materials on the platform, and guided them to listen to the audio based on the problems they had just mentioned. They explored the following two questions: (1) What is the overall development process of Barbie culture? (2) How does calligraphy culture continuously develop with the development of the times? Students can adjust their listening progress according to their own rhythm, and at the same time, ask students to have group discussions based on the pre class grouping situation. Students can express their opinions through the interactive discussion area of the learning platform, or communicate with their classmates offline to achieve mixed interactive communication within the group. Teachers also participate in it and provide appropriate guidance and personalized comments based on the opinions expressed by students at any time.

Step 3: Explanation. In this stage, the students in the class have significantly increased their awareness and desire for problem-solving. They actively obtain resources from online sources, engage in heated discussions with classmates offline, actively express their ideas, and show a desire to explore knowledge. After group discussion, students will present and report in groups. During the presentation, relevant presentation materials can be uploaded to the large screen through the Learning Communication platform. During the reporting process, some groups were able to summarize the key to the development of calligraphy based on listening materials, which was to introduce new ideas. Some groups expressed unclear opinions, and teachers should act as guides and students to conduct formative evaluations of the report content. Finally, the teacher provides feedback and summary on the students' reports, and further expands relevant knowledge to lay the groundwork for the transfer process.

Step 4: Migration. Teachers use the platform's scenario practice creation function to establish comparative scenarios, generate dynamic and contextualized exercises on "Who Do You Understand Chinese and American Culture", and push them to the student end. This exercise requires students to connect various dynamic cultural scenarios with corresponding countries based on the PPT course resources in the Learning Platform. The Xuotong platform applies data analysis technology to dynamically monitor students' answering situations throughout the entire process, providing explanations and analysis for students who have not passed situational exercises. After mastering the key points of knowledge, students can answer questions again until they reach a positive answer rate before passing.

Step 5: Evaluation. Before class ends, the teacher will conduct a classroom summary and evaluation of this lesson based on student performance data and classroom performance, as well as intelligent learning analysis on the platform. The evaluation indicators include the results of the classroom test, classroom participation, group cooperation and communication ability, language expression ability, etc. Students can reflect on themselves based on self-evaluation, teacher evaluation, and platform evaluation, and record the summary and reflection of this lesson in the classroom notes on the platform. They can also express their learning experiences in the discussion area.

In the process of practice after class, teachers release homework through the learning platform according to students' learning in class, including knowledge-based homework on Barbie culture listening Multiple choice and high-level thinking homework on writing around culture, to further consolidate students' knowledge. In addition, students can express any questions they have during the homework process through the discussion area of the Learning Connect platform, and teachers and other students can answer them.

Analysis of Teaching Effectiveness

After a month of four class hours of teaching practice, the pre test and post test scores of the experimental and control classes were analyzed using SPSS (26), and supplemented by interviews with teachers and students. It was concluded that the teaching model designed in this study achieved good teaching results. The following is an introduction and analysis of teaching effectiveness through surveys on student performance and teacher-student interviews:

Analysis of academic performance

The test results of students can largely indicate their learning effectiveness, thereby reflecting whether the new teaching model is effective. As shown in Table 1, after statistical analysis by SPSS (26) group, it can be seen that the average score of the experimental class in the post test is higher than that of the control class, and the post test score of the experimental class has made significant progress compared to the pre test score, while the post test score of the control class has made relatively small progress compared to the pre test score. Therefore, it can be preliminarily determined that the implementation of the new teaching mode will have a certain improvement in the performance of the experimental class students.

Table 1. Average score.
Average score

		N	M
Experimental class	pre-test	18	73.33
	Post-test	18	80.56
Control class	pre-test	20	73.60
	Post-test	20	75.05

Comparing the average scores alone may have some limitations and lack some scientific validity. Therefore, in order to further analyze whether the effectiveness of teaching implementation is significant, it is necessary to use SPSS (26) for independent sample t-tests on the pre and post test scores of the experimental class and the control class, as shown in Table 2. The test results show that there is a significant difference in the pre and post test scores of the experimental class ($P < 0.05$). However, there was no significant difference in the pre and post test scores of the control class ($P > 0.05$). Therefore, based on the results of the average score analysis, it can be seen that there is a significant improvement in the academic performance of the experimental class students before and after the implementation of teaching practice, while there is no significant improvement in the control class, indicating that this teaching model has a significant teaching effect in improving students' academic performance.

Table 2. Independent-samples t test.
Independent-samples t test

	t	Sig.	Std
Experimental class	-4.720	.000	1.530
Control class	-1.162	.253	1.248

Analysis of interview results

The analysis and evaluation of the effectiveness of 5E smart classroom teaching based on cloud platforms not only includes the objective aspect of students' academic performance, but also subjective aspects such as their classroom experience. Therefore, in order to fully demonstrate the effectiveness of the new teaching model, the author conducted interviews with teachers and some students.

In terms of teacher interviews, the teacher stated that this teaching model has significant advantages:

The education cloud platform has brought great convenience to teachers' lesson preparation. Not only is the platform rich in course resources, but it can also analyze students' learning situation data, providing important reference for teaching.

The use of educational cloud platforms for pre class preparation and post class consolidation saves valuable time in the classroom, allowing students more time for interactive exploration, group communication, and wisdom development.

In terms of student interviews, most students hold a positive attitude towards this teaching model:

90% of students expressed that they prefer a classroom where they can interact and communicate with team members, which improves their communication and cooperation skills compared to the classroom where teachers and students usually speak and answer.

60% of students believe that they are more willing to learn and explore new knowledge in this classroom mode, and believe that they can learn more knowledge through group discussions and platform resources, which improves their self-learning ability and scientific inquiry ability.

50% of students expressed a sense of pride and achievement when presenting their group's exploration results in the presentation of environmental energy conservation.

After analysis, it can be concluded that there is a significant improvement in students' grades under the 5E smart classroom teaching mode based on cloud platforms, and at the same time, teachers and most students actively recognize this teaching mode. Most students are willing to participate in the learning of platform learning resources and interactive exploration in the classroom, while a small number of students are introverted and unwilling to actively express themselves to others, so they do not actively participate in group communication and still need time to gradually adapt.

Conclusion

In the information age where teaching models tend towards intelligence, the development potential of smart classrooms that integrate various new technologies is immeasurable. Through theoretical and practical exploration and research, this article shows that the 5E smart classroom teaching model based on the education cloud platform meets the development requirements of the intelligent era, and is conducive to breaking through the traditional single teaching mode in China and promoting the transformation of the structure of college English classrooms.

Due to various factors such as research time, research subjects, and research conditions, there are still many shortcomings in this study. In future research, further in-depth teaching practice and effectiveness evaluation are needed.

Conflicts of Interest

There is no conflict of interest.

References

1. Zhu Zhiting, Wei Fei. Education Informatization 2.0: The Departure of Intelligent Education and the Navigation of Intelligent Education. *Research on Electronic Education*, 2018(9):5-16.
2. Tang Yewei, Pang Jingwen, Zhong Shaochun, Wang Wei. Intelligent classroom construction method and Case study in the information technology environment. *China Audio Visual Education*, 2014(11):23-29.
3. Cui Fuling. Research on User Satisfaction of Smart Education Cloud Platform. Wuhu. Anhui Normal University, 2020.
4. Yang Xianmin. The Connotation and Characteristics of Smart Education in the Information Age. *China Electronic Education*, 2014 (1):29-34.
5. Hu Qintai, Zheng Kai, Lin Nanhui. The Development and Transformation of Education Informatization: From "Digital Campus" to "Smart Campus". *China Electronic Education*, 2014(01):35-39.
6. Zhang Xue, Zhang Jing. A Study on the 5E Teaching Model Based on Physics Concepts Construction. *Physics Teacher*, 2020(6):7-10.
7. Hu Jiuhua, Gao Chong. Evaluation of the teaching practice of 5E teaching model in China and its research progress abroad. *Chemistry education*, 2017,38(01):5-9.
8. Ruan Yuhong. 5E Teaching Practice Based on "Smart Classroom". *Biology Teaching Research*, 2021(9):90-91.
9. Zhao Chengling, Zhao Wenjun, Jiang Zhihui. Design of 5E exploratory teaching mode for STEM education. *Modern Education Technology*, 2018,28(03):106-112.
10. Zheng Yunxiang. Exploring the Teaching Model of Personalized Learning for College Students from the Perspective of New Constructivism. *Journal of Distance Education*, 2015(4):48-58.