Research on blended learning mode based on STEAM

Xiao Wang[*], *Yalin* Yin, *Xing* Li, and *Tingjun* Li

Jianghan University, 430056 Wuhan, China

Abstract. With the continuous development of science and technology, how to integrate modern information technology with STEAM has become the direction of scholars' exploration. Based on the STEAM education concept and relying on the Learning-through-education cloud platform, this study combines online and offline learning to build a STEAM based blended learning mode. Taking the unit of "Hot Air and Cold Air" of primary school science as a case, specific teaching activities are designed to explore the implementation scheme of this learning mode. The research conclusion is that the implementation of STEAM based blended learning mode can significantly improve students' classroom participation, and cultivate students' interdisciplinary knowledge integration ability, problem solving ability and independent learning ability.

Keywords: STEAM, Blended learning, Teaching mode, Primary science curriculum.

1 Introduction

According to the 13th Five-Year Plan of Education Informatization issued by the Ministry of Education, STEAM with interdisciplinary integration should be actively explored to continuously improve students' innovation ability and information literacy ability[1]. Although China's research on STEAM is gradually deepening, there are still many problems in STEAM, and there is no in-depth development of localization. As a comprehensive course, science curriculum in primary school coincides with the interdisciplinary STEAM. Combined with blended learning, it is conducive to connecting relevant knowledge among various disciplines, presenting to students in a logical and sequential manner, thus helping to cultivate students' scientific and information literacy.

2 Literature review

STEAM, originated in the United States, emphasizing the organic integration of interdisciplinary knowledge[2]. Blended Learning (BL), refers to a kind of "online" + "offline" learning that integrates online leaching and traditional leaching[3]. Through combing relevant

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[*] Corresponding author: 1711335396@qq.com

literature at home and abroad, it is found that: Foreign research on STEAM and blended learning started earlier and is more mature, but in China it is late[4-5].

Most scholars at home and abroad combine STEAM and blended learning mode with individual disciplines respectively, but there are still practical shortcomings and problems in the combination of the two. With the deepening of scholars' research on STEAM, a series of practical problems have surfaced. In view of this, it is important to explore the blended learning model based on STEAM[4-5].

3 Conceptual framework

With STEAM as the basic framework and "online" + "offline" blended learning method as the learning method, this study constructed a steam-based blended learning model framework, as shown in Figure 1.
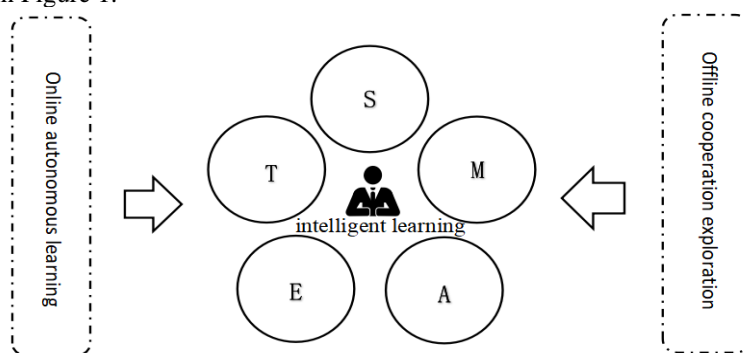

Fig. 1. Framework of blended learning mode based on STEAM.

The core of this learning mode is intelligent learning. Teachers and students are both the main body of learning, and teachers play the role of inspiration, guidance and assistance. The purpose is to realize intelligent learning and learning method, which organically integrates STEAM education concept and "online" + "offline" blended learning means.

Online, based on the education concept of STEAM, combined with the education cloud platform and extensive network resources, students can have full preview before class, and develop independent learning ability and interdisciplinary thinking; Offline, the teacher guides students to take question inquiry as the main line and students' inquiry activities as the center. Group members help each other to learn from each other and finally complete corresponding works or tasks[6]. It is beneficial to break through the traditional teaching mode and realize the reform of teaching and learning methods.

4 Implementation framework

Based on the Conceptual framework and combined with the characteristics of primary school science curriculum, the Implementation framework of STEAM based blended learning mode for primary school science is constructed, as shown in Figure 2.

The application scheme of this teaching model is mainly composed of three parts, including front-end analysis, teaching activities and support of online resources and platforms. Among them, this design divides teaching activities into three parts: pre-class, in-class and after-class. Support from online resources and platforms is integrated into front-end analysis and teaching activities.
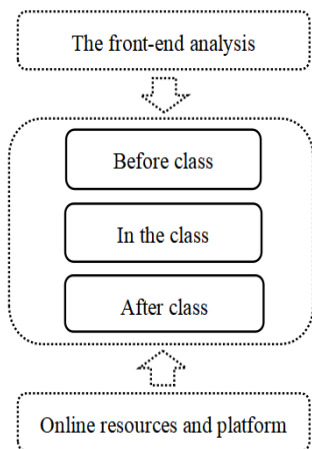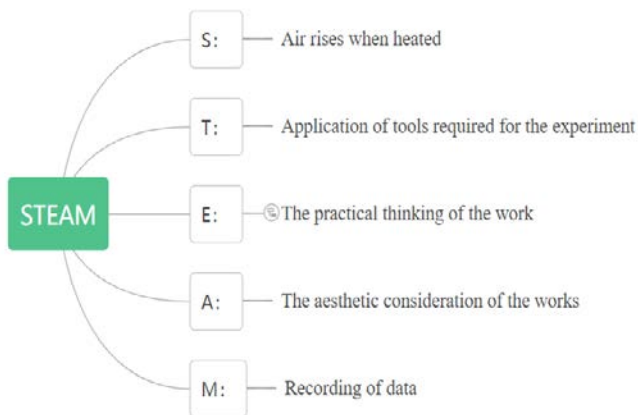
Fig. 2. Implementation framework.

Fig. 3. Course Content Analysis.

5 A sample unit

This chapter takes the science technology and engineering field of grade 5 primary school as the teaching material and the unit content of "Hot Air and Cold Air" as the specific case. The specific front-end analysis and teaching activities are as follows:

5.1 Front-end Analysis

This design lists the front-end analysis of teaching as a separate part, including learner analysis, learning content analysis and learning objective analysis.

5.1.1 Learner analysis

Students in grade 5 are in the critical stage of childhood growth. According to Piaget's cognitive development theory, students in this stage belong to the stage of concrete operation[7]. They have already acquired basic inquiry psychology and certain inquiry ability.

5.1.2 Analysis of learning content

The core content of hot Air and Cold Air unit is to master the scientific principles such as "air rises when heated" "hot aerodynamic drive" and their uses in life[8]. This unit covers the elements of the STEAM education philosophy. Therefore, this paper designs a unit course content analysis diagram based on STEAM education concept, as shown in Figure 3.

5.1.3 Analysis of learning objectives

A: Knowledge and Skills Objective: Know how kongming lantern gets its energy; Understand scientific principles such as "air rises when heated"; Be able to use the knowledge learned in this lesson to make creative kongming lanterns.

B: Process and Method Objectives: Learn to use interdisciplinary scientific inquiry methods in scientific experiment inquiry; Improve teamwork ability in group work.

C: Emotion and Values Objective: To cultivate students' love for science and truth.

5.2 Process of teaching activities

Blended learning is usually divided into three parts: pre-class, in-class and after-class[9]. Therefore, this design divides teaching activities into three parts: pre-class, in-class and after-class.

5.2.1 Before class

According to the students' learning situation and the corresponding science curriculum standards, the teacher determines the theme of the learning activity of this class as "Science in Kongming Lantern", sends the analyzed learning objectives to the course announcement of Superstar Learning, and then sends the course resources to the students. Under the guidance of course learning objectives, students can use the course resources given by teachers to carry out independent learning, and they can also publish their own problems in the process of preview on the platform[10].

5.2.2 In the class

Part 1: Situational exploration and problem explanation
    Teacher through the teacher end of the learning platform to show the related video resources of Kongming lantern rise, ask the students whether they know the scientific principle of Kongming lantern. Students answer relevant questions actively according to the online pre-class section. Finally, the teacher summarizes the scientific principle of Kongming lantern and understands how kongming lantern gets energy.
    Part 2: task arrangement and data collection
    In this part, teachers push videos of Kongming lantern through the learning platform to guide students to think about how to make Kongming lantern while watching the videos. At the same time clear design Kongming lantern task requirements: 1. Drawing lantern sketch. 2. Make clear the production steps and methods. 3. Use methods of experimental tools and materials through online information collection and learning platform. 4. Not only to complete the production of the lantern, but also to beautify, innovation.
    Part 3: Production and group presentation
    After clear tasks and data collection, students will cooperate with other groups to make lanterns. Finally, each group will show their own works, and evaluate each group and teachers and students to find out the advantages and disadvantages between themselves and other groups.
    Part 4: Class summary and reflection evaluation
    Finally, the teacher made a class summary, summarized the production points and corresponding principles of kongming lantern, and made a summative evaluation of students' performance. Students can record the summary and reflection of this lesson in the class notes on the platform.

5.2.3 After class

Teachers assign homework through the learning platform: What is the scientific principle of revolving lantern? Can you make a lantern? At the same time, upload the corresponding learning materials on the platform. If students have any questions about this lesson, they can post the discussion in the discussion area.

6 Conclusion

Based on the STEAM teaching concept, this study constructed a blended learning mode combining online and offline, and analyzed the specific implementation process of this teaching mode by taking a unit in primary school science as a teaching case. This teaching mode effectively integrates many advantages of traditional teaching and network teaching, which is worthy of continuous exploration and attempts by teachers and researchers.

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