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Attempt of JiTT Based on Cloud-Based Class—Review of Acid Properties as Example

Ni Shengjun[1], Fu Shaowu[2]

[1]Department of Teaching and Research Section, Longgang Teachers' Continuing Education Institute, Shenzhen, China
[2]Department of Teaching Office, Qiying School, Shenzhen, China

Email address:
562561756@qq.com (Ni Shengjun)

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Abstract: Feedback is the lifeline of classroom teaching. In teaching, how to immediately feedback students' learning situation is often based on the teacher's subjective judgment. Teaching based on Cloud-based Class is one of the ways to try to realize JiTT teaching. Taking the teaching of the review of acid properties in the junior middle school chemistry class as an example, the author tries the JiTT teaching mode, uses the Cloud-based Class to realize the real-time interaction, resource push and homework tasks between teachings, and records the students' learning behaviors in real time through cloud services to achieve process evaluation and individualized teaching. According to the platform characteristics of the Cloud-based Class, JiTT teaching mode theory, combined with the practical experience of junior middle school chemistry teaching, the teaching strategy model based on Cloud-based class is proposed. The teaching model has three advantages. First, teaching feedback is more efficient, second, participation motivation is stronger, and third, process evaluation is more scientific. At the same time, it also puts forward three points of thinking based on the teaching model. Firstly, it should pay attention to the consistency of teaching objectives, teaching activities and evaluation. Secondly, the construction of information-based teaching environment is the basis for the curriculum integration. Finally, the school and parents' concept change is a guarantee for blended learning.

Keywords: Cloud-based Class, JiTT, Immediate Feedback, Acid Properties, Chemistry-review Class, Junior Middle School

1. Introduction

E. L. Thorndike is an American psychologist in the early 20th century. On the basis of animal experimental research, he put forward a learning theory of behaviorist psychology - Connectionism, also known as "Connectionism Psychology". It also proposes three learning laws, namely, practice law, effect law and preparation law. Thorndike later revised the "exercise rhythm" because he believed that "practice without feedback is ineffective, that is, learning will not happen." It can be seen that feedback is the lifeline of teaching, so JiTT teaching mode (Just-in-Time Teaching, translated as "Instant Feedback Adaptive Teaching" or "Timely Teaching") came into being. JiTT teaching mode originated from the undergraduate teaching in American universities at the end of the 20th century. Gregor Novak, emeritus professor of physics at American Aeronautical College, and his colleagues summed up a teaching method through practice [1]. JiTT is a new teaching and learning strategy based on the interaction between Web-based research assignment and Active Learning classroom [2]. It is essentially a feedback loop composed of students' extracurricular preparation and classroom activities [3].

At present, the problem in primary and secondary school teaching is how to get students' immediate feedback based on objective data rather than subjective feelings or experience. Chen Qianming, Qian Yangyi and others have developed the Interactive Response System (IRS) [4] to provide a new support for the integration of information technology and curriculum. However, due to the high cost and technical requirements, the scope of promotion has been limited. However, under the background of "Internet + education", many problems have been solved. For example, student handheld terminals (iPad or smart phones), network coverage (WiFi or 4G) and platforms (such as Moso Teach), etc.. Some deficiencies in the traditional classroom can be compensated by the deep integration of information technology and

curriculum, and different information technology methods play different roles, such as using QQ (It is the most widely used online chatting software like MSN or Yahoo Messenger.) to promote the professional development of chemistry teachers [5], using Blogs to improve students writing level [6], using online forums to promote college biochemistry teaching [7].

This paper attempts a blended teaching based on Cloud-based Class through a teaching case, which is intended to illustrate the possibility of implementing blended teaching in the elementary education, and attempts to construct a strategic model of blended teaching based on Cloud-based Class.

2. Function Introduction of Cloud-based Class

Cloud-based Class is a cloud service platform for mobile teaching based on mobile internet environment, which meets the needs of interaction and timely feedback between teachers and students [8]. It is based on the class group and class space created by teachers in the cloud. After the application is installed on the mobile device, students can join the class by using the generated "invitation code". It can not only manage every student who participates in the class, but also provide students with course subscription, course PPT, video, audio and other resource services of mobile device. It can not only push information of homework and examination, voice interaction such as discussion and communication, but also feedback evaluation of teachers' teaching behavior such as questionnaires. It can not only stimulate students' enthusiasm to use mobile devices, but also can improve the frequency and efficiency of interaction between teachers and students. Most importantly, the platform tracks and records students' learning trajectory and progress, and automatically evaluates students' learning to achieve process evaluation and personalized teaching.

3. Application of Cloud-based Class in Chemistry Teaching in Junior Middle School

3.1. Developing and Uploading Learning Resources

In the "resources" location of Cloud-based Class, upload the learning resources related to the content of this lesson, see Table 1.

Table 1. *Analysis of video learning resources.*

No	Name of Video Resource	Approaches of Resource Development	Learning Requirements	Time length
1	Properties and uses of acids (referred to as "acid 1")	DIY		3.6min
2	Chemical properties of acids (referred to as "acid 2")	Network	Must learn	1.7min
3	Physical properties of acids (referred to as "acid 3")			1.4min
4	Physical properties of hydrochloric acid and sulfuric acid (referred to as "acid 4")		Choose to learn	57s
5	Similarity of acids and bases (referred to as "acid 5")			1.4min

Before class, teacher can check the learning of students' video resources at the mobile device or web page. There are 36 students in the class, with 33 students learning video and 92% learning participation.

(Design Intention: Intended to put knowledge learning before class and track students who did not participate in learning in time through the function of "reminding non-participants".)

3.2. Finish "Self-study Test" Before Class

Students are required to complete the "Pre-class Test" after video learning. Teacher design teaching according to the statistical feedback of background data (see Figure 1), and determine the key and difficult points of this lesson.

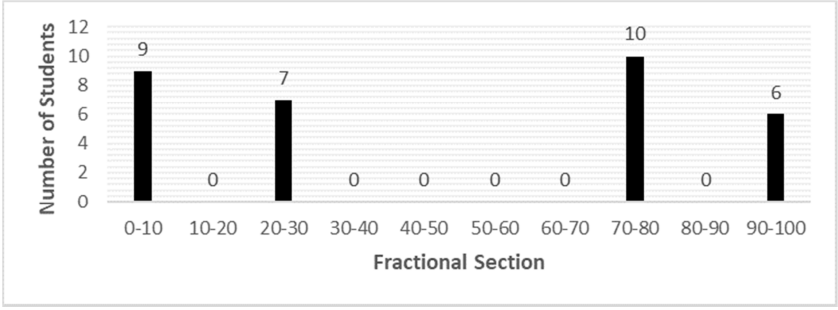

Figure 1. *Overall Analysis of Pre-class Test 1.*

Combining with the analysis of software background data, most students can match or identify the corresponding options by recalling and remembering the factual knowledge [9], and the correct rate is higher. Some students are not clear about the conditions for establishing the generality of acid, such as "the reaction between acid energy and active metal to produce hydrogen". At the same time, they are not clear about the process of "water absorption" of concentrated sulfuric acid.

Based on the analysis of pre-class self-test data and the students' actual situation, the teaching objectives of this lesson are formulated as follows: (1) to master the operation points of diluting concentrated sulfuric acid; (2) to verify and summarize the generality of acids through experiments; (3) to select the right drugs to verify that sodium hydroxide reacts with dilute sulfuric acid; (4) to evaluate their learning harvest.

(Design Intention: According to the feedback of the students' pre-class test, the teaching objectives, activities and evaluation of this lesson are analyzed and formulated.)

3.3. Breakthroughs in Key Points and Difficulties

3.3.1. Link 1: Grouping Experiment of Diluted Concentrated Sulfuric Acid

Students dilute concentrated sulfuric acid according to the tabletop medicines and instruments (concentrated sulfuric acid, distilled water, water tank, beaker 2, glass rod, rubber head dropper 3, test-tube 2), and complete the following tasks. (Note: 3min, group work together)

(1) experimental report, see Table 2.

Table 2. *Record sheet of concentrated sulfuric acid dilution experiment.*

Experimental name	
Main instrument	
Main operation	
Main phenomenon	No obvious phenomenon, but touch the outer wall with your hands, obviously feel_____
Empirical conclusion	The dilute sulfuric acid is _____ changes, also _____ thermal reaction.
Matters needing attention	

(2) Uploaded the report to the Cloud-based Class "group task activity 1".

(Design Intention: "Diluting concentrated sulfuric acid" belongs to procedural knowledge, which requires students to practice and experience. Meanwhile, teachers use the same-screen technology to present the group experiment report and typical problems of students' operation on the screen in real time for questioning and explaining doubts.)

3.3.2. Link 2: Grouping Experiments to Verify the Properties of Acids

Students add diluted sulfuric acid to other medicines according to the tabletop medicines and instruments (Different instruments in different groups: copper wire 5 groups, iron powder 6 groups, $CuSO_4$ solution 3 groups, CuO powder 1 group, NaOH solution 2 groups, pH test paper, phenolphthalein indicator, purple litmus 4 groups), and complete the following activities. (Note: 4 minutes, group work together)

(1) experimental report, see Table 3.

Table 3. *Record sheet for verifying the properties of acid.*

Experimental name	
Main instrument	
Main operation	
Main phenomenon	
Experimental principle	
Empirical conclusion	
Experimental group	Group NO._____ Operator _____

(2) Uploaded experiment report and experiment process to the Cloud-based Class "group task activity 2"

(Design Intention: Different groups verify different properties and upload experimental reports, which can realize the immediate sharing of results and sum up the generality of acids.)

3.3.3. Link 3: Breakthrough in Teaching Key Points and Difficulties

Teachers emphasized that NaOH solution was the only drug in one group except dilute sulfuric acid, and the conclusion that acid and alkali could neutralize was incorrect. Students' groups were asked to express their views in "Answer and Discuss Activity 3" of the Cloud-based Class, as shown in Figure 2. (Note: 8 minutes: 2 minutes for group discussion, 4 minutes for design, 2 minutes for input).

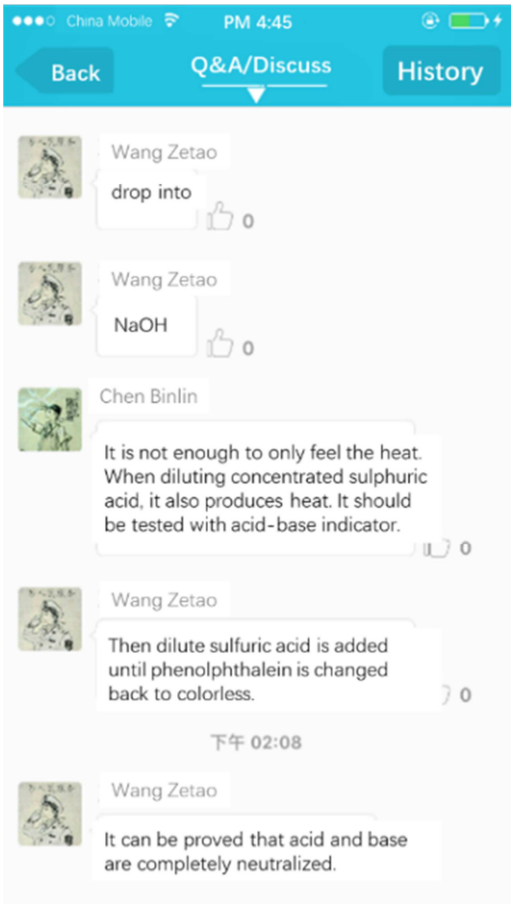

Figure 2. *Screenshot of Student's discussion on Cloud-Based Class.*

(Design Intention: In this part, students discuss in groups about "how to verify the reaction between sodium hydroxide and dilute sulfuric acid" and express their opinions in the "discussion" activities of the Cloud-based Class, so as to improve the efficiency of feedback and solidify the results.)

3.3.4. Link 4: Learning Detection

Teachers ask students to complete the "test activity 4" (time limit of 5 minutes) according to the content of this lesson. The software automatically collects and preserves the students' problem-solving situation, and forms the overall data analysis,

the analysis report of the correct and wrong rate of each question, and the data of students' individual scores and time-use.

(Designing intention: Teachers use the power of within a group, or between groups to solve students' problems according to the data of instant feedback. At the same time, they can also encourage each other.)

3.4. Reflection After Class

Teacher: What have you learned from this class? Ask the students to use "4321 method" (four keywords, three feelings, two doubts and one action) to sort out the lesson, and express in "Brainstorming" activities in time.

(Designing Intention: This link aims to use tools to cultivate students' metacognitive knowledge. At the same time, in the "brainstorming" activities, teachers can see all the students speak, but not among the students (after the activities are visible), so as to truly realize "back-to-back" thinking.)

4. Advantage Analysis of Cloud-based Class Teaching

4.1. Learning Feedback Is More Efficient

By using the real-time data analysis technology of Cloud-based Class, the students' participation in activities is presented and analyzed in real time. That is to say, the teachers' instructions are grasped more accurately, and the students' learning status and learning strategies are also adjusted by real-time feedback.

4.2. Learning Motivation Is Stronger

With mobile internet, students can actively learn the learning resources uploaded by teachers to mobile devices at anytime, anywhere and on their own initiative [10]. At the same time, using the teaching interaction and instant feedback of mobile devices, students can successfully motivate [11] and focus on learning tasks.

4.3. Process Assessment Is More Scientific

The learning progress and duration of each resource, the participation of each activity and the completion of interactive exercises can be recorded and presented in the form of “Empirical Values”. Let "process evaluation" no longer be presented in the way of "experience", "feeling" or "impression" without data support, and truly combine process evaluation with summative evaluation.

5. Teaching Strategy Model Based on Cloud-based Class

According to the platform characteristics of Cloud-based Class, JiTT teaching model theory and junior middle school chemistry teaching practice experience, a teaching strategy model based on Cloud-based Class is proposed, as shown in Figure 3. The model is a feedback cycle consisting of teachers and students' extracurricular preparation and classroom activities. It shows the role and strategy of Cloud-based Class in each teaching stage, and also reflects the process management and comprehensive evaluation of Cloud-based Class in teaching. Although the teaching strategy model has achieved preliminary results in practice, the evaluation of teaching effect has not yet formed specific data support, and whether it can be popularized to form a universal teaching mode remains to be further studied in practice.

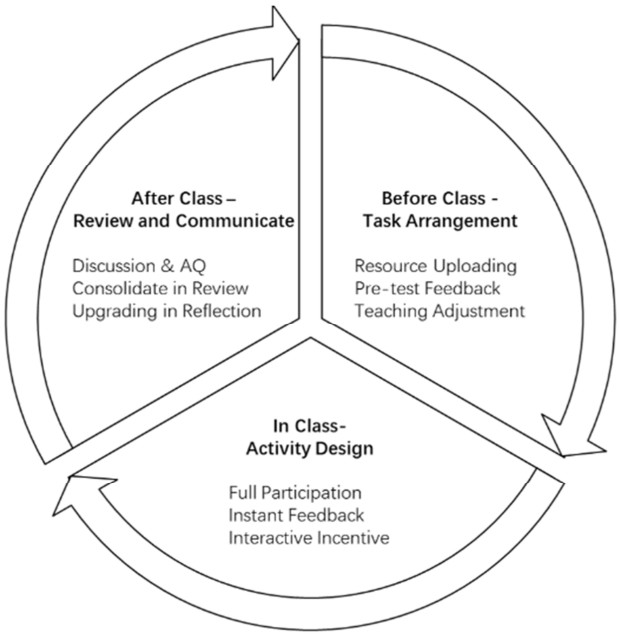

Figure 3. *A teaching strategy model based on Cloud-Based Class.*

6. Thinking About the Use of Cloud-based Class in Elementary Education

6.1. Consistency of Learning Objectives, Activities and Evaluation

The consistency of objectives, activities and evaluation, is the guarantee of effective efficient [12]. In this lesson, the pre-class video learning materials do not mention the strong oxidation of concentrated sulfuric acid, but there is a need to use this property to solve the problem in the pre-class test; secondly, in the classroom teaching link, there is no specific activities designed for this problem; thirdly, in the evaluation link, there is no such a property involving concentrated sulfuric acid questions. Therefore, the matching design between objectives, activities and evaluation is the core element of integration.

6.2. Construction of Informationalized Teaching Environment

Under the background of "Internet + Education", information technology is no longer just a supplementary function of teaching and learning, but a transition to integration with disciplines [13]. At the same time, this integration needs the support of the network environment to connect teaching and learning in depth. Therefore, the level of information construction in schools and classes is a necessary condition for integration. At present, Shenzhen is carrying out research and exploration on the integration of chemical core literacy and teaching, learning and evaluation, focusing on the evaluation of chemical academic quality in junior middle schools. The purpose is to determine the content of core literacy and academic grade standards, establish an academic quality evaluation system, and automatically form evaluation and analysis reports by using large data analysis platform. For each student, each class, each school to establish a set of dynamic academic quality files, and on this basis to provide a personalized self-learning system, and this study can provide reference cases and research recommendations.

6.3. The Change of School and Parents' Concept

In elementary education, the integration of information technology and curriculum is not as good as that of higher education. Part of the reason is related to the concept of school and parents, worrying about the difficulty of school management and the loss of children's willingness to play in smart mobile devices. However, the renewal of technology is an important driving force to promote social change, so there's no need to be afraid of talking about mobile phones., but to embrace technology and make better use of information technology to promote teaching.

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