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Suggestions on the Construction and Implementation of Junior Middle School Chemistry Teaching Mode Based on SPOC

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Abstract: With the development of society, information technology is widely used in teaching, **SPOC** teaching mode has also been widely used, but there are a series of problems to be solved in the implementation of junior high school chemistry teaching, for this reason, this paper constructs the "SPOC junior high school chemistry teaching model", the teaching mode reconstructs and optimizes the junior high school chemistry "before class - class - after class" teaching process, and put forward the implementation of the **SPOC** junior high school chemistry teaching mode, the teaching practice in HL middle school also shows that the model has achieved better results.

1. Introduction

In order to accelerate the construction of education modernization and promote the development of education informatization in the new era, the General Office of the CHINESE GOVERNMENT Central Committee and The General Office of the State Council issued the "Education Informatization 2.0 Action Plan" and "China's Education Modernization 2035", marking that China's education informatization has entered a new historical stage. In July 2021, the "double reduction" policy was introduced, which also brought greater challenges to the reform of basic education and teaching. Standing at a new historical starting point, junior middle school chemistry teaching should be reformed according to its subject characteristics and curriculum standards [1]. However, in the process of the integration of chemistry teaching and educational informatization, problems emerge one after another, such as "serious shortage or uneven distribution of teaching resources", "neglect of teaching ideas", "excessive learning pressure of students", and "the amount and difficulty of after-class homework are not suitable for students' personal ability". **SPOC**, with its strong interactivity, more targeted teaching, more flexible teaching methods and many other advantages, has unleashed great potential in junior middle school chemistry teaching.

Based on the current situation of chemistry teaching in a third grade in H City, a total of 120 questionnaires were sent out, 114 were recovered and 114 were effective, with an effective recovery rate of 95%.

2. Main Problems Existing in Chemistry Teaching in Junior Middle School

2.1. Many Teachers have Backward Teaching Concepts and Single Teaching Methods

At present, many teachers lack scientificity in the design of teaching objectives and pursue achievements too much, so that students' scientific literacy cannot be comprehensively developed. Student enters a higher index of pressure grade teachers, some teachers to student achievement important all the more, the teachers focus on the cultivation of the dimension of "knowledge and skills" target, despise even ignore contained in the chemistry teaching of "process and method", "emotional attitude and values", the elements of the three-dimensional goal imbalance, so that students in the training of excessive knowledge and skills, and the expected effect is far from. In the teaching process, some new teachers are easy to fall into the mode of teaching thinking due to their lack of teaching experience. Some old chemistry teachers' teaching methods lag behind, rely too much on their own teaching experience, and cannot adapt to the educational informatization reform. They are unfamiliar with the combination of network and teaching, and cannot grasp the teaching rhythm effectively [2].

Teachers' teaching habits that teachers are hard to find for a long time and update their teaching methods, according to the survey, only 26% of the students are more willing to accept the teacher's teaching method is used for most of the teaching, many teachers in the teaching process of the land by using the method of teaching neglects students' guide and inspiration, a lack of observation of the chemical phenomena, Easy to make students not easy to understand knowledge, fatigue, reduce the interest in chemistry learning, the psychological resistance to learning.

2.2. Chemistry Experiment Environment in Junior Middle School is Outdated and Teaching Resources are Lacking

The financial situation and teaching staff of different regions are different, as well as the teaching resources and teaching environment of different regions. Chemistry is a subject that combines theory and experiment, so we should pay attention to the creation of tasks based on experimental inquiry, and use chemical experiments to make students feel chemical reactions more intuitively, so as to expand the breadth and depth of students' knowledge from micro to macro, from theory to practice. However, some schools in remote areas lack laboratories, chemical raw materials and old experimental equipment, which makes the teaching and experiment of chemical experiment difficult. Therefore, many schools simplify and leave out the teaching of chemical experiment, which causes the imbalance of teaching resources to a certain extent, and also makes the teaching of chemistry in some schools get half the result with less effort.

2.3. There are Many Difficulties in Learning Chemistry in Junior Middle School and Great Pressure in Entering College

Junior middle school students from first contact chemical, students face the unfamiliar content and produce fear, in the survey 95% of the students feel learning difficulties for at least part of the chemical content, combined with the entrance pressure, time is short and high strength study of the "learn worse, bad for chemical stimulate interest in learning. With the comprehensive implementation of the "double reduction" policy, homework burden and off-campus training burden have been greatly reduced. However, basic education has undergone several changes, but the way of score admission has not been completely changed. Although the "double reduction" policy gives students and their parents sparer time, it does not reduce their pursuit of academic qualifications and schools. According to the survey, 90% of the students after the "double reduction" are faced with problems such as "the

quantity or difficulty of homework is not suitable for students' personal ability". The accurate stratified homework in practice will also bring great work pressure to teachers and increase the cost of homework. How to improve the efficiency of teaching and learning, reduce the burden and increase the quality is an urgent problem to be solved.

3. SPOC Junior Middle School Chemistry Teaching Model

Based on the analysis of the current situation and problems of chemistry teaching in junior middle school, the **SPOC** Chemistry Teaching Mode is constructed based on the reality, which gives full play to the leading role of teachers, fully reflects the subjectivity of students and achieves the best teaching effect. The chemistry teaching process of junior middle school based on **SPOC** is mainly carried out from online pre-class, online in-class and online after-class according to the characteristics of chemistry teaching. The pattern is shown in Figure 1.

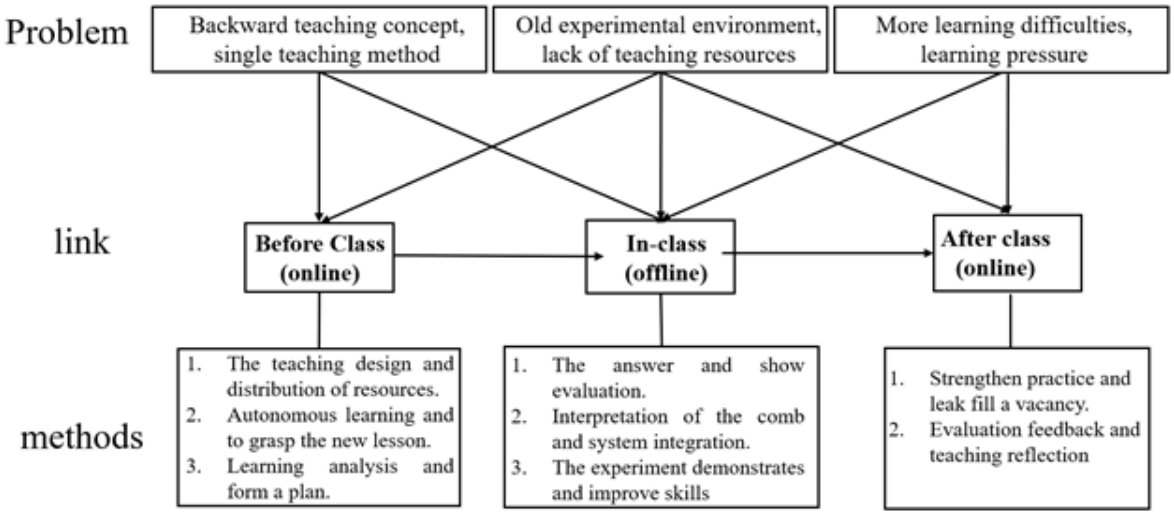

Figure 1: schematic diagram of "SPOC Chemistry Teaching Mode".

3.1. Before Class -- Online

In the online pre-class process, teachers are required to design teaching resources, upload them to online teaching platforms (such as Xuexitong, Dingding, QQ, etc.) and distribute them to class students, and set the deadline for completion. Students can log in the personal client to complete the self-study before class within the time limit. After the deadline, teachers log in to the teacher terminal to consult and analyze students' learning data.

3.1.1. Teaching Design and Resource Distribution

The arrangement of the teaching resources is the key of the class link, directly related to the quality of teaching, "Shuang Jian" policy emphasizes "together the best free online learning services" [3], free online rich high quality teaching resources to promote the balanced development of education resources, promote the education fair is of great significance, to some extent compensate for the region, the present situation of the imbalance of education resources. However, this also puts forward higher requirements for teachers, teachers need to design suitable pre-class teaching resources according to the teaching content and the characteristics and abilities of students. Pre-class teaching resources mainly include guided learning plans, micro-class videos and exercises.

Guided learning plan has the functions of "guidance, guidance and guidance". According to the requirements of teaching purposes and the systematization of the content and knowledge of the

textbook, the teacher distinguishes the primary, secondary, key and difficult points, lists the outline and raises questions so that students can learn according to the outline [4]. This prevents students from learning on the surface and getting half the result with twice the effort due to their inability to learn, low learning efficiency and blind learning.

Micro-lesson videos that fit the curriculum are the core of **SPOC** online pre-class links. Teachers can record and make micro-lesson videos of one or several knowledge points according to the teaching content, or select appropriate excellent teaching videos [5], which has strong pertinence and ensures the integrity of teaching. The video time is controlled in 5-10 minutes, and students can pause, replay, fast forward and other operations on the video according to their own needs. It is suitable for students to study in the stage of new lesson learning, consolidation and review, so that learning has greater autonomy.

In order to test and consolidate online pre-class learning results, teachers need to design exercises according to the teaching content and students' ability to promote students' understanding and penetration of knowledge. When designing exercises, teachers also need to ensure that the difficulty of exercises is appropriate and pay attention to the stimulation of students' interest in learning.

3.1.2. Learning Independently and Mastering New Lessons

Independent learning before class is equivalent to preview, which is an important process for students to complete knowledge construction. In the self-directed learning before **SPOC** class, students need to use terminal devices to enter the platform within a specified time and complete micro-lesson video learning, exercise training and other learning tasks according to the content of the guided learning plan. **SPOC** breaks the time and space barrier between teachers and students. Students with problems can interact with their classmates and teachers in real time on the platform. Students can master the new lesson content through independent learning before class through **SPOC**, and understand their own mastery through pre-class exercises, so as to enhance the pertinence of lectures and improve class efficiency. In the independent study of **SPOC** before class, guided learning plan is used to avoid the problems of formal preview caused by students' inability to preview, low preview efficiency and blind preview. Meanwhile, self-study habit and ability of students are cultivated to improve their ability of independent thinking.

3.1.3. Analyze the Situation and Form the Plan

After the students finish the self-study before class, the teacher enters the teacher side to check the completion of students' tasks. Teachers according to students' self-learning platform before analyze the data for master students' understanding of the content of the new lesson, students understand the problems in the learning process, determine the overall learning situation, to facilitate subsequent teachers completed **SPOC** autonomous learning links with **SPOC** tutorial learning before class link between good cohesion, form a line in the class teaching plans.

3.2. In-Class -- Offline

The classroom is the main front of school education, and it is the middle part of the class. Teachers are required to answer the questions of students in the pre-class independent learning link and show and evaluate the tasks of pre-class independent learning. Teachers systematically explain and sort out the content of this section according to teaching objectives, teaching material content, teaching difficulties and learning situation analysis in **SPOC** pre-class independent learning. According to the teaching objectives, the experiment part of this section carries on the chemical experiment demonstration and the operation, helps the student internalize the chemical knowledge.

3.2.1. Answer Questions, Show and Evaluate

In the process of introducing new lessons, teachers need to solve the mistakes in the knowledge independently constructed by students, that is, the wrong understanding generated by students in the process of independent learning and discussion, so as to avoid the accumulation of mistakes generated by students. Teachers need to explain special mistakes and common problems to avoid misunderstandings in students' thinking and form thinking inertia.

Teachers are required to display and evaluate excellent works according to the learning tasks set in the pre-class independent learning link and the arrangement of teaching design. Teachers praise excellent works to ensure the diversification of evaluation subjects and give full play to the function of evaluation guidance, inspection, incentive and improvement.

3.2.2. Explanation and System Integration

After SPOC self-study before class, students have complete independent intellectual structure, the students' knowledge system remains fragmented, however, teachers need to according to the actual teaching situation, combing the teaching difficult point, will be systematically integrated curriculum content, enables students to create knowledge framework in mind, to build knowledge building, And on this basis, appropriately expand the depth and breadth of knowledge, so that students can adapt to different problems of the same type.

3.2.3. Experiment Demonstration, Improve Skills

The mastery of chemical experimental skills is one of the objectives of the course. Most of the chemical conclusions are found or tested in experiments. Only systematic theoretical explanation combined with vivid and interesting chemical experiments can improve the efficiency of chemistry teaching to a greater extent. The creation of experiment-based scientific inquiry activities in teaching can help students understand chemical knowledge in the process of observation, experiment and communication, stimulate their interest in chemistry learning and improve their scientific inquiry ability and cooperation ability [6].

3.3. After Class -- Online

3.3.1. Consolidate Practice, Check and Fill Gaps

Under the background of the "double reduction" policy, students' homework burden is fully reduced. Under the requirement of reducing the burden but not reducing the quality, teachers should skillfully use technology, analyze students' learning data with big data, assign homework in accordance with the learning situation, and ensure that homework plays the role of diagnosis, consolidation and learning situation analysis [7]. The balance between the quantity and quality of students' homework and the degree of correspondence between homework level and students' learning situation are of great significance to students' learning efficiency and teachers' teaching quality. Therefore, the teacher should be according to the laws of the age characteristics of students, the study and utilization of network teaching platform to release the homework, record the assignment function such as delamination, elasticity and personalized assignment, in order to meet the needs of different level students, embody the quality education guidance, ensure the students in the school education to "eat" "eating well", improve teaching efficiency, radically reduce quality.

3.3.2. Evaluation Feedback and Teaching Reflection

Scientific and accurate evaluation of the teaching process not only directly determines the level of

teaching effect, but also directly affects the enthusiasm of teachers in teaching and the initiative of students in learning, which is of great significance to comprehensively improve the quality of teaching [8]. We should attach importance to the simultaneous development of "teaching" and "learning" evaluation, carry out teaching evaluation objectively from the actual situation, and give full play to the function of evaluation tools. For the evaluation of teaching process, it should be divided into class type, scientific distribution from teaching content, teaching thought, teaching method, strategy means, teaching quality and so on. For the evaluation of learning process, scientific allocation should be made from the aspects of activity state, activity form, activity validity, goal achievement, classroom concept, etc., and quantification should be assigned according to the evaluation content [9]. Teachers reflect on teaching according to the evaluation results, understand the quality of teaching and learning, as well as the factors affecting students' learning, and maximize the improvement of teachers' teaching and students' learning.

4. Suggestions on the Implementation of "SPOC Chemistry Teaching Model" in Primary and Secondary Schools

4.1. The School shall Implement the SPOC Chemistry Teaching Reform Policy

School support plays a vital role in teaching reform, and schools should vigorously implement **SPOC** chemistry teaching reform. Teacher support on policy, make teachers guided in spirit to encourage teachers to the teaching reform, to inspire teachers to the teaching reform of the power, optimizing the teaching conditions, set up special funds, to give theoretical guidance, provide ensure the smooth operation of the teaching reform to promote the teaching environment, and gives corresponding reward outstanding achievements in teaching reform of teachers.

4.2. Teachers should Avoid SPOC Chemistry Teaching being Superficial

To give full play to "**SPOC** chemistry teaching mode", we should start from school and family. On the one hand, teachers should pay attention to the distribution of teaching content. Offline classroom is the main position of education, teaching should not lose one or the other, so that the teaching mode becomes superficial. Teachers should combine the actual teaching situation, coordinate the online and offline content, ensure the good connection of online and offline teaching content, make the previous teaching for the later teaching to lay a solid foundation, organic combination of the three links, help students to build a complete knowledge system; On the other hand, families should pay attention to cultivate students' good Internet habits. Many minors are addicted to online games. According to the survey, only 50.7% of students' daily online time is controlled within 0-2 hours, this is shown in Table 1. Junior middle school students are young and have weak self-control, so it is difficult for many students to concentrate on online learning tasks within the specified time. In view of the cultivation of students' online learning habits, it is necessary to strengthen home-school communication, change parents' ideas, guide parents and students to reach a gentleman's agreement, establish rules of Internet use [10], cultivate good Internet use habits, and guide students' **SPOC** online learning in two ways.

Table 1: Average online time per day.

variable	Number of people	proportion
0-2h	57	50.70%
2-5h	20	17.54%
5-10h	12	10.71%
More than 10h	25	21.05%

4.3. Teachers should Pay Attention to the Quality of Teaching Content

When conducting **SPOC** chemistry teaching, teachers should plan and design the teaching materials before, during and after class according to the actual situation, simplify the teaching links and materials, and improve teaching efficiency in essence. The online part pays attention to making full use of educational resources and lets students' study efficiently through abundant network resources. As for the online preview before class, teachers can take micro class as the carrier to do a good job in the design of micro class, improve the quality of micro class, and realize "cloud preview". For those with strong operability in chemistry, teachers can carry out group teaching and guide students to learn to use virtual laboratories to conduct immersive chemistry experiments, so as to broaden their horizons and expand the depth and breadth of students' learning [11].

4.4. Teachers should Enhance Communication between Teachers and Students

Survey shows that 45.6% of students think "after finishing the exercises after class can't get good feedback", this is shown in Table 2, students' online preview before class to link with online consolidating practise after class will encounter more or less difficult to understand the knowledge point or is difficult to finish the practice, in order to avoid the students form a wrong understanding about the knowledge, teachers in the background after statistics can adopt the form of online answering questions, Help students build the correct knowledge system, so as to break the time and space barriers and avoid the accumulation of wrong knowledge. At the same time, it is also convenient for teachers to grasp students' ideas in real time, explore students' learning ability, guide them properly, and cultivate their innovative spirit and practical ability, so as to achieve the comprehensive development of students. At the same time, teachers also need to pay attention to the teaching feedback given by students, improve teaching in real time, make the integration of class and outside, and promote the better development of students.

Table 2: Problems with chemistry after-school exercises.

Variable	Number of people	Proportion
There is unnecessary repetition of topic knowledge types.	42	36.84%
The difficulty of the questions doesn't match the level mastery.	68	59.65%
Can't give better feedback after finishing the questions.	52	45.61%
Parts of knowledge can't be practiced enough.	49	42.98%
Other	3	2.63%

5. Conclusion

Based on junior middle school chemistry teaching needs to solve the problem as the breakthrough point, reconstruction and optimization of junior middle school chemistry teaching process, to explore the innovation and optimization of "**SPOC** junior middle school chemistry teaching mode", and in the middle school teaching experiment was carried out, HL results show that the **SPOC** teaching mode can improve teachers' teaching methods, perfecting teaching resources, It can also stimulate students' interest in learning and improve learning efficiency to a large extent. The "online + offline" two-pronged **SPOC** teaching model provides a stronger guarantee for the construction of a better and more efficient education system, a stronger school education front and a fairer education environment,

so that China's education ecology radiates new vitality and vitality.

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