

Biology Teaching Design in Senior High School Based on Scientific Inquiry Literacy

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Abstract: In order to cultivate students' core literacy of biology, teachers can try to use relevant theories to explore the teaching design of biology in senior high school. This teaching practice attempts to design the confirmatory biological experiment “extraction and separation of pigments from green leaves” in senior high school as an exploratory experiment. It is hoped that under the guidance of this theory, teachers can carry out reasonable, effective and operable experimental teaching design, so as to promote teachers' professional growth, improve students' biological core literacy, and reflect the unique educational value of biology.

1. Introduction

Academic experts and front-line teachers have made a detailed definition of high-quality and efficient education, in which high-quality and efficient education, which is widely recognized by the public, respects students' dominant position and allows students to experience the process of acquiring knowledge on their own. exercise and develop students' autonomous learning ability and inquiry ability [1] [2], which requires biology teachers to guide students to use scientific thinking. Choose scientific methods for teaching.

Through a large number of classroom teaching observations, the author finds that there are two common problems in daily high school biology teaching: from the perspective of teaching content, the distinction between factual knowledge and conceptual knowledge is not very clear, and the starting point of teaching is still the transfer of knowledge. there is a lack of connection between the curriculum objectives and classroom teaching, and teachers lack of understanding of the core literacy of the subject. From the perspective of curriculum implementation, there is a widespread problem of fragmentation of teaching content, resulting in teachers' lack of systematic and overall grasp of teaching content, thus affecting the effective implementation of the core literacy of biology.

In order to solve the above two problems, the author uses Bloom's educational goal classification theory to guide the teaching practice, tries to change the nature of the experiment to carry on the experimental course teaching design, and achieves a better teaching effect.

“Extraction and separation of pigments from green leaves” is a compulsory course in Biology in Senior High School. Chapter 5, “Energy and supply of cells”, Section 4, “Energy Source, Light and photosynthesis”. The first part captures the experimental content in the pigment and structure of light energy, which is the key and difficult point of biology teaching in senior high school [3]. In the process of biology classroom teaching, the teaching goal of teachers is not clear, and the efficient use of classroom teaching time cannot be guaranteed; the traditional teaching concept is deep-rooted, and most teachers still use the traditional education mode to teach, resulting in students being unable to master biological knowledge scientifically; the teaching method is single, and most teachers ignore the cultivation of classroom cooperative learning, which leads to the general low enthusiasm of students in learning biology [4]. In addition, compared with confirmatory experiments, exploratory experiments can better reflect the process of students' active construction of biological knowledge, and really realize the new teaching mode of teacher-led and student-centered. Therefore, this paper designs confirmatory experiments as exploratory experiments, in line with the concept of student-oriented teaching to carry out scientific inquiry, so

as to cultivate students' scientific spirit and innovative thinking, so as to improve students' core literacy of biology.

2. Practical Process

On the one hand, most teachers and students adapt to the traditional inherent mode of “teachers speak, students listen”, and there is a certain resistance to inquiry learning, on the other hand, because inquiry teaching is time-consuming and laborious, in order to ensure the smooth progress of the inquiry process, teachers need to seriously prepare for the inquiry experiment, and in this process, students need a high degree of cooperation. Therefore, this class is based on the inquiry teaching activities led by the students' main teachers. In order to ensure the high efficiency of the teaching effect, both teachers and students should make adequate preparations before class.

Experimental materials: green leaves, silica, calcium carbonate, anhydrous ethanol, chromatographic solution, funnel, beaker, mortar, capillary, nylon cloth.

2.1 Teaching Practice Design

2.1.1 Teachers Prepare Before Class:

The main results are as follows:

(1) Consult the relevant data, optimize the experimental materials, and select cheap spinach leaves and clover as experimental materials.

(2) Configure the chromatographic solution and put the necessary drugs and instruments on the experimental table.

(3) Grouping according to the principle of “heterogeneity within groups, homogeneity between groups”.

(4) Issue the task sheet one week before class, and ask the students to fill in the task form in order to familiarize themselves with the experiment in advance.

(5) Provide the video of making the leaf vein bookmark, and ask the students to use their spare time to make the leaf vein bookmark they like.

Classroom practice process:

2.2 Create Situations and Introduce Emotions

Creating problem situation is one of the basic links of inquiry teaching ^[6]. An excellent classroom should start with the situation and create a situation to mobilize students' enthusiasm, stimulate students' interest and enthusiasm in learning, and arouse students' desire for inquiry. In order to carry out inquiry teaching activities. The teacher plays the video of the colorful leaves of nature. by looking at the pictures and connecting with the reality of life, it is not difficult to ask why the leaves have different colors, following the students' way of thinking. The teacher guides: the reason for the colorful leaves of natural plants is the difference in pigment content in the leaves. Do you want to know which kind of pigment plays a role in the leaves of different colors? Today we are going to learn about the extraction and separation of pigments from green leaves to find out the answers we want.

2.3 Ask Questions and Encourage Inquiry

Teachers should first encourage students to raise questions through independent thinking according to their own knowledge reserves and life experience, summarize and sort out the general framework of questions, and make further repairs to form mature inquiry problems, so as to cultivate students' cooperative learning and scientific inquiry thinking. The final inquiry questions are summarized as follows:

(1) The effect of silicon dioxide on the experimental results?

- (2) The effect of calcium carbonate on the experimental results?
- (3) The effect of different extracts on the experimental results?
- (4) The influence of different experimental materials on the experimental results?
- (5) The effect of different chromatographic solutions on the experimental results?
- (6) The influence of different line drawing methods on the experimental results?

2.4 Work in Groups to Find Answers

The team members completed the formulation of the experimental scheme by collecting relevant data, carrying out discussions, and complementing each other's advantages. In this process, if the difficulties encountered by the students cannot be solved by the cooperation within the group, they can consult the teacher or classmates, and then the teacher reviews the plan to ensure that the plan is feasible and optimal and agrees to carry out the inquiry experiment in the group. Before carrying out the experiment, the teacher should explain to the students that the key to the success of the experiment is the correct use of the control variable method, and further elaborate the experimental process and matters needing attention, so as to remind the students to observe the experimental phenomena carefully and record them in detail. The experimental process is shown in the following figure 1:

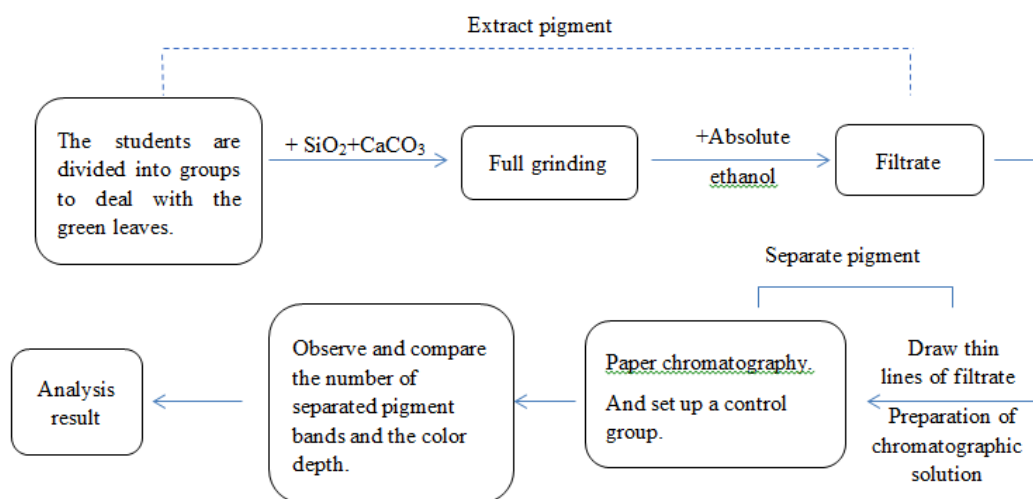


Fig.1 2.5. Sharing and Communication, Knowledge Internalization

At the end of the experiment, the representatives of the group shared the process and results of the experimental exploration of the group, the teachers and students commented on the report, and conducted the selection of the best group. This link is evaluated from three dimensions: experimental operation, experimental results and experimental analysis, so as to cultivate students' language expression ability, scientific and rigorous practical attitude and rigorous logical thinking, and make students deeply realize the truth that theory comes from practice. so that the students' core literacy of biology can be improved.

3. Prediction of Teaching Effect

Knowledge: through this experiment, students initially mastered the principles, operation steps and matters needing attention of pigment extraction and separation in green leaves; four kinds of pigments were observed through the experimental phenomena. Filter paper strips distribute carotene, lutein, chlorophyll an and chlorophyll in turn from top to bottom. At the same time, through the depth and width of the strip color, it is not difficult to find the content of the four pigments in green leaves. In order to obtain ideal experimental results, there are four necessary principles that green leaves must be fresh, grinding must be sufficient, medicine must be appropriate, and filtrate fine lines must be fine and straight.

Ability: through the successful completion of this inquiry experiment, both students' hands-on

operation ability and thinking logic have been significantly improved; students can use what they have learned to explain that the colorful leaves in life are due to different kinds of pigments, and can verify the validity and authenticity of the hypothesis through simple extraction and separation experiments. Students have further mastered the method of control variables, and can set up a control group to design and implement the experiment by controlling irrelevant variables.

In the aspect of emotion, attitude and values: the cooperative inquiry teaching model further improves the students' practical ability, cultivates the students' ability of independent thinking and cooperative learning, realizes the joy of success, and improves the understanding of self-value. thus stimulate students' enthusiasm for learning biology; deeply realize the hard-won hardships of success, thus establish a scientific and realistic attitude of students.

4. Conclusion

To sum up, the high school biological inquiry experiment is carried out under the concept of students and teachers. By experiencing the whole process of pigment extraction and separation, students not only exercise their hands-on operation ability and independent thinking ability, but also improve their logical thinking and innovative spirit. Scientific inquiry can not only improve students' biological learning skills, but also effectively stimulate students' enthusiasm for biological learning, and enable students to improve their knowledge and ability in class. it also cultivates the sense of teamwork and independent innovation ability of senior high school students in biology class^[7, 8]. Due to the factors such as the heavy task of biology knowledge teaching in senior high school and the lack of teachers' ability^[9], carrying out inquiry teaching is facing severe challenges. How to give full play to inquiry teaching and the construction of high-quality teachers should be the direction of efforts in the future.

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