

Discussion on POE Teaching Strategies Applied to Science Concept Transformation Teaching

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Abstract: POE (Prediction, Observation, Explanation) teaching strategy can effectively realize the integration of teaching methods such as inspiration and inquiry in teaching activities through experiential learning, improve students' action and thinking quality, and help students form correct scientific concepts. The characteristics, application principles, processes and implementation paths of POE teaching strategies were discussed.

Keywords: POE teaching strategy, Scientific concepts.

1. Introduction

Since the Ministry of Education issued the 2017 edition of the curriculum standards, the concept of "literacy-based" teaching has penetrated into the hearts of every front-line teacher, and the "literacy-based" teaching concept requires the creation of situations in teaching to be authentic. In the development of teaching activities, teachers should reasonably control the teaching progress, adhere to the principle of taking students as the main body, help students change their identity and learning style, from "educated" to "learner", from "passive indoctrination" to "active learning", stimulate students' learning motivation, improve students' interest in science courses and cultivate students' core literacy. In such an educational background, teachers must actively find a way out, break the previous teaching limitations and teaching inertia thinking, actively explore and develop new methods, new strategies, as "research-oriented teachers" to face the challenges posed in the new curriculum reform, in this context POE teaching strategy has been valued in many disciplines of basic education, many scholars have carried out relevant theoretical discussions and practical explorations, the strategy to "prediction-observation-explanation" three links as the main body is more applied to teaching strategies in experimental courses.

The POE (Predict-Observe-Explain) teaching strategy was formally proposed by Gunstone and White. This strategy refers to teachers guiding students to make predictions based on problems, generate hypotheses, and conduct experiments to carefully observe the phenomenon, find inconsistencies with previous predictions, and then further think according to the evidence, correct the past incomplete and scientific cognition, and finally explain and express this in their own words to build a scientific cognitive model.

Scenario creation is required in the prediction session, and the situation creation should be based on the principle of life, so that students can make predictions based on existing knowledge, life knowledge and experience. In the observation session, students will work in small groups to build models, and observe the teaching model prepared by the teacher in advance or use multimedia dynamic display materials. In the explanation session, after the students have some answers to the questions in the prediction after observing activities, the teacher needs to guide the students to cooperate, communicate, discuss and explain the answers to the

questions and supporting reasons, and then the teachers evaluate, explain and summarize the students' answers from a scientific perspective. In the classroom led by the POE teaching strategy, it is no longer just a classroom for a few students, the strategy advocates paying attention to each student, guiding all students to devote themselves to classroom activities, and greatly highlighting the main position of students. In the orderly promotion of classroom teaching activities, students' enthusiasm for learning can be greatly improved and positive feedback can be obtained, knowledge can be internalized under the guidance of teachers, and the framework of their own knowledge can be corrected and improved, so that students' scientific thinking ability and innovation ability have also been developed. This is in line with the 2017 version of the course standard's requirement for teachers to "let students become the masters of the classroom", and the POE teaching strategy stands out among many teaching strategies [1,2].

2. Characteristics of POE Teaching Strategies

Through experiential learning, POE teaching strategy can effectively realize the integration of teaching methods such as inspiration and inquiry in teaching activities, and improve students' action and thinking quality. The POE (Predict-Observe-Explain) teaching strategy is an evolution of the DOE (demonstrate-observe-explain) teaching strategy proposed by Champagne, Klopfer and Anderson [3,4], but there are obvious differences between the two. POE teaching strategy is a teaching strategy based on educational theories such as constructivism, observational infiltration, and humanism.

The prediction part in the POE strategy provides a platform for the free expression of students' precognitive concepts, the experiment provides opportunities for students' cognitive conflicts, and the explanations provide conditions for realizing students' conceptual transformation [5]. Specifically, this strategy has the following characteristics.

(1) Give the experiment a stronger orientation, highlight the unique role value of the experiment, make the student experiment no longer blind, stimulate the subjective initiative of students, and have strong directionality.

(2) Emphasizing the inquiry-making nature of the classroom, the cognitive conflict caused by teachers can

effectively help students cultivate dialectical thinking and establish evidence awareness.

(3) Taking problem creation as the core, taking problem solving as the center of practical activities, compared with the single teaching method of teaching and demonstration, it highlights the application and scientific nature of knowledge.

(4) Suitable for formative or diagnostic assessment, helpful to understand students' confusion.

(5) Adhere to the student-oriented, learning is the process of students' independent construction and continuous improvement, students should exert their own initiative to discover and solve cognitive conflicts, the sense of experience is strengthened, students are attracted by the teaching content throughout the process, so that the degree of control and concentration of knowledge is higher.

(6) The transmission of information is pluralistic and two-way, which is reflected in the information transmission between teachers and students and the communication and sharing between students and students, giving students more opportunities for language expression, and students can be clearer about their thinking direction and clear their thinking in the process of recording and expression.

(7) There is no need for students to draw correct conclusions directly, allowing initial answers to be relatively rough, gradual, and follow the order of cognitive development.

3. Principles and Processes of POE Teaching Strategies

In order to better apply POE teaching strategies to teaching, the author discusses the principles and processes of applying POE teaching strategies to conceptual teaching based on teacher interviews and the characteristics of each link of POE teaching strategies, so as to provide reference for teaching practice.

3.1. Principles of POE teaching strategies

(1) The principle of authenticity

In the prediction process, the situation created by the teacher and the material provided should be based on the student's original cognitive level or familiar to the student, that is, the student can predict the knowledge concept according to his own cognitive level. Therefore, in the teaching process of this link, teachers should follow the principle of authenticity, make full use of examples in life and old knowledge to guide students to boldly say their predictions, let their attention focus on the classroom, and establish their own conceptual system on the basis of existing knowledge experience, so as to be more conducive to the development and implementation of subsequent teaching links.

(2) The principle of intuitiveness

Students have a keen interest in a wide variety of scientific phenomena, so in the observation link of POE teaching strategy, it is necessary to fully reflect the intuitiveness of teaching, not only to let students clearly see the observation object, but also to make the experiment have a stronger intuitiveness and more obvious phenomenon, so as to help students find scientific laws from observation. Through the comprehensive use of students' various senses and existing knowledge, with the help of a large number of emotional materials, students can fully perceive concepts. For example, through videos, experiments, specimens, models and other forms of intuitive materials, students can fully understand the

formation process of concepts.

(3) The principle of student-oriented

After students complete the prediction link and the observation session, the results of their prediction may be different from the results of observation, and cognitive conflicts occur, at this time, teachers can guide students to express their ideas, and organize group discussions, enter the interpretation link, the interpretation link is the key link to play the student's main position, therefore, in this link. Students should be encouraged to explain their ideas and correct students' wrong interpretations, guide students to form scientific explanations, and help students construct correct scientific concepts [6].

3.2. Processes of POE teaching strategies

The specific teaching process is shown in the figure: the first step is to create a situation. Based on the teaching content, teachers create teaching situations that are as close to real life as possible and in line with students' cognition. The second step is prediction and exploration. Students or teachers put forward questions according to the teaching situation, students predict a problem or a certain phenomenon, and record the predicted content in the activity worksheet After that, students start from experimental problems in small groups, carry out experimental design, remind students to follow the general principles of exploring experiments in the process of designing experiments, think about the independent variables, dependent variables and control variables of the experiment, carry out content design, and communicate with teachers and students to modify and improve the experimental plan. Step three, observe. Students carry out experiments, observe the experimental process, record experimental phenomena, and the more detailed the written record, the better. Step four, explain. Students judge whether the prediction and the observation result are caused, and if they are inconsistent, they are required to use evidence to form reasoning about the difference between the two to make a claim and explain it; The students concluded the experiment conclusions. The fifth step is to expand and improve. Teachers are appropriately promoted according to the content of the experiment.

4. The Implementation Path of POE Teaching Strategy

4.1. Fully recognize the student's cognitive level

"Pre-concept" is the existing experience accumulated in real life, in order to transform students' experience cognition into scientific concepts, teachers should be clear about the process of students' concept transformation in teaching activities, so as to help students realize the transformation of "pre-concept" to "scientific concept". In the prediction stage, teachers understand and grasp the pre-concepts exposed by students, so as to determine students' cognition of this part of knowledge and the difficulty of mastering knowledge [5]. Teachers should adjust the rhythm and sequence of classroom activities based on the actual situation of students.

4.2. Use real teaching situations in production and life

The emphasis in POE is that scientific understanding begins with a problem, so the center of the classroom should revolve around problem solving, but no problem can be

separated from a specific context. Many scientific problems are closely related to human daily life. Questions that originate from daily life are the most likely to stimulate students' enthusiasm for inquiry [7].

As the designer and guide of the classroom, teachers should pay attention to the integration of problem situations and real life, make the problem situation come to life, make it more conducive to students' understanding, inspire students to think and solve problems from different angles, and experience the practical value of scientific knowledge.

4.3. Enhance students' ability to obtain and process information

The new college entrance examination pays more attention to the examination of subject literacy and ability, and it is particularly important to cultivate students' ability to obtain and process information. POE-based teaching activities emphasize that students acquire information through practical experience, and guide them to use methods such as comparison, generalization and induction to process information. Teachers should grasp the core knowledge points to design practical activities and problems, and students will organize and summarize the information collected by each sense through multiple steps such as operation, observation, discussion, and recording, and process disordered information into orderly and useful information. Under the guidance of teachers, through repeated training, students' language expression will gradually be structured and organized. In this process, teachers should pay attention to avoid too much explanation, encourage students to express their ideas, and give students space to constantly think and improve [8].

5. Conclusion

POE teaching strategy highlights the main position of students, permeated with the concept of life-oriented, the teaching strategy can effectively explore students' original cognition, facilitate teachers to better discover the irrationality in students' pre-concept, students cause cognitive

conflicts through observation, and finally, help students achieve conceptual transformation through teacher-student dialogue. Taking "pre-scientific concept to scientific concept" as the internal teaching clue, in line with the law of students' cognitive development, and following the conceptual teaching principle from phenomenon to essence, it is helpful for students' in-depth understanding and transfer application of knowledge, and also helps to develop students' correct scientific concepts.

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