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Strategy Research on Biology Experiment Inquiry Teaching of Junior Middle School from the Perspective of Core Literacy

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ABSTRACT. *Based on core literacy, this research discusses the teaching reform of junior high school biology experiment, and believes that inquiry learning is of great significance in experiment courses. Through the analysis and research on the implementation process of inquiry teaching of junior high school biology experiment courses, this paper proposes specific reform measures in the contents, the teaching mode and evaluation of experiment courses.*

KEYWORDS: *Core literacy, Junior high school biology experiment, Inquiry teaching, Strategy research*

1. Introduction

The development of science and technology is closely related to the progress of human. The development of life sciences has penetrated and promoted many disciplines, which produces inestimable economic value and social benefits. The development of modern human society which is supported by resources is causing more and more problems, which even threatens the survival of human. Major problems, such as environmental degradation, excessive consumption of resources, food safety and infectious diseases, need to be resolved. The key to solving these problems lies in the cultivation of biology talents and the progress of biotechnology. Biology discipline has already started at the stage of basic education. Due to the imbalance of education and teaching resources in various regions, how to effectively carry out biology teaching, how to realize the teaching value of biology experiments and how to cultivate students' awareness of life sciences and discipline basic literacy in education are the problems that need to be solved urgently in junior high school biology education. From the perspective of core literacy, this paper conducts research on the inquiry teaching strategy of junior high school biology experiment.

2. Core literacy and biology discipline core literacy

Opinions on Comprehensively Deepening Course Reform and Implementing the Fundamental Task of Morality Education (2014, Ministry of Education) purposed that "the Ministry of Education will organize research and propose core literacy system for student development in each school stage and clarify the required character and key abilities that students should have to adapt to lifelong development and social development". Core literacy is the key ability and essential character that students should have to meet the needs of lifelong and social development. Through continuous learning and practice, students will gradually improve their individual comprehensive abilities, and finally achieve the national talent training strategic goal. The junior high school stage is the most important stage of youth development, and is the end of compulsory education. In this stage, the cultivation of students' core literacy is particularly important.

The Ministry of Education has formulated the quality standards for various disciplines, and clarified the requirements for the degree that students should complete in different stages and disciplines. Based on discipline knowledge and skills, discipline core literacy is a comprehensive and inherent quality or ability which is formed after integrating factors, such as emotions and values. Core literacy level of students can be better demonstrated in the process of solving complex problems. Biology discipline has national uniform regulations during the compulsory education stage and is required to improve students' biology science literacy. Biology is a natural discipline based on experiments with both strong abstraction and strong reality[1]. The effective development of biology experiment discipline can consolidate students' theoretical knowledge and enhance their ability to analyze and solve problems.

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3. Research progress of inquiry teaching at home and abroad

Inquiry teaching is the process in which teachers guide students to explore the generation and development of knowledge in teaching activities. Through inquiry learning, students can master inquiry thinking methods and form correct and reasonable cognitive qualities. At present, inquiry teaching has been widely used in the teaching process of the United States, Britain, France, Japan and China.

At the beginning of the last century, the American educator Bruner mentioned "discovery learning" in his book *The Educational Process*. Discovery learning can promote the development of students' inquiry thinking, which is an earlier manifestation of inquiry teaching. American educator Dewey also mentioned in the teaching process: learning and teaching should focus on cultivating students' inquiry ability and inquiry habits. In inquiry teaching, the "problem solving method" he proposed is a commonly used teaching method. In addition, some foreign scholars believe that through the guidance of teachers in the teaching process, students will have correct ideas. The Dutch mathematician Freudenthal proposed that there should be “re-creation” in the teaching process, that is, in the teaching process, teachers should guide students to create and discover the content that is about to be learned, instead of only transferring knowledge during the teaching process.

The development of inquiry teaching started late in our country, but the development process is rapid. *Nine-year Compulsory Education Full-time Primary School and Junior Middle School Teaching Plan* (1992, National Education Commission) proposed that activities should be added to daily teaching courses, so that students can participate in teaching, and experience the joy of creation through observation and operation in the activities. Subsequently, the Ministry of Education put forward the inquiry teaching activity in 2000, which advocates rediscovery and re-creation through students' thinking, putting forward, analyzing and solving problems. Since then, the inquiry teaching model has been continuously advocated. Chinese scholar Gu Lingyuan believes that inquiry teaching activity has a positive effect on students' learning initiative. He divided teaching into three levels, namely memory level, explanatory understanding level and inquiry understanding level. Among them, inquiry understanding level means that teachers trigger students' cognitive initiative about new problems, increase students' enthusiasm, promote students' active participation to put forward problems and conduct joint research.

4. Thoughts on inquiry teaching of junior high school biology experiment

The junior high school biology experiment course standard points out that “biology science is not only a lot of facts and theories, but also a process of continuous inquiry.” If students have the opportunity to conduct inquiry learning in biology courses, they can actively acquire biology knowledge and understand the methods of scientific research. The development of inquiry teaching is inseparable from the support of conditions. The current problems are mainly reflected in the following points:

First, inquiry experimental teaching is inseparable from the support of laboratory equipment, consumables and other material conditions. Due to regional economic differences, the gap in school hardware facilities is large, and the importance of various schools to biology discipline is different. As a result, biology experiment hardware facilities of junior high school are not balanced currently, and there is still a certain gap between laboratory construction and the development of inquiry experimental teaching.

Second, after the promulgation of the new course standards, the flexibility of the course has increased. Schools and teachers have greater autonomy in the selection of course contents and the allocation of class hours. However, inquiry experiment requires a longer class hour and pays more attention to the learning process, which may occupy the class hours of basic theoretical knowledge. Therefore, schools and teachers are required to systematically deal with course contents and class hours.

Third, influenced by traditional teaching models, junior high school biology discipline tend to emphasize theory rather than experiment. In the teaching of experiment courses, the teacher explain experiments while students have few opportunities for hands-on practice. The leading role of the teacher is not organically combined with the dominant position of students.

5. Strategy research of the junior high school biology experiment

5.1 Implement biology experiment course and teaching reform

Biology science is one of the fastest-growing sciences in natural sciences. The training of biology science

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talents should be carried out smoothly from junior high school. Under the influence of traditional teaching habits, junior high school biology teaching pays more attention to knowledge without skills. The selection and arrangement of the traditional biology course contents is not adapted to the development of the times to a certain extent. The teaching methods are relatively fixed without new ideas, which results in being lack of the attentions to students' emotional experience and values. The biology experiment course and teaching reform enable students to conduct inquiry learning in experiments, cultivate their interests in biology, so as to let their interest in learning continue. The biology experiment course and teaching reform enable students master scientific research methods and improve students' scientific inquiry and innovation abilities, which is of great benefit to the cultivation of biology science talents.

5.2 Design reasonable inquiry experimental teaching programs

Experiment is a process of inquiry and an important way to train students' core literacy. Therefore, experimental teaching should guide students to question independently. In the inquiry of autonomous experiments, students' ability to acquire experimental knowledge will be continuously improved, thereby their biology learning efficiency will be improved. In biology teaching, the practical research of inquiry learning is carried out by designing reasonable experimental teaching programs, and the influence of these programs on students' comprehensive ability of inquiry and innovation is tested through teaching practice. Middle school biology teachers can carry out appropriate biology inquiry experiments based on local reality and the content of biology textbooks, which plays an important role in cultivating and improving the comprehensive quality of students. The flexibility of the course standards determines the openness of the teaching contents, which also leads to many changes in teaching and learning. For biology courses, teachers guide students to actively participate in inquiry experiments. Students have more opportunities for exploration and discovery, so they can construct their own knowledge system. This process is full of the transformation of teaching concepts, reflecting the all-round changes in courses, teaching and learning. It can be seen that it is very important for teachers to design reasonable inquiry experimental teaching programs.

5.3 Actively explore and adopt new teaching models

Teaching strategy has practical guiding significance for teaching practice. Inquiry experimental teaching also requires corresponding teaching strategies. In other words, a targeted teaching model should be established. This innovation in teaching practice is a breakthrough in the traditional biology experimental teaching process, and it is a new problem-oriented model. In this process, the guiding position of teachers and the dominant position of students have been strengthened and clarified. Students conduct experimental exploration under the guidance of teachers. They first find the problem, take the problem as the guide, design the experiment to explore under the guidance of teachers, and finally draw a conclusion. In the experiment, the situation and exploration process created by teachers can greatly arouse students' enthusiasm for learning, and give full play to their autonomy and initiative in learning. The teaching model of inquiry experiment fits well with the learning theory of constructivism. Student learning is a process of autonomous knowledge construction under the guidance of teachers. Biology experimental teaching is full of unknown problems, which are the key for students to explore and accumulate knowledge.

5.4 The development of inquiry experimental teaching needs scientific and effective guidance of teachers

"Experiment" is a series of operations or activities used to test a theory or confirm a hypothesis. Inquiry experimental teaching strives to change the way students learn and help students understand the nature of science. The cultivation of scientific inquiry ability requires frequent and repeated training in the teaching activities, which requires students to get direct experience by designing and implementing experiments in order to cultivate students' science inquiry spirits. The accumulation of these knowledge and experience also requires teachers' careful design and reasonable arrangements in teaching process. Teachers should guide students scientifically and effectively, cultivate students' experimental hands-on ability, so as to improve the effectiveness of biology experimental teaching.

5.5 Construct a teaching evaluation system which is compatible with course reform

The classroom teaching evaluation system plays an important guiding role in classroom teaching behavior. The perfection of the classroom teaching evaluation system has a profound impact on course reform[2]. The

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construction of the inquiry teaching evaluation system of junior high school biology experiment should be based on the teaching objectives. A combination of qualitative and quantitative evaluation methods should be used to establish a scientific evaluation index system. In the implementation process of evaluation, pay attention to dynamic developmental evaluation. Scientific evaluation methods should be used to judge the degree of achievement of teaching goals, so as to provide a basis for course reform to promote the improvement of students' core literacy and discipline quality.

6. Conclusions and suggestions

6.1 Conclusions

Unswervingly carry out course reform, unremittingly carry out inquiry teaching and cultivate students' inquiry ability. On the basis of strengthening basic knowledge learning, training students' core literacy and inquiry ability is an inevitable trend in biology course of junior high school. "Inquiry learning" has become a hot spot of international education reform. Traditional knowledge learning methods can no longer meet the needs of talent training in modern society. The goal of education increasingly became to cultivate students' knowledge inquiry ability. The core literacy of biology course is to cultivate students' concept of life, scientific thinking, scientific inquiry and social responsibility. Therefore, biology experiment courses should carry out active exploration and teaching reform to cultivate students' inquiry learning ability.

6.2 Suggestions

The implementation of inquiry teaching of biology experiment courses enable more students to carry out inquiry learning through experiment courses; focus on the educating function in biology experiment process; cultivate students' interests in scientific research and enhance their biology science literacy, in order to lay the foundation for the cultivation of high-level talents.

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