

Exploration of interdisciplinary teaching models for junior high school biology based on the cultivation of innovative thinking

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Abstract. This paper aims to explore the interdisciplinary teaching model for junior high school biology, with the cultivation of innovative thinking as the core content. Through in-depth research on junior high school biology courses and combined with interdisciplinary teaching theories, an interdisciplinary teaching model for junior high school biology based on the cultivation of innovative thinking is proposed. This model mainly includes three aspects: first, integrating junior high school biology with other disciplines, broadening students' knowledge horizons and enhancing their comprehensive quality through interdisciplinary teaching methods; second, focusing on cultivating students' innovative thinking abilities, stimulating their creative thinking and problem-solving skills through various innovative practical activities; third, emphasizing students' individual differences and adopting personalized teaching strategies to meet the learning needs of different students. Through the implementation and evaluation of this model, it is found that the model can effectively promote the cultivation of students' innovative thinking, improve their comprehensive quality, and has a good application prospect.

Keywords: junior high school biology, interdisciplinary teaching model, cultivation of innovative thinking, personalized teaching strategies

1. Research background

At present, junior high school biology teaching generally has problems such as the disconnection between theory and practice and the lack of interdisciplinary integration, which restrict the cultivation and development of students' innovative thinking [1].

The interdisciplinary teaching model, with its unique advantages, provides new ideas for solving the above problems. However, how to construct a teaching model that can not only reflect the characteristics of biology but also promote interdisciplinary integration is still an urgent problem to be solved in the field of biology education. The use of modern information technology can better realize resource sharing, teaching interaction and personalized learning, creating a broader space for the cultivation of innovative thinking [2].

In view of this, this study aims to conduct an in-depth exploration of the interdisciplinary teaching model for junior high school biology based on the cultivation of innovative thinking, so as to provide theoretical basis and practical guidance for the reform of junior high school biology education, further promote the development of biology education, and cultivate innovative talents who meet the needs of future society.

2. Research significance

By introducing the cultivation of innovative thinking, this study can stimulate students' learning interest, promote the development of their critical thinking and problem-solving abilities, so as to better adapt to the challenges of future society. In the modern education system, biology also needs to be combined with other disciplines such as mathematics, chemistry and information technology to form interdisciplinary teaching content. Through the interdisciplinary teaching model, students can not only gain the breadth of knowledge but also exercise and improve their innovative and practical abilities in practice. This study closely combines theory with practice, focusing not only on the design and implementation of the teaching model but also on analyzing its effects and conducting in-depth discussions on existing problems. This research method can provide useful references for subsequent educational practices.

3. Research content and methods

The research content of this study includes two parts: theoretical analysis and practical exploration, specifically including the combining of biology education theories, the design of interdisciplinary education models, and the application of innovative thinking cultivation strategies.

The research methods mainly adopt literature analysis method, case study method and questionnaire survey method. First, through the literature analysis method, systematically review and summarize the relevant theories of biology education, interdisciplinary education and innovative thinking cultivation, laying a solid theoretical foundation for subsequent empirical research. Then, using the case study method, select typical junior high school biology teaching cases for in-depth analysis, explore the existing problems and deficiencies, so as to design an interdisciplinary teaching model suitable for junior high school biology teaching. Finally, collect feedback from teachers, students and parents through the questionnaire survey method to evaluate the effectiveness and feasibility of the teaching model.

Through the implementation of the above research content and methods, this study expects to provide a new teaching model for junior high school biology education, promote the all-round development of students, especially achieve remarkable results in the cultivation of innovative thinking abilities.

4. Research objects and tools

This study aims to explore the interdisciplinary teaching model for junior high school biology and how to cultivate students' innovative thinking through this model. The research objects are students from a public junior high school in a certain region, covering the second to third grades of the school (a total of 40 students). These students have completed the basic biology knowledge learning and have a strong interest in biology.

The research tools mainly include four aspects: questionnaire survey, interview, classroom observation and learning outcome analysis. First, a self-designed questionnaire is used to investigate students' interest in biology, self-evaluation of innovative thinking abilities, and acceptance of the interdisciplinary teaching model. Second, through semi-structured interviews, collect the views and suggestions of students, teachers and parents on the interdisciplinary teaching model. In addition, classroom observation is an important part of this study. By systematically observing the classrooms where the interdisciplinary teaching model is implemented, record the design and implementation process of teaching activities as well as students' participation. Finally, analyze students' learning outcomes, including but not limited to test scores, project assignments and classroom performance, to evaluate the impact of the interdisciplinary teaching model on students' innovative thinking abilities.

In terms of research methods, this study adopts a mixed-method research strategy, combining quantitative and qualitative research methods. Quantitative data are collected through questionnaire surveys for statistical analysis; qualitative data are obtained through interviews and classroom observations to deeply understand the real thoughts and feelings of students, teachers and parents. This mixed-method research strategy helps to comprehensively understand and analyze the application effect of the interdisciplinary teaching model in junior high school biology education from multiple perspectives [3].

5. Research results and analysis

5.1. Research results

Through comparative experiments and questionnaire surveys, this study has obtained a series of valuable findings.

During the experimental phase, the junior high school students participating in the study were divided into two groups: the experimental group adopted the biology interdisciplinary teaching model based on the cultivation of innovative thinking, while the control group used traditional biology teaching methods. By conducting cognitive ability tests, innovative thinking level evaluations and assessments of biology knowledge mastery on the two groups of students before and after the experiment, we observed significant differences.

The experimental results show that the experimental group students have significantly improved in interdisciplinary knowledge application, problem-solving abilities and innovative thinking. In addition, through carrying out diversified interdisciplinary project activities, the experimental group students also showed better abilities in autonomous learning, teamwork and critical thinking.

In the questionnaire survey conducted on the two groups of students, most experimental group students reported that their interest in biology content has increased, which can better stimulate students' learning motivation and innovative potential compared with traditional teaching.

In addition, teachers' feedback on the interdisciplinary teaching model indicates that implementing interdisciplinary teaching requires more time and energy input, but in the long run, it can promote the all-round development of students' abilities, especially in innovative thinking and interdisciplinary abilities.

Finally, from the perspective of parents, they generally believe that the interdisciplinary teaching model can help children better understand complex concepts and better apply the learned knowledge in daily life.

In summary, this study confirms that the interdisciplinary teaching model for junior high school biology based on the cultivation of innovative thinking can effectively improve students' innovative thinking abilities and interdisciplinary application abilities.

5.2. Analysis and discussion

In this study, we explored the impact of the interdisciplinary teaching model for junior high school biology on cultivating students' innovative thinking. By comparing the learning effects of the experimental group and the control group, we found that the interdisciplinary teaching model can significantly improve students' mastery of biology knowledge and innovative thinking abilities [4].

The experimental results show that students adopting the interdisciplinary teaching model have significantly improved their academic performance in biology. In addition, interdisciplinary teaching not only enhances students' understanding of biology knowledge but also promotes their ability to use multi-disciplinary knowledge in solving problems [5].

It is worth noting that the interdisciplinary teaching model also has a positive impact on students' critical thinking abilities. During the project implementation process, students need to evaluate the advantages and disadvantages of different solutions and select the most appropriate method to achieve the goals. This process requires students to use logical reasoning and critical thinking, thereby improving their thinking abilities.

In addition, in the projects, students are encouraged to work together with peers. This interaction not only deepens their understanding of subject content but also cultivates teamwork and communication skills.

6. Research conclusion

Through in-depth exploration of the interdisciplinary teaching model for junior high school biology, this study aims to construct a teaching framework that can effectively promote the cultivation of innovative thinking. After a series of empirical studies and data analysis, this paper draws the following conclusions:

The interdisciplinary teaching model for junior high school biology based on the cultivation of innovative thinking can not only improve teaching effects but also promote the development of students' innovative abilities. To better implement this teaching model, it is necessary to optimize and improve from multiple aspects such as teaching content, teaching methods, teacher training and evaluation mechanisms. Future research can further explore how to establish closer connections between different disciplines and how to adjust teaching strategies according to students' personalized needs to achieve more effective interdisciplinary teaching [6].

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