

Exploration of Experimental Teaching Reform in Colleges and Universities and Measures to Cultivate Students' Innovative Ability

Zemin He, Yuzhen Zhao*, Yongming Zhang, Huimin Zhang, Cheng Ma, Haiyang Wang, Zhun Guo, Jianjing Gao,

Yang Zhao

Xi'an Key Laboratory of Advanced Photo-electronics Materials and Energy Conversion Device, School of Sciences, Xijing University, Xi'an 710123, Shaanxi, China . E-mail: zyz19870226@163.com

Abstract: Carrying out the reform of experimental education in colleges and universities is conducive to cultivating students' innovative ability and creative ability. In this process, colleges and universities need to timely update the original old and backward educational ideas, integrate new forms of teaching management, and set reasonable teaching objectives, so to optimize the existing experimental teaching courses. In this process, teachers need to take students as the core of teaching in an all-round way and cultivate students' innovative consciousness and creative ability in the form of teaching guidance. This paper briefly analyzes and discusses the reform of experimental teaching in colleges and universities and the measures to cultivate students' innovative ability.

Keywords: Experimental Teaching in Colleges and Universities; Reform Exploration; Innovation Ability; Measures

1. Introduction

In today's higher education work, there are relatively many contents involved in carrying out experimental teaching guidance for students. Teachers need to effectively innovate the existing teaching strategies, teaching methods and contents, cultivate students' autonomous learning ability, and take differentiated teaching guidance for students to further improve the quality and efficiency of relevant teaching work.

2. Renew educational ideas

Any scientific theory needs to be verified by corresponding scientific experiments. At the same time, scientific experiments are also the source of scientific innovation and an important link of practical verification in the process of scientific and technological development at this stage. In the experimental teaching work in colleges and universities, we also need to innovate and create the existing experimental teaching forms in an all-round way, so as to cultivate more directional professionals for the scientific research activities of the society and the country. In the work of higher education in developed countries, special attention is paid to the integration of experimental teaching into corresponding scientific research activities, and the corresponding scientific research achievements are effectively transformed, so that the relevant experimental teaching work has both depth and breadth.

However, in the work of higher education in China, we usually only pay attention to the explanation of relevant knowledge and theory, and ignore the corresponding experimental education. Most teachers are unwilling to carry out

Copyright © 2021 Zemin He et al.

doi:10.18686/ahc.v5i8.3857

This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

experimental teaching guidance to students during teaching work, and students generally do not have corresponding interest in experimental learning. However, experimental teaching has the characteristics of intuition, image, vividness and interest, which can help students better understand and master relevant knowledge and skills, and further stimulate students' desire for exploration and knowledge of relevant knowledge and theoretical learning. Experimental education is one of the important forms of cultivating students' good scientific habits. It can further cultivate students' innovation ability and creativity. At the same time, during the corresponding experimental teaching work, it can also enrich students' perceptual cognition, further find the key and difficult points of problems, and cultivate students' exploration spirit and observation ability, in order to help students form good study habits. Therefore, higher education at this stage needs to pay all-round attention to the development of relevant experimental teaching courses to promote students to achieve more long-term and stable development.

3. Changing the traditional educational concept

In the traditional experimental teaching, teachers are usually the core of related work, focusing on teachers' teaching explanation in the process of practical teaching, rather than around students' "learning" in the process of practical learning. Although students participate in experimental learning activities, they are completely in a state of passive acceptance of teachers' knowledge indoctrination. Students do not have subjective learning initiative in this process. Secondly, the corresponding teaching model cannot cultivate students' innovative ability and innovative thinking.

Students explore the essential meaning of experiment and the internal nature of relevant knowledge theory through teachers' teaching guidance. Secondly, in the corresponding experimental teaching work, teachers need to let students actively explore learning and help them build their own systematic knowledge structure. In experimental teaching, teachers also need to help students analyze and collect relevant problems and integrate and utilize relevant materials, help students boldly make conjectures and assumptions on various experimental problems, and verify and discuss the corresponding problems in combination with their own understanding and understanding, so that students can effectively connect the knowledge theory they have learned with the existing practical teaching. In addition, in experimental teaching, teachers should also encourage students to carry out extensive communication and cooperation and cultivate students' basic sense of teamwork. Generally speaking, during the current practical teaching work, teachers should closely focus on students' autonomous learning and innovation, rather than around teachers' knowledge explanation and theoretical propaganda, to adopt the strategy of cramming students.

4. Adjusting the experimental teaching objectives and optimizing the existing experimental teaching

4.1 Curriculum system

In the existing experimental teaching work, teachers and schools need to effectively set up the existing experimental curriculum system, combined with the corresponding subject setting framework, and take students' actual operation as the main line of teaching work, in order to integrate the existing experimental teaching resources, help students analyze the experiment and control the experimental content, and reasonably arrange the experimental teaching content to build a basic thinking and cognitive system for students.

4.2 Teaching content

The corresponding teaching content needs to help students realize the experimental verification learning of relevant basic theoretical knowledge. At the same time, for students at different levels, the corresponding differences should be provided when setting the corresponding experimental teaching content, so as to realize the personalized teaching guidance for each student.

4.3 Teaching methods

At the level of corresponding teaching methods, we should combine with corresponding micro experimental courses and multimedia demonstration electronic courseware, adopt the teaching strategy of elective + compulsory courses, and enrich the existing experimental teaching course knowledge system, so as to attract students to independently participate in the teaching and scientific research activities of the laboratory, and cultivate students' innovation ability and creativity. Secondly, the school's laboratory should also adhere to the thinking of open management. The corresponding laboratory should not only complete the content set by the teaching work, but should realize the experimental exploration of relevant knowledge points in combination with the extensibility of relevant courses and the specific needs of teachers' scientific research project decomposition.

In addition, in the corresponding experimental teaching work, teachers should also pay attention to the ideological content of relevant courses in an all-round way, and help students understand the evolution process of relevant knowledge theory through corresponding educational guidance. Combined with scientific teaching strategies, we can ensure that relevant knowledge points can be verified in the process of experimental teaching. Secondly, in the process of experimental teaching, teachers should also explain the cutting-edge knowledge theory of the times to stimulate students' desire for exploration. In the process of experiment, teachers also need to focus on cultivating students' learning interest and learning attitude.

5. Improving and enriching the existing experimental teaching methods and strategies

Experimental teaching is mainly to realize students' effective mastery and rational use of relevant knowledge and theories. In this process, students need to have basic experimental thinking and scientific thinking, be able to reasonably explore problems, and effectively combine theoretical knowledge, so as to finally solve problems. In this link, teachers should actively encourage students to explore, so that students can have a basic sense of innovation.

And good teaching strategies and teaching methods can get twice the result with half the effort. Students need to draw more knowledge content through the existing knowledge theory and corresponding skills in the process of experimental learning, so that students can form a systematic knowledge structure in the process of experimental learning.

Therefore, in order to ensure the above teaching guidance to students, teachers also need to change the original old and backward teaching methods and teaching strategies in the process of experimental teaching, take students as the center of experimental course teaching in an all-round way, and abandon the traditional imitation experimental teaching form. During this period, students should have broad ideas, be able to systematically study relevant knowledge points, and explore the existing experimental teaching contents according to the teachers' guidance and the reference suggestions of the experimental instruction, in order to introduce more innovative elements, and adopt different learning strategies according to different experimental course contents. At the same time, teachers also need to adopt the teaching management method of teaching students according to their aptitude in the process of implementing the experimental education for students.

For example, students often don't know how to start when doing experimental learning. Therefore, in this process, teachers should carefully explain the common fault problems in the process of experimental learning and relevant troubleshooting strategies for students, so as to cultivate students' rigorous thinking. At the same time, students should also be required to carry out corresponding experimental operations in strict accordance with the operation instructions to reduce the experimental risk. And in the corresponding experimental design stage, teachers need to throw out corresponding questions, guide students to complete the corresponding experimental design, and encourage students to discuss each other in the design process, to make bold assumptions and reasoning about the possible problems in the experiment, so as to ensure that students enter the corresponding theme with problems in the practical learning link. In this series of processes, teachers need to play an effective teaching guidance to students and improve students' comprehensive application ability of relevant knowledge and theories.

6. Conclusion

In general, in the corresponding experimental teaching content, we should further broaden their professional caliber, help students form their own knowledge system in the process of practical learning, and enable students to carry out directional analysis on the key and difficult points of relevant knowledge, as well as enhance the comprehensive attribute of experimental teaching. Specifically, at the level of existing experimental teaching ideas, we should first start from the basic experimental work to help students understand the basic knowledge principles, and then combined with comprehensive experimental teaching to help students realize the expanded learning of relevant knowledge theories.

References

1. Miao C, Zhao E. Physical chemistry experiment teaching reform based on the cultivation of innovative ability. *Shandong Chemical Industry* 2019; (14): 208-209.
2. Li J, Jiang G, Yin B. How to improve students' innovation ability and engineering practice ability-reform and exploration of practical teaching of Mechanical Design. *Econmist* 2021; (2013-7): 234-235.