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Exploration of Scientific Research Mentorship on the Cultivation of Undergraduate Students Innovation Ability

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Abstract In order to improve the quality of undergraduate training and cultivate students' innovation ability, more and more colleges and universities are implementing the research mentorship system among undergraduates. The study summarizes the main role of mentorship on the cultivation of innovation ability, analyzes the problems in the implementation of mentorship, and proposes corresponding solutions.

Key words Scientific research mentorship, Undergraduate students, Innovation ability

1 Introduction

With the rapid development of the national economy, the social requirements for talents show a rising trend. How to improve the quality of undergraduate talent training has become the focus of public attention. In recent years, China has attached great importance to the reform of undergraduate teaching and talent training methods. *The Outline of the National Medium- and Long-Term Educational Reform and Development Plan (2010–2020)* points out that "firmly establish the central position of talent cultivation in the work of colleges and universities, and strive to cultivate high-quality specialists and top-notch innovators with persistent beliefs, good morals, rich knowledge, and excellent skills." It can be seen that the cultivation of top-notch innovative talents has become an important strategic task of China's education work. In 2012, promulgated a number of opinions on comprehensively improving the quality of higher education clearly put forward the "innovation of talent cultivation mode", and in 2015, the CPC Central Committee issued the Opinions on the Deepening of the Reform of the Mechanism of Talent Development also clearly put forward "the opinions on the deepening of the reform of talent development mechanism". In 2015, the CPC Central Committee issued the Opinions on Deepening the Reform of Talent Development Mechanism, which also explicitly proposed "focusing on the cultivation of talent's innovative consciousness and ability, exploring the establishment of innovation and entrepreneurship-oriented talent cultivation mechanism, and perfecting the synergistic cultivation model combining industry, academia, research and application". In order to improve the quality of undergraduate talent cultivation, especially the cultivation of top-notch innovative talents, it is necessary for colleges and universities to continuously innovate talent

cultivation mode and actively explore talent cultivation system and education and teaching system.

Undergraduate tutoring system originated in Britain, and its development can be divided into four stages. The first stage is the formation stage of the mentorship system. At first, it was because Oxford University recruited a part of underage students who were difficult to manage their own lives independently. For this reason, Oxford University began to employ specialized tutors to supervise and manage students' lives. The second stage is during the Reformation in medieval England, tutors not only manage the students' life, but also manage the students' studies, tutors' duties are becoming clearer. The third stage is the establishment of the modern undergraduate tutorial system. This stage is characterized by the combination of mentorship and credit system. Mentors may also guide students' scientific research in addition to their academics and life. The fourth stage is the development stage of mentorship. This stage of the tutorial system shows more flexibility and diversity, and plays a very important role in the cultivation of talents for the Oxford University, which is called the "crown jewel" of the Oxford University^[1]. This model of education and teaching according to the talent, focusing on the cultivation of talent innovation ability has received more and more attention.

In 2002, Peking University, Zhejiang University and other universities began to implement undergraduate tutoring system. After that, more and more colleges and universities in China applied the mentorship system to undergraduate education^[2]. China's undergraduate mentorship system can be divided into four types: the whole mentorship system throughout the four years of college, mentors from the ideological, life, academics and other aspects of the overall guidance of students; senior mentorship, mainly to guide senior undergraduates to carry out research projects; excellence mentorship, mentorship for some of the best students; junior mentorship, for supporting the credit system, mentors to guide the junior students to make courses and professional selection^[3]. Based on these different mentorship models, different mentor functions can be summarized. Some mentors are responsible for helping students with course selection, some mentors are responsible for guiding students to conduct scientific re-

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search, some mentors are responsible for solving problems in students' study and work, and some schools require mentors to provide comprehensive guidance to undergraduates^[4]. Among them, scientific research mentorship is a kind of mentorship mode in which the mentor organizes and guides undergraduates to carry out graduation project research, participate in innovation and entrepreneurship projects, as well as the mentor's scientific research project as the main body, which plays a more significant role in exercising students' hands-on and scientific research ability, and improving the sense of innovation and comprehensive quality.

2 The role of research mentorship in enhancing students' creative ability

2.1 Mentors can play a better leading role in students' professional cognition

China's undergraduate education is mainly based on theoretical teaching, resulting in undergraduate students' insufficient knowledge of professional practice. Although the undergraduate group is active in thinking, there is a general deficiency in the breadth and depth of observation, and the occasional inspiration is unable to achieve innovation due to the lack of horizontal connection. Mentors have carried out teaching, research and extension work in related fields for many years, and have quite profound insights into the specialty. The mentor's leadership can help students integrate their professional studies and broaden their academic horizons, and can set an example for students, provide them with role models for professional work, and also provide valuable resources and insights for their graduate studies and employment.

2.2 Mentorship can improve students' scientific research ability and comprehensive quality

The vast majority of undergraduate students believe that scientific research and innovation require experimental equipment, sufficient funds and relevant technology to explore in depth, and they do not have the strength to engage in scientific research. As a result, undergraduates generally neither pay attention to the cultivation of scientific research and innovation ability, nor pay attention to academic innovation activities inside and outside the university. After the implementation of the tutorial system in colleges and universities, students can rely on their tutors' scientific research projects to conduct scientific research, which helps to expand their academic horizons and improve their innovative and practical abilities. On the basis of scientific research work, students can also write scientific papers under the guidance of scientific research tutors, and gradually improve their ability to write and submit papers. In addition to this, by participating in the research work of the mentor's project, undergraduates can realize the importance of teamwork, and exercise the communication ability with teachers and classmates and team writing ability in the process of carrying out scientific research activities^[5].

3 Problems and countermeasures of research mentorship

3.1 There is a large blindness in the mutual selection of teachers and students

There exists greater blindness in the selection and distribution of tutors. On the part of students, they

lack in-depth understanding of their mentors and their research direction, and can only blindly choose teachers with higher titles or more familiar teachers instead of choosing mentors according to their own strengths or development needs, thus appearing the phenomenon of students piling up to choose individual mentors. On the part of the mentors, many of them did not fully demonstrate their strengths, resulting in missing out on the most suitable students.

In order to accomplish the mutual selection of teachers and students better, universities should give sufficient time for consideration before undergraduates choose their tutors, and do a good job of sharing tutor information, such as establishing tutor resource files and updating tutor information on the official website of the university in a timely manner, so that students can know all aspects of each tutor's ideological and ethical cultivation, teaching level and ability, research direction and scientific research achievements, and other related information, so that students can select tutors more often according to their personal interests or future research. The students can choose their supervisors according to their personal interests or future research directions. Schools or colleges can also build an information platform to release information about tutors, so that students can check the information of tutors at any time and understand the situation of tutors, so that they can choose tutors suitable for themselves according to their own direction of development and interests, and do their best to satisfy the selection needs of students. In addition, in the double selection of teachers and students at the end, universities should also give the tutor the right to choose students, to confirm whether the tutor's field of research and the student's interest in the field of high degree of match, to avoid the phenomenon of miscommunication between teachers and students.

3.2 Insufficient teacher-student interaction

The key reason for the lack of student-teacher interaction is the lack of student initiative^[6]. Students with problems generally lack the enthusiasm and courage to take the initiative to contact their tutors, and sometimes there is no need to contact their tutors about their problems. The tutors often miss individual students due to a lot of daily affairs and too many students, which makes the understanding of the students insufficient and affects the realization of the function of "guidance" according to the students' abilities.

Closing the distance between teachers and students and establishing a cordial teacher-student relationship is an important way to solve the problem. First of all, tutors can enhance communication with students so that students will feel friendly and thus be more willing to increase contact with tutors. Secondly, tutors should do their best for students and deal with and answer all kinds of students' questions gently. Thus, the distance between teachers and students can be narrowed, and the purpose of harmonious relationship between teachers and students can be achieved. In addition, the mentor should take the initiative to guide the students, should not only wait for the students to ask questions to the mentor, should also develop the corresponding guidance planning, the students into the track of scientific research work.

3.3 Lack of reasonable evaluation system and incentives

With regard to the assessment and evaluation of tutors, a diversi-

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cords of experimental phenomena are complete, whether the formulas are applied properly, whether the calculations are correct, whether the analysis of data or interpretation of experimental phenomena is accurate, and whether the conclusions or suggestions are reasonable. Comprehensive scores of experimental courses involve pre-test, experimental operation and process, experimental report and ideological and political perception, accounting for 10%, 30%, 40% and 20%, respectively. And ideological and political perception can be comprehensively assessed by asking questions in class, summarizing ideological and political experience, and conducting questionnaire survey. Through the evaluation of students' experimental courses, teachers can reflect on the shortcomings in the teaching process, and make some improvements in the next round of teaching.

5 Conclusion

The course of Soil Science Experiment is an extension of the theoretical course of Soil Science. Practice promotes the understanding and absorption of theoretical knowledge, realizes the organic combination of theoretical knowledge and practical exploration, and lays a good foundation for students majoring in environmental and ecological engineering to engage in employment and research related to soil science and environmental science in the future. The ideological and political elements are integrated into laboratory safety training, self-study before class, experimental teaching implementation, evaluation and other teaching links in the course of Soil Science Experiment. Guided by the real cases in Pingdingshan area, students' interest in exploring and studying problems is stimulated, and practical problems are analyzed and

solved with a rigorous and scientific attitude. Students' sense of responsibility for caring for soil and protecting the environment and their sense of protecting the ecology are cultivated, so as to truly implement the concept of "educating students in the whole process and educating students in all directions" in the course of Soil Science Experiment.

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fied assessment and evaluation method should be adopted, which should not only look at the number of papers or awards of students, but also evaluate the effectiveness of tutors' work in terms of students' professionalism and moral values. A good mutual evaluation system between teachers and students should be established to promote the effective implementation and realization of the mentorship system through the evaluation leverage. As one of the main subjects of undergraduate tutoring system, it is necessary for students to evaluate the tutor's guidance work. Tutors can find out the deficiencies in the process of their own guidance through the evaluation of students, and the students' recognition of the tutor's work will greatly stimulate the enthusiasm of the tutor's guidance. Mentors should also be evaluated for the guidance of students, positive evaluation words can greatly stimulate students to participate in the initiative and enthusiasm of the guidance, mentor evaluation of the student's problems pointed out can also become an opportunity for students to actively seek guidance for teachers and students to create opportunities for interaction.

In terms of incentives for mentors, positive incentives can be taken. For example, to give tutors a certain amount of workload, the effectiveness of the tutor's work in guiding students and the evaluation of titles, job promotions linked to the tutor's outstanding effectiveness in guiding the tutor awarded an honorary title, and in the evaluation of recruitment and promotion as a bonus indicator, so as to fully mobilize their participation in the guidance

of the enthusiasm. From the students' point of view, for students who have won awards and achieved certain results by writing papers under the guidance of their tutors, corresponding honors, innovation credits and bonus rewards should be given in order to form a positive influence in the student group and improve the motivation of other students.

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