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REFORM OF TEACHING MECHANICAL DISCIPLINES AND EXPLORATION FOR TOP CREATIVE TALENTS IN HOHAI UNIVERSITY

To meet requirements of top creative talents in economic and social developments, we introduce the reform and exploration of the training model in the national key discipline Engineering Mechanics of Hohai University. The reform can be summarized into the following three categories. At first, interest-oriented, we select outstanding students who are interested in scientific research, and a dynamic selection mechanism for top creative students is proposed. Secondly, to meet the needs of the national strategy, we combine scientific research and teaching together to build a top-creative talent training program that orientates independent learning and innovative practice. Finally, by integrating the competition, creation, and training, a top-creative training platform is obtained. In this way, the students in the discipline of mechanics perform excellent performances in universities and society.

Key words: reform for talents nurturing, Hohai University, mechanics education, innovation, high-level professionals.

Introduction. The formation of top creative talents is one of the focus strategies for countries responding to the global competition. The creation of top students has a long history in China and abroad. The history of this process in China dates back to the 20th century. In the 1970s, a mature system of training and rewarding the best creative talent was established through broad national support, strong university response, and broad student participation. The search and identification of the best students with innovative potential can be called honorary education or elite education and it was more common in foreign countries. Countries such as the United Kingdom and the United States of America began to implement honors education in the 1920s and have made great strides in worldwide attention attraction. Honorary education in foreign countries was intended primarily for excellent students. For these students, special rules were provided regarding curricula, teaching models,

teaching staff, living conditions, scholarships, etc. Equipped with high quality resources, students had the opportunities for growing into outstanding creative talents.

The raising of innovative talents overseas has mainly manifested itself as an honorary education or elite education with a long developmental history and distinctive characteristics. Thanks to this education system, a large number of outstanding students were prepared, they made outstanding contributions to the political, economic and cultural development of their countries. After careful study, it was found that foreign prestigious education went through approximately three stages. The first stage occurs at the beginning of the 19th century. Universities and colleges in the United Kingdom and the United States have introduced an honorary degree system or established an honorary college to prepare outstanding students. For example, the University of Oxford in the United Kingdom reformed its degree linkage to determine whether a general honorary degree should be awarded based on the types of exams to pass as a criterion. The second stage took place at the end of the 1970s. Governments of various countries began to pay attention to the importance of training higher creative talents who carried out the education of elite students and capable children in the form of policies, regulations, laws and institutions. For example, in 1999, South Korea passed the "Ordinance to Promote Education for the Capable and Talented," which officially began to function in 2002. Over the next five years, 4 % of South Korean school-age children were educated as talented children. The final stage of elite education began at the beginning of the 21st century. To adapt to the fierce competition and modern development, governments and universities around the world adopted the revised laws and regulations or improved innovative curriculum. For example, in 2018 Russia issued an Education Development Plan for further refining of the model of education and training for talented students. Based on the results and achievements of each stage, it was verified that various measures, laws and regulations were adopted for these purposes.

It is known that the education is the foundation of all investigations and innovations. Nowadays, the formation of the top creative students has become one of the important missions of universities. The governments of China pay great attention to the innovation of high educational establishments. The significance of students' innovation ability to the development of the country has resulted in a series of policies and plans to promote the innovative talents forming, such as the launch of the "Graduate Education Innovation Program" in 2005, the "National Innovation Experiment Program for University Students" in 2007, the "Plan for Cultivating Top-notch Students of Basic Disciplines" in 2009. The "Excellent Engineer Education and Training Program" and six other types of talent training programs have been implemented since 2010. The "Six Excellence and One Top-notch" talent training program version 2.0 was launched in 2018, and the "Plan for Strengthening Basic Academic Disciplines" was officially launched in 2020. In response to the national education policy, some domestic colleges and universities carried out various forms of innovative talent training programs based on their school-running characteristics. They taught reform classes, base classes and experimental classes. At present days, honorary institutions or honorary colleges are gradually established to systematize the creation of top-notch innovative talents. In general, various innova-

tive talent training programs are progressing smoothly, and a large number of outstanding talents have been trained for the country and society. They are struggling to become the backbone of national construction in the new era in all fields of life.

With the support of governments, a lot of policies have been implemented in Hohai University for the top creative students training. The trained students are welcomed for higher education and society. In this paper, some of the applied methodologies are discussed.

Recent trends in the training program. With a focus on fostering innovation literacy and student potential, there was conducted a highly rewarding research and practice in the Engineering Mechanics discipline teaching. This practice showed some of the trends.

1 *The mechanism of students' selection that considers primary grades, practice screening, and interest optimization.* At a new step of practice and research for searching the top-notch innovation talents at Hohai University, there is adopted the results-based pre-selection criteria. In addition, the students are kept in the group in the learning process dynamically based on their results to ensure a focus on innovation, even if student's innovation fails. Also, there is important to make sure that this does not affect the graduation and promotion. Students develop an interest in innovation. Once the instructor discovers that students are enthusiastic and interested in a particular aspect, they will make specific recommendations or even conduct collaborative research to help students develop innovative literacy and potential through communication with teachers and friends. From our point of view the preliminary selection by characteristics, practical selection and selection by interests is one of the main directions of a first-class innovative mechanism development for training and selection of personnel at Hohai University.

2 *The personalized training program that combines innovation and independent learning.* With regard to the training program for first-class innovative talents, the experience of some European universities was adopted. They study basic knowledge from the first- and the second-year students in order to have a clear understanding of the basic knowledge. This is the same at Hohai University. The difference is that some European universities place special emphasis on the practice of three and four steps, requiring students to practice in research or production units, where they can find problems in practice. After returning to school, they place particular emphasis on self-study according to their needs in order to acquire their needs through practice. The procedure at our university is the similar. Each student joins a research group of faculty members according to their interests in junior and high school. Teachers create individualized learning plans for them and conduct innovative practices where students take courses in accordance with practical needs. A one-to-one study program that combines innovative practice and self-directed learning is the second focus of our university's first-class innovative talent training.

3 *Low-demand training platform that combines scientific research, learning and innovative practice.* Providing innovative opportunities for practice and leadership is a new dimension in developing a top-notch innovative learning platform for the talented students. The key to teaching talent is to provide students with opportunities and guidance for innovative practice. The appropriate training area should be a real work area,

not a training area. Such a learning platform has a function to enable students to explore scientific research and conduct innovative practice. Innovation inevitably sometimes leads to failure, and students should not pay too much attention to the results of innovation when they practice innovation through an innovation platform. The practice of our university has shown that undergraduates without requirements for an innovative result work much better than doctors of sciences. According to surveys, many doctoral students are afraid to graduate because of the requirements for research results, so they hesitate to choose difficult and interesting topics. Since students do not experience this external pressure and do not worry about the failure, it is easier for them to achieve innovative results without pressure. Therefore, we believe that creating a learning platform for students that combines research, teaching and innovative practice and does not require achievement or low achievement requirements is an emerging trend for nurturing top-notch innovative talent.

Results and discussions. In this section, personal results of the International Engineering Mechanics Contest [1, 2] for the students in Hohai University have been listed to show the advantages of our proposed training model (table 1).

Table 1 – **Personal results of 2014–2021**

X International Engineering Mechanics Contest (2014)	
I category	One Student
II category	One Student
III category	Two Students
XI International Engineering Mechanics Contest (2015)	
III category	Two Students
XII International Engineering Mechanics Contest (2016)	
I category	One Student
II category	One Student
III category	One Student
XIII International Engineering Mechanics Contest (2017)	
I category	One Student
II category	Two Students
III category	Two Students
XIV International Engineering Mechanics Contest (2018)	
I category	One Student
II category	Two Students
III category	Six Students
XV International Engineering Mechanics Contest (2019)	
III category	Two Students
XVI International Engineering Mechanics Contest (2020)	
II category	Seven Students
III category	One Student
XVII International Engineering Mechanics Contest (2021)	
I category	One Student
II category	Two Students
III category	Two Students

From 2014 we have attended 8 times of the International Engineering Mechanics and get 5 times of the first category. It is verified that the described training model for the talented students is successful in our university.

Conclusions. In this paper, the reform and exploration of the training model of the national key discipline Engineering Mechanics in Hohai University have been introduced. The difference of the training model of different countries has been thoroughly discussed. From the competition results of the International Engineering Mechanics Contest, we can see that the training model for the top creative students in Hohai University has great potential for other universities.

The implementation of the reform based on integrating competition, creativity and learning for students, allowed to create the groups of a high-level training. These students perform excellently during their study at the universities, in industry and society at future professional work.

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РЕФОРМА ПРЕПОДАВАНИЯ МЕХАНИЧЕСКИХ ДИСЦИПЛИН И ВЫЯВЛЕНИЕ ТВОРЧЕСКИХ ЛИЧНОСТЕЙ В УНИВЕРСИТЕТЕ ХОХАЙ

С целью воспитания творческих личностей для обеспечения экономического и социального развития в Университете Хохай внедряется реформа и исследование модели обучения ключевой национальной дисциплины «Инженерная механика». Суть реформы состоит в трех положениях. Во-первых, осуществляется отбор одаренных студентов, интересующихся научными исследованиями, и предложен механизм динамического выбора из них наиболее творческих. Во-вторых, в соответствии с потребностями национальной стратегии мы объединяем научные исследования и преподавание для построения программы обучения, которая ориентирует на самостоятельное обучение и инновационную практику. Наконец, на основе интеграции соревновательности, творчества и тренинга создана первоклассная обучающая платформа. Таким образом, студенты, изучающие механику, показывают отличные результаты как в университете, так и в общественной жизни.

Ключевые слова: реформа воспитания талантов, Университет Хохай, обучение механике, инновации, профессионалы высокого уровня.

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