

Promotion of Skills Competition on Construction of Teaching Staff in Higher Vocational Colleges

Shang Wang*, Zhixin Feng

School of Automotive Engineering, Beijing Polytechnic, Beijing 100176, Beijing, China

*Corresponding author. Email: wangshang@bpi.edu.cn

ABSTRACT

Skills competition is an important part of the vocational education system and plays an important guiding role in the reform of vocational education. Skills competition is not only an arena for students in vocational colleges, but also a stage for teachers to exercise and improve their abilities. This paper analyzes the problems existing in the construction of teaching staff in higher vocational colleges from the perspective of the preparation for skills competition. On this basis, it explains the role of promotion of skills competition on the construction of teaching staff. Various skills competitions are important means to test the achievements of vocational education teaching reform, education quality and school running level. Teachers in higher vocational colleges should actively participate in skills competitions and improve their abilities in the process of guiding students.

Keywords: Skills competition, Teaching staff, Higher vocational colleges, Vocational education.

1. INTRODUCTION

The overall improvement of teachers' team ability is much needed for the development of higher vocational education in China in the 21st century. Higher vocational education is an essential part in China's educational development, which helps China to realize massification of its higher education and promote its economic and social development. It develops tremendously since the 1990s and up to now it accounts for half of the country's age-appropriate population in higher education. The state to promote innovation and entrepreneurship education reform, higher vocational education level put forward higher requirements, higher vocational colleges should cultivate innovative talents as the goal, deepen the reform of education and teaching [1-4].

Higher vocational education should take it as the goal by the combination of industry, education and research, combination of work and study, cooperation of school and corporation, contrasting internship and other training model and concrete measures. This poses a challenge to the abilities of teachers engaged in vocational education. The construction of teaching staff is an important guarantee for the development of vocational education. Without a high-level professional team of teachers, vocational education cannot develop with high quality [5-9].

Technical skills competition is an important part of vocational education system and has an important impact on the high-quality development of higher vocational colleges. In recent decades, various technique and skills competitions have been highly valued by vocational colleges, and the number of participating teams and students has increased significantly. Taking the Henan Provincial Competition of the "Internet+" College Student Innovation and Entrepreneurship Competition as an example, up to 288,000 students from 98 vocational colleges signed up in 2021. Various technical skills competitions are not only the arena for students in vocational colleges, but also the stage for teachers to exercise and improve their abilities [10-13]. From the perspective of preparing for and participating in the skills competition, this paper systematically combs the problems existing in the construction of teaching staff in higher vocational colleges. On this basis, it explains the role of skills competition in promoting the construction of teaching staff from six dimensions.

2. PROBLEMS IN THE CONSTRUCTION OF TEACHING STAFF

Various skills competitions provide a competitive stage for students in vocational colleges. Unlike the traditional way of evaluating the quality of classroom teaching, skills competition is a competition between

schools, provinces, cities, and even countries, and is a test of students' skills and also a test for instructors. The in-depth analysis of the competition experience, especially the deep reflection on the weaknesses, can reflect some shortcomings in the faculty development more objectively.

2.1. Low motivation to participate in competition

The number of teachers participating in various skills competitions has increased significantly in recent years, but this figure is still low in terms of the number of participating teachers as a percentage of the total number of school staff. The research team finds that there are three main reasons why teachers are not motivated to participate: firstly, some young and inexperienced teachers are intimidated by the competition because they have little practical experience and are unfamiliar with the competition system, rules, and planning and arrangements for preparation, and the students they supervise are often eliminated directly from the school, which further increases the intimidation of these young teachers; secondly, experienced teachers do not have enough energy because they have several jobs, and most of the experienced teachers are already the backbone of the school, and in addition to teaching tasks and classroom teacher work, they also have to undertake teaching reform projects and research projects, so they do not have enough time and energy to prepare for the competition; thirdly, there is little correlation between the award of the competition and the evaluation of titles, for example, the title evaluation document of a school requires that the first prize of provincial and ministerial level competition can be listed as achievements. Take the "Challenge Cup" Student Innovation Competition as an example, it takes at least two years of preparation for teachers to guide students to get the first prize in the provincial and ministerial level competitions, and it requires a considerable amount of supporting funds. Compared with the publication of journal articles, teachers think that it is not cost-effective to accumulate performance through skills competitions.

2.2. A gap existing between the skill level and the requirements of competitions

As the competition system and competition rules continue to be developed and improved, the requirements for the participants in each event are getting higher and higher, so the skills of instructors must be at the forefront of the industry so that they can guide students to achieve better results. However, there are few technician-type teachers from the front line of enterprises in vocational colleges, and most professional teachers lack the background and experience of working in enterprises, and are not familiar with the actual production process, new processes, new technologies and new products in

enterprises. The teachers' professional skill level and practical teaching ability are not high, which makes it difficult to train high-quality participating students. Nowadays, skills competitions are held jointly and hand in hand by relevant educational institutions, enterprises and higher vocational institutions, so the contents of the competitions are more and more closely dovetailed with the industry and enterprise sites, but many teachers rarely pay attention to the new industry dynamics and new technologies, which leads to slow update of educational concepts, aging teaching contents, and ineffective connection with the actual positions in enterprises.

2.3. Outdated guidance methods

There is a huge difference between skills competition guidance and classroom guidance. However, many teachers are not aware of this, and their instruction methods are outdated and difficult to be matched with students. Take the "Internet+" College Student Innovation and Entrepreneurship Competition as an example, students need to design and produce their own work through what they have learned. Designing requires the students to use their brains and inspiration, and the teachers can only give guidance in the general direction, but the students need to do the main work independently. If there is a problem that the students cannot solve, the teachers should assist them as soon as possible. The students have to sacrifice a lot of extracurricular time for the whole process. Therefore, in addition to the guidance of the work, encouragement and motivation from the teachers are also the important guidance for the students. In addition to skill mastery, students should also be given psychological counselling for the operational skills competition. Some students' poor performance in the competition is not due to a lack of skills or knowledge, but rather to a lack of mental capacity or psychological quality. This situation reflects the limitations of teachers' teaching methods and training methods. These soft skills are not achievable with short-term training, but are to be developed throughout the teacher's instructional process. Many teachers only focus on the accumulation of students' knowledge but neglect the training of comprehensive quality, which leads to the elimination of students in the competition. The psychological shadow of being eliminated from the competition can sometimes affect students for a long time.

2.4. Weak collaborative capacity

Instructors for skills competition are usually not one person, but a team of several teachers. The collaborative capacity of the team of teachers directly affects the efficiency of the preparation for the competition. Some teachers have strong theoretical ability and are good at solving the questions raised by the students; some teachers have strong practical and testing skills, and are able to guide the students hand in hand; some teachers

have excellent overall planning and communication skills, and are able to keep the students together and enthusiastic at all times. If such three teachers can form a guidance team, the preparation process must be efficient and high quality. In reality, however, it is often the case that three teachers with a strong theoretical orientation form the guidance team, or the teachers are all practical-oriented. In this way, they do not complement each other in the preparation process, and there may even be different ideas in guidance.

3. PROMOTION EFFECTS OF SKILLS COMPETITION ON FACULTY DEVELOPMENT

Skills competition can be divided into two types by nature: one is the skill operation type, such as the National Industrial Robot Technology Application Skills competition; the other one is the innovation and invention type, such as the “Invention Cup” innovation and entrepreneurship competition for college students. Either type of competition demands a higher level of practical skills from teachers in vocational colleges. Some of the practice content is from the enterprise sites, which requires teachers to learn the expertise on site. Some of the innovations are closely related to new technologies and techniques, so the teachers have to study and research them in depth. The process of guiding students to participate in the competition is the process of improving and exercising teachers’ own abilities in all aspects.

3.1. Promoting a change in teaching philosophy

Vocational education cultivates high-quality skilled talents, and the vocational skills competition can largely reflect the core teaching concept of vocational education, which is “aiming for service, taking employment as orientation, and improving students’ comprehensive practical ability”. The skills competition aims at practicality, combines teaching contents with actual needs, improves the relevance and practicality of classroom lectures, and helping teachers to change and update their teaching concepts. The requirements of each enterprise for the overall quality of talents themselves should be given sufficient attention in the preparation and guidance process. For example, the national CNC competition provides the corresponding tasks based on the participants, and the overall process of the competition involves many relevant professional qualities, which provides a great deal of guidance for teachers in their teaching. Teachers have to analyze the documents related to the competition and go to the companies to study them in order to grasp the content of the competition. Schools can also hire experts from companies to provide guidance in the field, integrate corporate norms in their teaching, improve the relevance and efficiency of the teaching itself, and promote the

conversion and upgrading of teachers’ own teaching concepts.

3.2. Enriching teaching contents and improving teaching quality

Through the competition, teachers in higher vocational colleges use all the contents of the competition to summarize the common knowledge and integrate it into the teaching system. For the knowledge that is not common, teachers can expand their expertise and create new teaching contents. In this way, the teachers’ teaching quality is improved through feedback from the skills competition. The teachers can organize the design work of the creative class competition and distribute it to the students in the form of reading materials after school. These materials stimulate students’ interest in learning, develop their creative thinking, and provide a manpower pool for future competition participants.

3.3. Upgrading practical skills

Compare with undergraduate colleges and universities, higher vocational education are specialized in training highly skilled talents, which are also needed for the society. And it is the main channel to cultivate talents with innovative spirit and practical ability. Therefore, the reform of practice education is necessarily the most important task in the construction of teaching staff. Through the process of guiding students to participate in the competition, teachers can grasp more comprehensively the needs of each enterprise for talent training and the operational ability requirements of each position. In this way, the teaching content will be integrated, and new teaching methods and means will be developed for the actual needs of the enterprise site in the later teaching, thereby making the vocational education dovetail with the enterprises, industry and society in a zero distance. In the process of guiding students to participate in the competition, teachers’ willpower, ability to coordinate planning and arrangement, and ability to judge and handle unexpected situations will be significantly exercised and improved. In short, through the skills competition, the teachers’ practical skills level and practical teaching ability are improved by leaps and bounds.

3.4. Improving innovation and research capabilities

The skills competition requires not only solid theoretical skills and skillful operational skills, but also a certain degree of creativity. The cultivation of creative talents requires a team of highly qualified and creative teachers for guidance. In the process of participating in skills competition, teachers naturally take the initiative to study the rules of the competitions and conduct in-depth research on relevant professional knowledge. There must

be industry leading enterprises among the organizational units of each skills competition, and the competition rules formulated by these well-known enterprises contain new ideas, new thoughts, new processes and new technologies. In order to better prepare for the competition, teachers, as professional front-line workers, have to pay attention to the development of society, industry and enterprises and technological innovations, and transmit all kinds of latest information to students at the right time. Teachers should also actively encourage and support students' new ideas and concepts, and help them complete the transition from conceptual innovation to practical exploration. In this process, the teachers' innovation ability will also be enhanced.

3.5. Prompting the mastery of new technologies

The preparation process of skills competition is obviously different from the teaching process. The latter is implemented according to the original teaching plan, while the former will encounter various unexpected problems that need to be solved by the students and instructors. In order to solve emergent problems, the instructors have to learn new techniques.

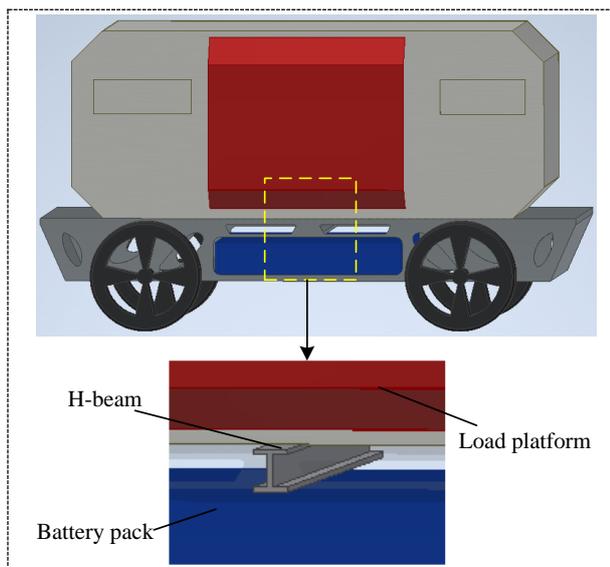


Figure 1 The supporting H-beam of the unmanned rescue vehicle.

The students who took part in the skills competition designed an unmanned rescue vehicle, as shown in Figure 1. The application scenario of the entry is: at the disaster scene, the unmanned rescue vehicle enters the dangerous area to transport emergency rescue materials (such as medicines and rescue equipment).

It can be seen from the above application scenario that the load capacity of the rescue vehicle is an important parameter of the entry.

The upper part of the rescue vehicle is the carriage for transporting supplies, and the lower part is the battery pack and power system. There is an H-shaped beam

between the load platform of the carriage and the battery pack below. The pressure of the loading platform is transferred to the rack by the H-beam rather than the battery pack. If the bending resistance of the H-beam is poor, it will bend and touch the battery pack below when the rescue vehicle was carrying heavy supplies. Obviously, this is a security risk. The students hope to carry out a three-point bending mechanical experiment to test the bending resistance of an H-beam to be used. The students' solution and test requirements were recognized by the research team.

However, the school does not have corresponding mechanical experimental equipment. It takes too much time to do experiments outside school. In order to solve students' problems and promote the progress of the entries, the research team considered using finite element software for modeling and simulation calculation.

The finite element theory is to simulate a real system (geometry and load conditions) by using the method of mathematical approximation. The finite element model discretizes the continuous structure into finite elements, and sets finite nodes in each element. In this way, the complex continuum is treated as a collection of elements connected only at the nodes. Based on the variational principle of mechanics and related formulas, the equations for solving node unknowns are established.

In recent decades, with the rapid development of computer technology, finite element software has been applied in many fields, and the accuracy of simulation results has been greatly improved. ABAQUS is a widely recognized and powerful finite element analysis software. It can analyze complex mechanical problems, especially can simulate highly nonlinear complex problems. ABAQUS software can not only analyze the mechanics and multiple physical fields of a single part, but also do system-level research.

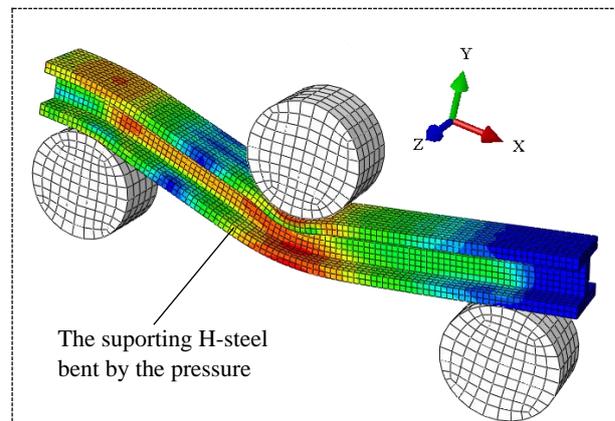


Figure 2 Mises stress nephogram of H-beam obtained by finite element simulation.

In order to solve the students' problems and improve their scientific research ability, the instructors studied the finite element theory and ABAQUS software. The finite element model was established with ABAQUS software

according to the needs of the students. The finite element model is simulated on the computer according to the test requirements. The Mises stress nephogram clearly shows the large-scale deformation of H-beam under external load and the law of stress distribution of H-beam (the redder the color, the greater the stress), as shown in Figure 2.

The data obtained by simulation has solved the students' doubts and satisfied the students' test requirements. In the process of studying modeling and simulation calculation, teachers' ability is improved. The mastery of simulation software will greatly promote the follow-up scientific research work of the teachers.

3.6. Promoting the collaboration among faculty team members

The preparation process for the skills competition is long and the team of teachers will devote a lot of time and energy to guide the students. In this process, the teachers rub shoulders and learn from each other, and while improving their respective abilities, they will gradually form a highly qualified and professional team of teachers. From the preparation of the rules of participation to the training program, the joint efforts of teachers and students are indispensable. As teachers have differences in knowledge structure, thinking methods, and understanding characteristics, there are obvious differences in the teachers' selection of teaching methods and implementation of teaching plans even for the same teaching content. Through the skills competition, teachers discuss and complement each other's strengths and weaknesses in a team, and their thinking is expanded, their knowledge is broadened, and their abilities in all areas are enhanced.

4. CONCLUSION

Higher vocational education should be aware of its position in the systems of vocational education and higher education, and make the goal clear. As is known to all, higher vocational education should take it as the goal by the combination of industry, education and research, combination of work and study, cooperation of school and corporation, contrasting internship and other training model and concrete measures. This goal challenges all aspects of vocational education teachers' ability, especially their practical ability.

To strengthen the construction of teachers in higher vocational colleges, we need to have new ideas and perspectives. The skills competition is a stage for students to show themselves, and also a platform for teachers to improve themselves. Skills competition can promote the change of teachers' teaching concept, enrich teaching content and improve teaching quality. In the process of guiding students to participate in the skills competition, teachers' practical operation ability and

scientific research level will also be significantly improved.

Vocational colleges should firmly grasp the platform of the skills competition to improve the overall quality of teachers. The construction of teachers is the key to ensure the quality of talent training. Vocational education cannot develop with high quality without a high-level professional team of teachers.

AUTHORS' CONTRIBUTIONS

Shang Wang contributed significantly to analysis and manuscript preparation. Zhixin Feng helped perform the analysis with constructive discussions.

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