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The Role of Skills Competitions in Improving the Practical Ability of Vocational College Students

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Abstract: Vocational education and general education are two different types of education that are equally important. The orientation of talent training in vocational education is to nurture skilled talents to serve the society. The practical ability of students is both the focus of teaching in vocational colleges and the requirement of enterprise posts. The various types of skills competitions provide a "stage" for students to showcase their abilities. First, this paper explores students' problem-solving ability while preparing for these competitions, expounding the importance of vocational education and skills competitions. Second, this paper summarizes the views of different scholars. Third, based on a specific case, this paper describes the improvement in students' ability while preparing for these competitions. Fourth, this paper analyzes the results of the questionnaire survey conducted to investigate the improvement in students' ability. Lastly, this paper puts forward several suggestions that appeal for vocational colleges to pay more attention to skills competitions.

Keywords: Skills competition; Practical ability; Vocational college students; Vocational education

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1. Introduction

Rapid economic development is inseparable from high-quality skilled talents. In recent decades, vocational education has delivered a large number of skilled talents to various industries, providing intellectual support for rapid economic development. With the acceleration of industrial upgrading and economic transformation, various industries have higher requirements for skilled talents, and the importance of vocational education is becoming more and more prominent [1].

Vocational colleges are positioned to cultivate high-quality skilled talents. Hands-on ability and practical ability are both very important. These abilities are not only the job requirements of enterprises, but also the focus of talent training. Skills competition is an important supplement to campus teaching. In the preparation process, students' manipulative ability can be effectively improved. Taking the mechanical skills competition as an example, under the guidance of an instructor, students have to design and process mechanical equipment independently according to the competition requirements. In addition to meeting the basic requirements of the skills competition, the stability, accuracy, and safety of the developed mechanical equipment need to be fully considered. Mechanical design, mechanical drawing, engineering mechanics, mechanical manufacturing technology, control engineering, and other professional course knowledge need to be applied. Obviously, it is a challenge to students' comprehensive quality, especially in terms of their ability to apply theoretical knowledge.

The preparation and participation process is an opportunity for students to re-learn and further consolidate their knowledge. Students who participate in skills competitions have shown to have more solid

professional knowledge compared with those who do not participate. It is known to all that students who win skills competitions are more likely to be employed. Enterprises participating in these competitions may even provide opportunities to award-winning students to work or practice in their firms.

The Chinese government is also becoming more aware of the significance of skill competitions. In April 2022, the government introduced the Law on Vocational Education, which emphasizes the role of skills competitions in vocational education. The document states that vocational institutions should "provide a platform for technically skilled personnel to showcase their skills and compete with each other" and "continue to train more high-quality skilled talents through skills competitions" [2,3].

2. Literature review

What is the role of skills competitions in promoting vocational education? Scholars have carried out research work in different fields. In a study, Japanese scholar Wan [4] used a big data approach to investigate the intrinsic relationship between vocational skills, and these findings have provided a theoretical basis for other vocational skills research fields. Maia [5], a British scholar, believes that skills competitions can improve the attractiveness of vocational education. He conducted 110 interviews with contestants of a skills competition. Based on these data, he analyzed the potential contribution of skills competitions to revitalizing the British vocational education. Scholar Wu [6] has carried out an in-depth analysis of the problems of digital education and suggested the addition of a simulation operation competition module within the operating system. Students play games (compete with each other) to complete learning tasks, and thus improve the quality of teaching and learning. In another study, Li [7] analyzed the importance of the "tiered ladder" training mechanism in the context of vocational skills competition, taking secondary-level electronics students as the research subject. Wang [8] believes that guiding students to participate in various skills competitions can promote the construction of the teaching staff in vocational colleges. He suggested that teachers should take an active part in these competitions and consciously improve their teaching ability. Zhu [9] believes that the important indicators of talent training in higher vocational education are skill level and practical ability. He found that skills competition training players have advantage in employment competitiveness and sustainable development ability. Liu [10] has investigated the overall situation of the transformation and upgrading of vocational skills competitions and put forward several general countermeasures for the transformation and promotion of national vocational skills competitions. Di [11] believes that vocational skills competitions have a positive impact on the teaching in vocational colleges. He found that vocational skills competitions can effectively improve students' innovation ability and practical ability. The aforementioned research results show that skills competitions have played a role in promoting vocational education. However, the research done is relatively broad, and there is a lack of research on specific cases. This paper takes the design and construction of a certain skills competition as a case to carry out the relevant research work.

3. Case analysis

3.1. Introduction to entries

A lifting device for sophisticated equipment was designed by several students for a skills competition. However, they encountered difficulties in carrying out mechanical property tests. As shown in **Figure 1**, the center precision equipment is to be lifted. When hoisting the precision equipment, the vertical deflection should be less than 1°. Located on either side of the precision equipment are two identical cranes, and the hydraulic equipment powers the claws through a lever device to lift the precision equipment. Obviously, the deformation of the support column must be considered. **Figure 2** is a schematic diagram of the support column for the leverage.

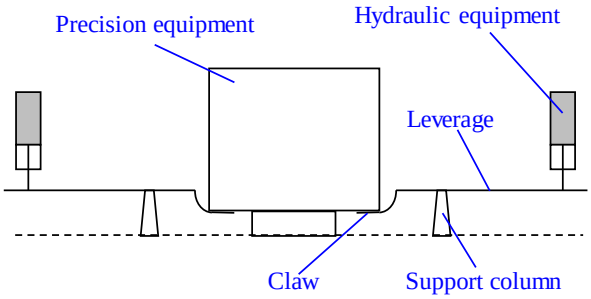

Figure 1. Structure of the skills competition entry

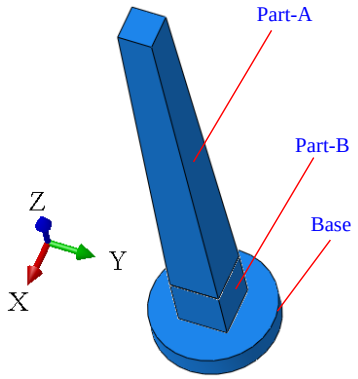

Figure 2. The research logic diagram of this paper

3.2. Solution

In order to solve the problem, both the teachers and the students considered using finite element software for modeling and simulation calculation. In order to complete it as soon as possible, the tasks were divided between the teachers and the students. The teachers were primarily responsible for finite element modeling and simulation, while the students were responsible for image production, formula editing, report writing, *etc*.

3.3. Simulation results

The model was simulated on a computer, and relevant data and nephograms were obtained. **Figure 3** shows the U3 nephogram of the model. Different colors represent different displacement sizes (the redder the color, the greater the U3 value). As can be seen from the annotation chart, the U3 value on the upper surface of Part-A is the maximum, which is 14.67 μm. The data met the students' design requirements. This is the result obtained by the finite element simulation method applied to the case.

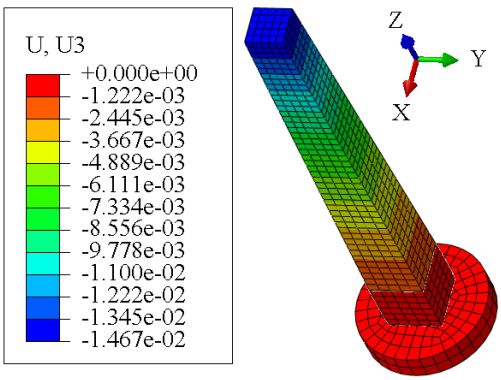

Figure 3. U3 nephogram of the model

4. Questionnaire investigation

The students participated in the whole problem-solving process, thus exercising and improving their abilities. The operations performed by the students are shown in **Table 1**.

Table 1. Operations performed by students

J1:	Consult relevant data and determine the specific size of the sample.
J2:	Determining specific needs for test data.
J3:	Creating a 3D drawing of the sample. After completing J3, the students' drawing ability improved.
J4:	Processing the data.
J5:	Writing the test report. Similar to J4, the students completed the project report, comprising figures, tables, and formulas, which provides the necessary data support for the skills competition entry.

The research team conducted a questionnaire survey, comprising several questions (**Table 2**).

Table 2. Survey questions

Q1:	Did the skill competition help improve your practical ability?
Q2:	Did you consolidate your knowledge through the skill competition?
Q3:	Is the skill competition helpful to your data analysis ability?
Q4:	Is the skill competition helpful to your drawing ability?

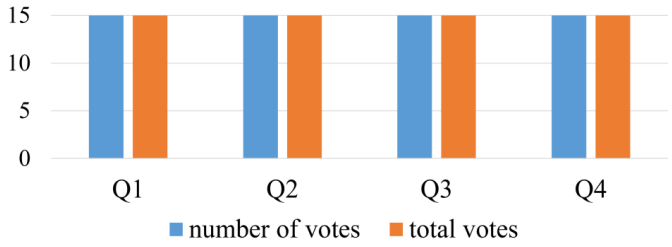

Figure 4. Questionnaire for students

The statistical data are shown in **Figure 4**. All the students responded "Yes" to the questions. Two students in the participating team expressed great interest in simulation technology and software. They made it clear that they had taken the time to learn about simulation software. The students showed interest in learning and were willing to take the initiative to learn. This was in line with the teachers' expectations.

5. Specific suggestions

5.1. Increase students' participation

Skills competitions are not "elite education," and students should show their talents on this "stage." Instead of "picking" students with high grades, more students should be involved. Especially for school-level skills competitions, teachers should encourage more students to participate. Every student who takes part should have a chance to show his/her own ability and a fair chance to compete. Vocational schools should set transparent and fair competition rules and select student teams for municipal competitions through "elimination competitions." "Elimination" winners should be praised so as to improve their confidence and motivation to learn. Students who are eliminated should be affirmed and encouraged by the teachers. Even if they do not win, students will be able to improve their hands-on skills as they participate in skills competitions.

5.2. Integrate the competition content into classroom teaching

The research team's teaching experiments showed that the content of the skills competition aroused students' interest in learning. Vocational schools should encourage teachers to incorporate skills competitions into traditional classroom teaching to motivate students. On the one hand, teachers should use skills competition works to help students better understand the teaching content. On the other hand, teachers should encourage students to bring up innovative ideas around the knowledge points when explaining them, thus laying a foundation for the design of future entries. When teaching about skills competitions in class, teachers ought to carry out more publicity to encourage students to take part in these competitions.

5.3. Build a skills competition platform

Vocational colleges should invest more money in building skills competition platforms to create better conditions for both teachers and students. Relying on skills competition platforms, schools should implement the regular mechanism of skills competition and engender it as the "second classroom" for students to grow. With the help of skills competition platforms, schools can also hire technical personnel from enterprises to train and guide the participating students. Schools that can afford it should hold a skills competition month every year and include as many majors as possible. Schools should also focus on supporting projects corresponding to national and provincial skills competitions. Only through the selection of excellent projects can schools carry out the preparation work for higher-level skills competitions.

6. Conclusions

Vocational skills competition is a major reform and innovation of the vocational education system. It is necessary for students in vocational colleges to participate in various skills competitions. Teachers should attach importance to improving students' practical ability. The leaders of vocational colleges should formulate more attractive policies to encourage both teachers and students to participate more actively in various skills competitions.

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Disclosure statement

The authors declare no conflict of interest.

Author contributions

F.P. and S.W. conceived the idea of the study and wrote the first draft of the paper. Z.F. proofread the whole text.

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