

Research on the Teaching Innovation of Architectural Engineering Specialty in Vocational Colleges Based on Results-Oriented Education

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Abstract: Results-oriented education is a teaching model commonly used in the education offered by vocational colleges at present. The teaching model focuses on the acquisition of students' learning results, which has been unanimously recognized and extensively practiced. The integration and implementation of the results-oriented model in the teaching of architectural engineering specialty, especially in domestic vocational colleges, are facing many challenges in the term of its teaching impact, and teaching objectives. Therefore, this research was conducted to analyze the causes of various problems in integrating the results-oriented education model and further propose recommendations for improving the teaching quality.

Keywords: Results-oriented education; Teaching model; Reform in education

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1. Introduction

Vocational education is a very important part in the higher education system, where its teaching goal is to cultivate applied talents, with certain practical skills and professional knowledge. Therefore, the teaching of architecture in vocational colleges is not only to impart architectural knowledge, but also to cultivate architectural application skills. In order to tackle the problem of “emphasizing teaching over learning, and emphasizing knowledge over action,” it is important to scientifically integrate and implement the results-oriented education model based on traditional teaching models in architectural engineering, especially in vocational colleges, so as to nurture high-quality comprehensive talents who can meet the demands of the industry. Han Xiaodong pointed out that the results-oriented education model is a good teaching model for vocational schools^[1]. In order to achieve the teaching goal based on the results-oriented education model, teachers should actively change their inherent teaching concepts, vigorously implement the independent inquiry learning mode, and enhance their own achievement consciousness as well as that of the students; subsequently, they should also cultivate high-quality architectural engineering professionals who will contribute to the development of China's architectural engineering industry.

2. Significance of implementing the results-oriented education model

With the continuous application and practice of the results-oriented education model in the teaching of various disciplines, teachers have accumulated rich experience and formed a unique successful practice model.

2.1. It is conducive to promoting students' personalized development

In the course of teaching architecture engineering students in vocational colleges, the implementation of the results-oriented education model, which encourages students to independently explore and learn, is focused on personalizing teaching to stimulate students' learning enthusiasm. Therefore, teachers should select individualized teaching methods when implementing teaching strategies to stimulate students' learning interests and meet their learning needs ^[2,3]. Furthermore, in order to ensure that each student learns and understands, a personalized evaluation of students' learning effect and efficiency should be included, so as to promote students' personalized development to a great extent.

2.2. The transformation of teachers' and students' concepts in teaching and learning

The results-oriented teaching model emphasizes the dominant role of students in the learning process, whereas the dominant position of teachers is the process of teaching. They carry out professional teaching and learning from their own goals, achieving the subversive transformation of teachers' and students' ideas about teaching and learning. Additionally, with the implementation of the results-oriented education model, teachers have more space and flexibility in achieving the teaching objectives, and by further reviewing the teaching and learning achievements, they can improve the teaching and learning methods ^[4].

2.3. Increase the employment opportunities for students

Based on the effective implementation of the results-oriented education model in the teaching of architectural engineering courses in vocational colleges, teachers are required to train students to master their practical operation skills. Therefore, there is a great flexibility in arranging the teaching contents ^[5]. In this way, students can combine their interests and expertise to specialize in a specific field, making them an expert in the particular field and increasing the employment opportunities after graduation.

3. Analysis of the teaching challenges in architectural engineering especially in vocational colleges based on results-oriented education

3.1. Professional training objectives lack characteristics and are seriously formalized

According to the analysis results of talent training programs of architectural engineering specialty in many vocational colleges, there are similarities in the professional training objectives, where some colleges and universities do not design their own school professional training objectives but blindly follow the objectives from other colleges and universities. In that case, there is no uniqueness in the professional training objectives between schools ^[6]. Additionally, through a questionnaire survey of students majoring in architectural engineering, it is known that many students do not understand the professional training objectives of their own colleges, leading to confusion among students regarding their own professional development objectives. As a result, students are tired of coping with the professional learning, without any clear learning objectives ^[7].

3.2. Insufficient correlation between curriculum teaching and professional training objectives

From the perspective of the educational objectives of architectural engineering specialty in vocational colleges, the main teaching objective includes cultivating students' professional knowledge and operating skills. However, in many vocational colleges, the teaching methods and teaching contents do not match the professional training objectives, thereby disconnecting the link between curriculum objectives and professional training objectives. Further, the curriculum objectives do not reflect the comprehensive professional quality that is required by professional training objectives. Furthermore, in some vocational colleges, the expression of the curriculum objectives is not comprehensive enough, leading to the lack of clarity in the learning objectives. In the long run, this will lead to the loss of enthusiasm of students in

professional curriculum learning [8].

3.3. Poor implementation of practical teaching

The new curriculum reform requires all vocational colleges to actively change their school curriculum by integrating and incorporating practical teaching as a teaching content. Therefore, many colleges and universities have successively included practical teaching; however, the implementation of practical teaching in many vocational colleges is not optimistic, where there is a lack in the training conditions, with insufficient training equipment, resulting in the failure of practical teaching in achieving the expected goal [9].

3.4. Single teaching implementation mode

Although, the new curriculum reform has been introduced, due to the deep-rooted influence of the traditional teaching mode, some colleges and universities continue to use the traditional single teaching method in the teaching of architectural engineering courses. In addition, some professional teachers in colleges and universities have begun to include project teaching, case teaching, and modular teaching. However, the implementation effect of these teaching methods is still doubtful, indicating that the traditional single teaching method is still a serious problem [10].

3.5. Low participation in curriculum evaluation

Most of the vocational colleges have made a great effort in changing the traditional summative curriculum assessment method. They have tried to adopt more flexible and diverse curriculum assessment methods by gradually increasing the proportion of process assessment. However, students' participation in curriculum evaluation is low, resulting not only in a poor effect, but also a difficulty in the innovation of architectural engineering curriculum [11].

4. Implementation guarantee of results-oriented education reform of architectural engineering specialty in vocational colleges

4.1. Strengthen the construction of teaching staff

The comprehensive quality of teaching staff in results-oriented education determines the success of the teaching reform of architectural engineering specialty. Therefore, vocational colleges should further strengthen the knowledge of the teaching staff by implementing the principle of "going out, and bringing in," take various measures to build a high-quality, "double qualified" teaching team, as well as use the latest and the best teaching methods to carry out professional teaching activities. There are several ways to improve the teaching methods.

- (1) Encourage teachers to go deep into construction enterprises for engineering practice. Architectural engineering specialty is a specialty with high practical characteristics; therefore, it has high requirements for teachers' practical skills. Increasing the engineering practice experience is not only important for teachers to better understand the course content, but also to develop students' thinking. Therefore, the school leaders should encourage architectural engineering teachers to collaborate with enterprises to carry out practical trainings, understand the most cutting-edge engineering technology through engineering practice, as well as enrich their professional literacy to impart the most cutting-edge professional knowledge to students in the teaching practice, thus improving students' ability to understand and apply professional knowledge [12].
- (2) Actively introduce engineering technology and management personnel to junior college teachers. Additionally, encourage senior engineers or enterprise managers to collaborate with colleges through social recruitment as teachers, whether as full-time or part-time teachers. However, those from

enterprises may have strong practical skills, but often lack theoretical knowledge. Therefore, they should regularly attend vocational education theory training, in order to improve their knowledge and help them complete the transformation as teachers. Additionally, industrial experts can also be hired to give lectures at schools to help students gauge the current development and the future trend of China's architectural engineering industry, allow them to see their own shortcomings, and encourage them to be more involved in learning ^[13].

- (3) Improve the professional training system of vocational and technical education. At present, the lack of engineering practice experience of in-service teachers in many vocational colleges is a problem. The introduction of professional managers from architectural engineering enterprises as a professional course teachers cannot be efficiently implemented. Therefore, it is essential to improve the professional training system of vocational and technical education. In 2015, the state selected 46 vocational colleges and universities to take the lead in the launching of the master's education degree program training in the field of vocational and technical education. The implementation of this training system has improved the level of educational theory among teachers and students, in addition to the teaching practice and the research ability in vocational and technical education ^[14]. Therefore, vocational colleges should strive to improve the training system of architectural engineering and divide different training directions according to the classification of disciplines in architectural engineering. For example, for civil engineering, it is necessary to focus on strengthening the training of civil engineering related professional knowledge, while for hydraulic engineering, it is necessary to focus on water conservancy related knowledge. In that way, there will be more efficient construction technologies and theories through continuous in-depth exploration, thus promoting the healthy and sustainable development in China's architectural engineering industry ^[15].

4.2. Strengthen the construction of training base

Compared with ordinary high schools, vocational colleges have clear differences in the orientation of talent training. The education goal of vocational colleges is to produce a large number of talents with vocational skills for the society. Therefore, in the teaching practice, focus should be on professional practical teaching, and as the main place of this type of teaching, training base plays a very important role in vocational education. Therefore, all colleges and universities should continue to increase education investment and consider constructing more training bases ^[16].

- (1) We should continue to improve the on-campus training base of architectural engineering, so as to meet the requirements of practical training courses for students who are majoring in architectural engineering. Colleges and universities need to allocate special funds for the construction of on-campus practical training bases. The construction of these campus training bases can be divided into different training work areas according to the practice type, such as material test training work area, masonry structure training work area, concrete frame structure training work area, steel structure training work area, and others. Secondly, it is necessary to actively build the "Internet + training base" and link different training workers, so that students can access the related knowledge of other work areas at any time during the training process ^[17]. For example, when students conduct practical training in the concrete frame structure implementation work area, students can query the key points of concrete material detection and reinforcement binding through the mobile client, in order to realize the deep integration of theoretical and practical teaching, truly promote the improvement of their comprehensive quality, and grow into useful talents for the society.
- (2) Strengthen school enterprise cooperation and expand off campus training bases. Colleges and universities should establish a long-term cooperation mechanism with relevant construction enterprises and build more off campus training bases to meet the teaching requirements of students' practical training

courses. After students have completed their theoretical course, they are arranged to carry out their internship at specific enterprises for a period of time to consolidate their theoretical knowledge and effectively improve their architectural thinking and practical skills. When establishing an off-campus training base, schools should carefully select architectural engineering enterprises in combination with the national economic development needs and industrial upgrading requirements, in order to ensure that the training base can really play a role in cultivating students' practical skills. It should be noted that when students participate in off-campus practical courses, they should enter as enterprise employees and carry out practical training operations in strict accordance with the project construction quality, safety, and progress plan formulated by the enterprise. Students will be able to identify their own shortcomings through practice, thus encouraging them to work on their weakness and make up for their deficiencies when they return to school. This will, in turn, promote a stable improvement in their theoretical knowledge and practical skills [18].

4.3. Build a systematic, and scientific assessment method

There are some differences in students' knowledge level, comprehension ability, interests, learning effect, and focus in learning the topics in architectural engineering. Some students master theoretical and technical knowledge well but are lacking in practical operation skills. In contrast, some students can quickly master the technical points when learning a certain construction technology, but they lack the ability to comprehend basic theoretical knowledge. Therefore, teachers can no longer use the unified examination method at the end of the semester to assess the students' knowledge and ability. They should use a more reasonable and systematic assessment method to evaluate students' learning effect. For example, a combination of closed book examination, practical examination, and usual performance results should be implemented to increase the proportion of practical training results and reduce the proportion of ordinary results and closed book examination results. **Table 1** shows the composition and proportion of each part of the results.

Table 1. Assessment methods for professional courses

Serial number	Assessment	Composition of achievements	Percentage (%)
1	Usual performance	Online operation completion and attendance	20
2	Training results	Project completion (progress, quality, and safety control effect)	30
3	Interim test	Evaluation of basic theoretical knowledge of curriculum	10
4	Final test	Evaluation of basic theoretical knowledge of curriculum	40

5. Conclusion

At present, the results-oriented education model is the inevitable trend of the implementation of vocational education and teaching under the background of the significant change in talent training objectives after the transformation of the social industry. It is a major change in the traditional education and teaching mode. Therefore, in order to cultivate more high-quality architectural engineering professionals in the society, colleges and universities should deeply understand the challenges that exist in the teaching of architectural engineering specialty based on the results-oriented model. Consideration should be given to the teaching content and professional training methods to make better contributions to the construction of professional teaching bases, professional evaluation methods, and high-quality teaching personnel.

Disclosure statement

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