

Research on Developing BIM Intelligent Construction Programs Based on Application-Oriented Talent Cultivation

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Abstract: Cultivating application-oriented talents have become essential in vocational and higher education. This concept also applies to BIM intelligent construction programs. Based on literature review and general observations, we analyzed the connotation, key points, and value of developing a BIM intelligent construction program based on application-oriented talent cultivation. We also identified problems in the development of the program such as lack of comprehensive planning and the school being the sole authority in program development. Therefore, we proposed several strategies to address these problems, including systematic program development planning and fostering a multi-faceted partnership between schools and the industry. The goal is to provide valuable insights for the development of relevant programs in the new era.

Keywords: Application-oriented talent training; BIM intelligent construction; Professional construction

Online publication: October 25, 2023

1. Introduction

The increasing maturity of BIM technology has given rise to the BIM intelligent construction profession. As an emerging profession, it needs to be constructed more effectively, and the development of this profession also needs to be highly consistent with new educational and talent training concepts. The cultivation of application-oriented talents is crucial to drive the development of this profession. However, this process can be affected by many factors, and some problems are prone to occur. This shows that the system construction of the corresponding major is complex, and many factors need to be considered. Therefore, measures need to be taken to address the problem in developing BIM intelligent construction program based on application-oriented talent cultivation.

2. Overview of BIM intelligent construction program based on application-oriented talent cultivation

(1) Connotation

BIM intelligent construction program based on application-oriented talent cultivation is the general

term for a series of professional construction activities carried out with the goal of professional development under application-oriented training. BIM intelligent construction is a dynamic project involving relatively diverse elements, which requires many perspectives. The training of application-oriented talents should be done with the goal of developing construction professionals.

(2) Key points

There are some critical points in developing BIM intelligent construction program based on application-oriented talent cultivation. The quality of the students depends on how well the essential tasks are done. These essential tasks include construction planning, number of staff, the curriculum, and the evaluation methods for the students.

(3) The value of this training concept

The development of BIM intelligent construction program based on application-oriented talent cultivation has significant value, which is reflected in multiple levels. By integrating application-oriented training into the curriculum effectively, BIM intelligent construction students will learn how to apply their knowledge and develop practical skills. The better development and application of some new courses can further improve the quality of professional courses. Moreover with a good balance of theoretical and practical lessons in each course, the students professional qualities and practical skills can be better can be better developed. This enhances the students' chances of employment and their career development opportunities.

3. Analysis of BIM intelligent construction program based on application-oriented talent cultivation

(1) Lack of planning

Some schools have tried to build BIM intelligent construction programs based on application-oriented talent training. However, the final results could be better, which indicates the need for a more effective program planning. The work involved in the establishment of majors is extensive, and more elements of application-oriented training should be incorporated to make the courses more systematic and complex. Some schools do not fully understand the concept of application-oriented talent training. Therefore, they usually do not conduct a detailed analysis before constructing the BIM intelligent construction course. Besides, they do not have a systematic plan while establishing the major, and the courses do not have a specific direction or purpose^[1]. Over time, it has been difficult to form a good BIM intelligent construction environment in schools. Even if certain efforts have been made on other levels, the quality of the course will still be less ideal if the planning is not in place.

(2) Limited course content

After comparing the BIM intelligent construction programs in some schools, it was found that the reason some struggle to make progress in the construction of majors is because the system in which the course in constructed is relatively rigid. The school usually has full authority over curriculum design and the organization of academic activities. This model provided schools with better control over program development and allowed them more autonomy in program management. However, in the training of application-oriented talents, the disadvantages of this model becomes more apparent. Teachers and students should both play a role in program development, and when collaborating with external companies for applied talent development, these companies can also become primary participants in program development. When a school remains the sole entity responsible for program development, the approach to applied talent training becomes quite narrow. It restricts the diversity of

program development strategies, hindering the effectiveness of program development.

(3) Lack of unique courses in BIM intelligent construction programs

When it comes to program development, curriculum design is an essential aspect. Looking at it from the perspective of application-oriented training, many educational institutions tend to overlook curriculum design in the context of their BIM intelligent construction program development. Even among schools that have taken steps in curriculum development, some may lack distinctive courses, which presents a challenge in the development of BIM intelligent construction programs^[2]. Currently, many schools have not fully embraced the idea of application-oriented talent development to actively create distinct courses. When it comes to the collaboration between academia and industry in professional education and talent development, the limited number of distinct courses fails to adequately support new educational and talent development methods. The shortage of such courses often means that the curriculum lacks distinctiveness, which, in turn, hampers the development of specialized talent in the field of BIM Intelligent Construction, subjecting it to various constraints.

(4) Lack of systematic evaluation of BIM intelligent construction major

Various issues can arise in the development of BIM intelligent construction program based on application-oriented talent cultivation, especially when there is a need to balance the development of the program and the teaching of the courses. In theory, there should be a more effective evaluation of the relevant professional development. However, in practice, many schools have not adequately established an evaluation mechanism for professional development in the field of BIM intelligent construction. The absence of a specific evaluation mechanism makes it challenging to conduct effective evaluations directly related to professional development^[3]. When there is no systematic evaluation of BIM intelligent construction programs, it becomes challenging for schools to grasp the situation of the program and its effect on talent cultivation. As a results, many problems in the program may go unnoticed. Besides, without proper evaluation methods, it is difficult to make adjustments in the program because there is lack of effective reference.

4. Measures to improve BIM intelligent construction program based on application-oriented talent cultivation

(1) Systematic program planning

Given the complexity and diverse aspects involved in the development of BIM intelligent construction program based on application-oriented talent cultivation, it is imperative for schools to establish a comprehensive development plan for this specific program. This plan will offer clear guidance for carrying out various activities related to program development at different levels and stages^[4]. For instance, a university introduced a BIM intelligent construction program in 2021. In 2022, the university conducted an in-depth analysis of the current state of the program's development. Emphasizing application-oriented talent cultivation, they carried out a thorough needs analysis for program development. Based on this, the university formulated a detailed program development plan. This plan clarified the roles of different entities involved in program development and the specific responsibilities of each. Moreover, it provided a refined framework for multi-entity program development. Setting clear, phased objectives enhanced the purpose and direction of program development activities. Hence, this proves that a systematic and well-thought-out plan serves as a crucial foundation of the development of BIM intelligent construction program. Developing the program based on a systematic

plan also enhances the program's purpose, direction, and organization ^[5].

(2) Fundamentals in industry-education collaboration-based comprehensive program development.

It is crucial to continually diversify the entities involved in the development of BIM intelligent construction program. Especially when cultivating application-oriented talents based on the industry-education integration concept, the number of entities involved in professional education increases ^[6]. For instance, in the development of the BIM intelligent construction program at a certain school, the school, companies, teachers, and students are all considered specific entities involved in the development. With multiple entities actively participating, each contributes differently to the professional development. The school is primarily responsible for the comprehensive planning of the BIM intelligent construction program development and holds a significant advantage in curriculum development. Companies contribute by offering input on curriculum design, enriching teaching content, and providing feedback on BIM practical aspects through industry-education integration. Additionally, teachers and students provide feedback based on their teaching and learning experiences, which serve as valuable reference information for the school's leadership in the major development. The involvement of multiple entities in the BIM intelligent construction program development results in more diverse approaches and outcomes that align better with expectations ^[7].

(3) Actively creating distinctive courses

In the context of BIM intelligent construction program based on application-oriented talent cultivation, the development and creation of distinctive courses are of paramount importance. Building on the development of these specialized courses not only supports industry-education integrated professional teaching but also aids in application-oriented talent development. For example, in recent years, a certain school has made significant efforts in BIM intelligent construction program development based on application-oriented talent training and has successfully created several distinctive school-based courses. Among these, the course "Comprehensive Application of BIM Technology" has significantly benefited students by enhancing their understanding and proficiency in BIM technology applications. To meet the requirements of application-oriented talent development, the school has introduced specialized courses such as "Fundamentals of BIM Technology," "Practical Internship for BIM Technology Fundamentals," "Application of BIM in Engineering," and a hands-on course on "BIM Drawing Practice." The development of these specialized courses not only aids in enhancing the effectiveness of application-oriented talent development but also results in a noticeable improvement in course teaching quality.

(4) Dynamically conduct evaluation and adjustment of professional construction

In the process of developing the application-oriented talent training for BIM intelligent construction major, various challenges can arise. To address these challenges, a twofold approach can be taken. On one hand, schools can engage in specific planning and experimentation from different perspectives for major development. On the other hand, a system can be established for evaluating the progress of major development, so that necessary adjustments can be made based on the evaluation results. For instance, a certain school has not only been proactive in experimenting with major development but has also taken steps to create an evaluation mechanism related to this initiative ^[9]. In this context, fundamental evaluation criteria include the development and implementation of school-based courses, students' proficiency in practical skills related to their major, and the effectiveness of industry-education collaboration in talent development. Furthermore, the schools are to assess the outcomes of specific decisions made in the course of major development. By successfully obtaining these evaluation

results and gaining a comprehensive understanding of the state of the program development, the school's capabilities in program development will continue to improve^[10]. Hence, when undertaking major development based on application-oriented talent cultivation, it is essential to perform ongoing evaluations and utilize these dynamic assessments as a foundation for further adjustments and enhancements. This approach ensures a higher degree of control over program development.

5. Conclusion

In the development of the BIM intelligent construction program based on application-oriented talent cultivation, effective planning is the foundation. Approaches such as diversifying the stakeholders and creating distinctive courses offer significant support for program development. However, it is essential not to overlook the development of the teaching staff. The quality and active involvement of teachers directly impact various aspects of program development, including course instruction, dynamic program growth, and overall program quality. Therefore, to align with the specific needs of BIM intelligent construction program development, it's crucial to focus on teacher training and actively enhance the quality of the teaching staff. This effort also contributes to the success of the program based on application-oriented talent cultivation.

Funding

- (1) Chongqing Municipal Education Science Planning Project
- (2) Educational Reform Special Project
- (3) Practice Research on Integrated Teaching Reform of “Post Course Competition Certificate” for BIM Intelligent Construction Major in Vocational Schools (K23ZG3250169)

Disclosure statement

The authors declare no conflict of interest.

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