

Research on Interest Group Based for Cultivating Applied Talents of BIM Technology in the Second Classroom Mode

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Abstract: The traditional two-dimensional planar model can not fully express the three-dimensional building, construction projects on the efficient application of BIM (building information modeling) technology is the key to the development of the construction industry. Therefore, with the wide BIM technology in the construction industry, training personnel with the ability to apply BIM technology has become a challenge in the field of education. This study aims to conduct an in-depth research on the cultivation of applied talent in BIM technology by exploring the second course mode based on interest groups, without disrupting the teaching order of the first classroom, constructing an optimal course development mode, compensating for the shortcomings of the first classroom, which enables colleges and universities to effectively cultivate BIM technology applied talent in new engineering disciplines and innovation in practical education.

Keywords: BIM Technology; Second Classroom; Interest Group; Practical Education

1. Introduction

BIM technology plays an increasingly important role in the field of project management with the advent of the modern construction era. Based on the 3D model, it integrates the progress, cost, quality, safety, procurement and other information in the whole project management, and synergises them into a project management platform, providing an all-round visualization and collaboration platform. [1]. As an integrated digital design and construction management tool, BIM technology has effectively improved the efficiency and quality of construction

projects and led the digital transformation of the construction industry. However, as BIM technology has attracted widespread attention and application in the modern construction industry, cultivating talents with the ability to apply BIM technology has become an urgent issue in the current education field.

Traditional classroom teaching often fails to meet students' needs for BIM technology applications, so there is a need to find more flexible and personalised ways of training. As a new form of course organisation, the second course mode emphasises students' interests and independent learning and provides more practical opportunities and resource support than traditional integrated practice courses. In this context, the second course mode based on interest groups has become a promising way to cultivate applied talents in BIM technology [2].

2. Problems Faced in Teaching BIM Technology in the First Classroom

2.1 Weak Curriculum Linkages

Weak linkage of BIM technology teaching between different courses. In the actual teaching process of BIM technology, most colleges and universities pay too much attention to the theoretical teaching of BIM technology, and for the application of BIM technology teaching is easy to be limited to a single application, ignoring the synergy of information between the different related courses, the BIM model can't reflect the original value of information [3]. The BIM model cannot reflect the original information value. A building is an integrated structure composed of multiple disciplines and systems, including architecture, structure, equipment, energy, environmental protection and management. These disciplines integrate, coordinate and support each other in working together under a unified goal. However, in

university teaching, students are seldom trained in multi-disciplinary integrated design, and in most cases, students independently select topics and complete designs within their own disciplines in accordance with the requirements of their respective disciplines. This approach does not fully reflect the overall requirements of design units and construction companies on the coordination and cooperation between various professional knowledge and design skills, and it is difficult for colleges and universities to cultivate the core competitiveness that engineering management students should have.

Figure 1 shows the classification of literature according to different specialisations or course settings [4]. In Figure 1 it is found that, on the one hand, in professional education, the

introduction of BIM technology into the engineering management profession is more significant compared to the education of other civil engineering and construction professions, such as civil engineering and engineering costing, etc. On the other hand, in the teaching of the curriculum, the BIM technology stays at the level of simple data modelling, i.e., the engineering drawing course, in which the traditional software CAD is easier to operate and thus more advantageous than the BIM software, and BIM technology cannot fully demonstrate its information integration advantages. BIM software is easier to operate, and thus has more advantages, BIM technology can not fully demonstrate its information integration advantages.

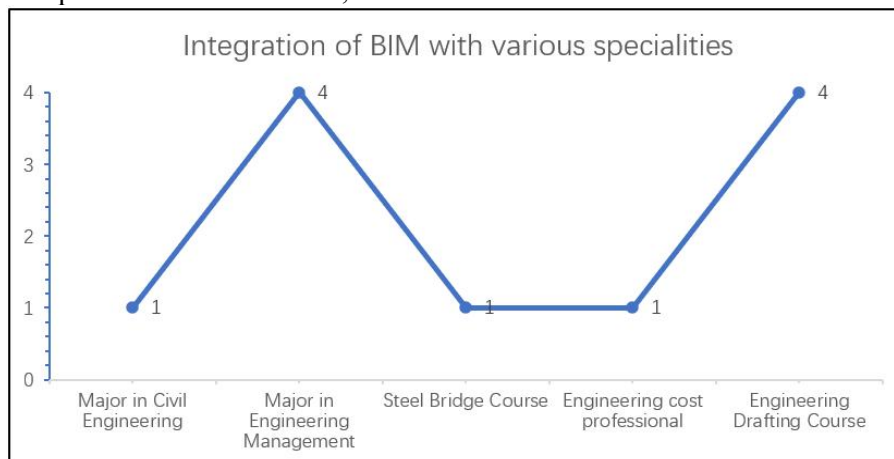


Figure 1. Integration of BIM and Various Professional Courses

2.2 Limitations of Teaching Methods

The traditional teaching of BIM technology usually adopts the teacher-centred lecture teaching method. On the one hand, this teaching method cannot truly combine the theory with actual engineering management scenarios, and cannot stimulate students' practical ability and innovative thinking; on the other hand, it is not in line with the "student-centred" view of education and teaching set up by the Ministry of Education in the new curriculum reform in 2022.

2.3 Lack of Industry Orientation

The traditional BIM technology teaching and lecturing method pays less attention to the latest development trend and cutting-edge technology of the industry, and cannot meet the current needs of the era of progress in the field of engineering management [5]. BIM

software is constantly updated, technical models are constantly innovated, and the fields involved are constantly extended. At present, the BIM software is constantly updated, the technical model is constantly innovated, involving the continuous extension of the field, college BIM technology classroom education can not catch up with the rapid development of the industry brought about by the changes in the demand for talent.

2.4 Lack of Practical Sessions

BIM technology is closely related to the future of the construction industry. BIM technology teaching in the classroom focuses on theoretical teaching, but the arrangement for practical sessions is relatively small. Students in the process of learning a large amount of knowledge is input, however, the output of knowledge is very little, students in the first

classroom to learn the knowledge can not be effectively extended to the actual BIM information modelling, resulting in the application of the students' ability to be weak, lack of understanding, colleges and universities are difficult to cultivate a large number of practical professionals skilled in the application of BIM technology.

3. Interest-driven Second Classroom Model

3.1 Overview of the Second Classroom Model

The second classroom is a college student's way of compensating for the deficiencies of first classroom instruction in addition to first classroom education [6]. The second classroom mode means that college students make full use of their spare time to enrich their knowledge and skills through participation in clubs, social practices and academic competitions. The second classroom mode is a practical nurturing mode for college students to make full use of their extracurricular time to enrich their knowledge and skills and cultivate their comprehensive qualities by participating in clubs, social practice and academic competitions. The establishment of interest-driven learning interest groups is guided by professional interests, and students combine their own professional learning with creative ideas to design and carry out activities related to the second classroom. Different from the traditional classroom teaching mode, the second classroom as a platform for college students to grow up and become successful, taking students as the masters of spreading knowledge, students' independent planning, independent design, independent management, giving full play to students' positive initiative.

3.2 Design of Interest Groups

Through the people with similar interests to form their own team, the team as a whole selects professional instructors with BIM technology experience, in the university, the interest group to participate in the relevant disciplinary competitions, the practice of BIM technology throughout a series of engineering management courses offered, at the same time, relying on alumni resources, with the help of university platforms, with professional instructors as a technical guarantee, interest group The interest groups can receive projects

from companies and enterprises in the form of groups, and the companies and enterprises and the many BIM interest groups formally set up by the university have reached a two-way cooperation, in which the members of the groups get a share of the projects according to their technical contributions, improve their experience and get a sense of achievement. The instructors get a share of the profits and are also promoted in the assessment mechanism set up by the university. This second classroom mode enables the members of the interest group to enhance the efficient scientific synergy of engineering management courses in the role change of cooperation and confrontation, and lays a solid foundation for personal career development. At the same time, the instructors are diversely involved in the curriculum development and construction of the university.

3.3 How Interest Groups are Formed

The interest groups are conducted by outstanding professional teachers or enterprise experts as instructors, and students participate voluntarily [7]. Students participate voluntarily. A student with good professional foundation, strong learning ability and organisational ability, and a sense of responsibility is identified as the leader of the group through the designation of the teacher and the recommendation of the members, and is responsible for the daily liaison and management. The instructor, by means of occasional classes, discussions and tutorials, formulates programmes and tasks suitable for the students' interests and personal development, so that the students can gradually discover the joy of learning, and thus achieve proficiency in the application of professional skills. The teaching mode of interest group is a gradual process, roughly divided into several stages: the first stage, knowledge reserve. In the first year of university, through teachers' extracurricular lectures, group discussions and other ways, to stimulate students' interest in learning, popularise and deepen students' knowledge and mastery of the content of the selected group learning, and at the same time, to carry out basic training for the students enrolled in the BIM interest group to learn the knowledge and skills related to BIM, and to complete the learning objectives of this stage. The second stage, learning to use. In the

second year of university, under the premise that students have professional basic knowledge, instructors for each student's situation, regularly assign tasks or lead students to participate in real projects, set up the form of senior with lower grades, according to the number of members of the group in each grade to establish the group "one to one" or "one to many". The "one-to-one" or "one-to-many" model for the group is based on the number of members of each grade in the group. Meetings or seminars will be held on time so that teachers can follow up and evaluate the progress, identify problems, sum up experiences, assist students in internalising knowledge, and provide a platform for communication and demonstration so that students can experience a sense of achievement in learning. The third stage, continuation and enhancement. In the third and fourth years, students have the ability to study independently, during this period, the instructors select students with higher professional knowledge to serve as teaching assistants, on the one hand, to guide the group members to study and practice, and supervise the students to independently arrange the content of the study; on the other hand, to

mobilise the members of the team to seize the critical period of new student education in the form of publicity, lectures, etc., to recruit and absorb new members, so that new students will have a comprehensive understanding of the second classroom. On the other hand, the team members were mobilised to recruit and recruit new members in the form of publicity and lectures during the key period of freshmen's entrance education (as shown in figure 2), so that the freshmen could have a comprehensive understanding of the second classroom and know the rules, regulations and characteristics of the activities. With the assistance of the instructors, we will maintain the standardisation and continuity of the activities of the interest group through passing on, helping and bringing along. At the same time, the outstanding students in the group can be recommended to the enterprise tutor studio, various competitions, scientific and technological innovation, and professional teachers to assist in teaching and other activities for more in-depth study and practice, and constantly improve the students' professional ability and comprehensive quality. Provide more resource support for BIM interest group members.

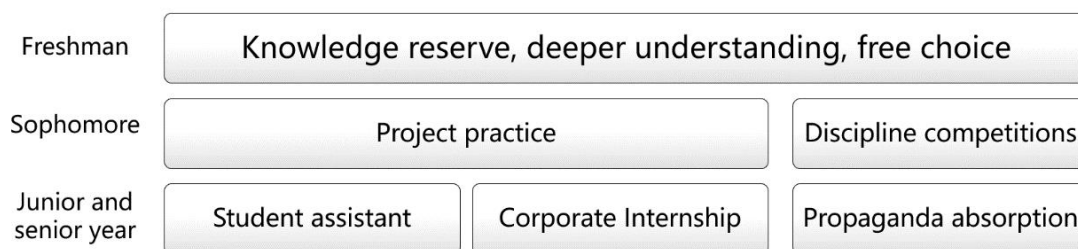


Figure 2. Focus of Group Activities by Grade

4. Content and Form of Interest Group Activities

4.1 BIM Technology Research and Practice Project

In the activities of the BIM Interest Group, the second classroom mode focuses on promoting the research and practice of BIM technology, and encourages group members to actively participate in various BIM technology projects in order to deepen their understanding of BIM and enhance their practical application ability. On the one hand, the interest group organises group members to participate in BIM

technology research projects. By participating in these projects, they will gain an in-depth understanding of the latest development of current BIM technology and learn about various innovative BIM application cases. Group members will have the opportunity to participate in the process of project research, data collection and analysis, as well as the presentation and evaluation of the final results; on the other hand, group members are encouraged to carry out hands-on BIM technology projects under the interest-driven group model. These projects will involve real building or infrastructure projects, and

participants will have the opportunity to experience first-hand the application of BIM technology in the design, construction and operation phases. The university platform and professional instructors provide the necessary training and technical support to ensure that each group member can effectively apply BIM technology to solve real-world problems and gain valuable practical experience.

4.2 Participation in BIM Technology Competitions and Events

Currently, there are a large number of BIM competitions in China, such as the "Intelligent Construction" competition to be held in 2019, the "Li Bing Award. Kaiming Cup" BIM competition held in Sichuan Province, the Sichuan Provincial Department of Education held by the college students BIM modelling competition, etc. In addition, there is the China Association for Construction Education sponsored by the major software companies to host the BIM series of competitions [8]. In addition, there are also BIM series competitions sponsored by China Construction Education Association and organised by major software companies. Strictly speaking, there are more than ten official discipline competitions with high level and popularity and wide participation in China every year. The organisers of discipline competitions generally have the participation of enterprises, which have a lot of contact with BIM application in actual engineering projects, so the requirements put forward in discipline competitions are closely related to engineering practice. The interest group encourages group members to participate in all kinds of BIM technology competitions and tournaments, in the form of a stable student team for on-campus and off-campus selection, through exchanges and competitions with other colleges and universities, the students can improve their technical skills, broaden their horizons, and accumulate experience for their personal development in the field of BIM.

4.3 Participation in School-enterprise Co-operation Projects

Interest groups can participate in enterprise-related BIM projects through the university-enterprise co-operation platform by using alumni resources [9]. Students have the opportunity to cooperate with enterprises and

participate in the implementation and management of university-enterprise cooperation projects. These projects are usually jointly planned by the college and the enterprises, and the group members will have the opportunity to participate in the programming, progress management and quality control of the projects. By combining the theoretical knowledge they have learnt with actual engineering and participating in the whole process of project management, the group members will exercise their project management ability and teamwork ability while feeling the value of BIM technology in actual projects for improving efficiency and reducing errors, cultivating the awareness and ability to cooperate with enterprises, and laying a solid foundation for future employment and entrepreneurship.

5. Evaluation and Improvement of Interest Groups

5.1 Regular Evaluation of Interest Group Activities

The university regularly evaluates the activities of the interest groups by holding regular meetings or organising questionnaires to assess the results and participation of the interest groups, the ability and results of the students in applying BIM technology, etc., to understand the performance and progress of the students in the practical projects, and to provide targeted feedback and guidance. When the university holds a conference or seminar, by letting the leaders of each interest group organise the reporting work and the instructors listen in, the teachers involved in the guidance of the interest groups in the university will negotiate and unify to determine the general theme of the reporting work, and after the report is explained, ask questions to the reporters or leaders of the group about the process of carrying out the work in order to assess the group's operation and management process, including the organisation of the meeting, the arrangement, the effectiveness of information dissemination and communication, and the effectiveness of the group's operation and management process. After the explanation of the report, questions are asked of the reporter or group leader to assess the operation and management process of the group, including the organisation and arrangement of meetings,

the effectiveness of information dissemination and communication, etc., so as to ensure the authenticity and scientificity of the entire work process and the content of the work, and to require the group leader to make timely adjustments and improvements to the organisation and management through the identification of problems [10].

Colleges and universities are assessing the extent to which the team members' knowledge of BIM and skill levels have increased. This can be assessed through individual reports, project presentations or knowledge quizzes. Based on the assessment results, members' progress is determined and feedback and guidance is provided in a targeted manner. Secondly, assessing teachers need to evaluate the extent to which interest group activities have improved communication and co-operation skills among members. This can be assessed by observing the interactions during group discussions and project co-operation, as well as the quality of the presentation of results. Through the assessment, problems such as poor communication and insufficient co-operation can be identified and resolved, and appropriate guidance and training can be provided.

Finally, interest group instructors or reviewers can give students positive feedback and guidance based on the assessment results, helping them to identify shortcomings and make improvements. At the same time, they can also plan personal development pathways for students and provide personalised learning advice based on students' interests and potentials [11]. The following are some examples of how this can be done.

5.2 Removal or Restructuring of Interest Groups

For BIM technology interest groups with long-term development difficulties, universities may consider removing the instructor in charge of the group or adjusting the group members in order to promote the development of the interest group and students' learning outcomes. If, after a long period of evaluation and improvement, serious problems with the interest group are still identified, the college will consider removing or restructuring the interest group. This may include changing leaders, redeploying members, revisiting the objectives and size of the interest group, etc. In

implementing this decision, the HEI will communicate fully with group members to ensure that the restructuring process is fair and transparent.

6. Conclusion

As a new generation of engineering students, proficient mastery of BIM technology is a requirement of the times put forward by the changes in the field of construction, and the learning and application of BIM technology is increasingly coming into the vision of the education and teaching system of colleges and universities to cultivate engineering management majors to cultivate relevant talents. Here, by combining BIM technology with the interest group-driven second classroom mode, we set up interest groups under the second classroom mode in colleges and universities, clarify the activities carried out by the groups, evaluate the activities of the interest groups on a regular basis, provide feedback and guidance, and remove or adjust the interest groups as needed in order to improve the effect of the interest groups. Through these measures, colleges and universities will continue to improve the activities of the interest groups and increase the participation and learning effect of the members. The mode is still in the exploration stage, and it is still necessary to further promote the concretisation and diversification of the activities under the second classroom mode, so that the second classroom can fully make up for the insufficiency of the teaching practice of the colleges and universities under the traditional first classroom, so as to realise the accumulation of practical experience of the BIM technology by the school students, and to guide the teachers in the BIM course teaching and development, civil engineering and construction enterprises to absorb BIM technology professionals win-win situation.

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