Progress of Land Engineering Discipline and Comparative Study on Teaching Methods

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Abstract This paper introduces the origin and development of land engineering. Taking the course *Introduction to Land Engineering* as an example, this paper makes a comparative analysis of the teaching effects of traditional teaching method and task-driven teaching method. The results show that the task-driven teaching method is more suitable for the teaching task of land engineering, the students' learning effect is remarkable, and the degree of realization of teaching goal is high.

Key words Land engineering discipline, Teaching method, *Introduction to Land Engineering*, Comparative study

1 Introduction

Land is not only the source of food, the foundation of our living place, but also the important material basis for human survival and development. As an important part of the earth ecosystem, land plays a vital role in maintaining the virtuous cycle of the ecosystem[1]. However, due to the lack of systematic theory and technical support, low entry threshold, low technical content and lack of professional and technical personnel in the land engineering industry, it is difficult to guarantee the quality of the newly added cultivated land for land consolidation, and it is impossible to fully realize that "construction projects do not occupy or occupy less cultivated land, especially high-quality paddy fields". Therefore, there is an urgent need to carry out the discipline construction of land engineering, train professional and technical personnel of land engineering, and guide and support the practice of land engineering construction. Shaanxi Provincial Land Engineering Construction Group has long carried out work on the treatment of different types of contaminated land, such as sandy wasteland, saline-alkali land, abandoned residential land, industrial and mining wasteland. Through the accumulation and refinement of practical experience in land engineering projects for many years, it has established a complex discipline system that integrates scientific theory, engineering technology and project implementation management, and realizes that land engineering is not only engineering construction, but also a comprehensive and practical discipline. At the same time, the scientific research team led by researcher Han Jichang first put forward the idea of establishing a first-tier discipline of land engineering, and successively edited and published monographs such as *Introduction to Land Engineering*, *Foundation of Land Engineering*, and *Principles of Land Engineering*.

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This provides a basic theoretical basis for the development of land engineering discipline. In March 2017, the Ministry of Education approved the establishment of a new land consolidation engineering major (undergraduate) in Chang'an University, thus forming a complete training system of land engineering from bachelor's degree to master's degree to doctor's degree. On this basis, the state will further promote the construction of the discipline system of land engineering, hoping to make it a national first-level discipline with the joint efforts of universities and enterprises from all walks of life.

2 Brief introduction to the course *Introduction to Land Engineering*

The discipline of land engineering aims to emphasize the combination of theoretical knowledge and practice, and the corresponding course teaching should also be targeted and practical. *Introduction to Land Engineering* is a basic application course for land engineering majors. The purpose of this course is to foster students' ability to comprehensively cultivate the basic knowledge of land engineering, the principles of land engineering and other courses on the basis of mastering scientific theory, engineering technology and project implementation management. However, in the actual teaching process, due to the limitations of various conditions, domestic colleges and universities still use the traditional teaching method for teaching. This is not good for the cultivation of students' practical ability and professional quality[2]. If we simply accumulate and repeat professional knowledge, it will not only dampen students' enthusiasm for learning, but also lose the practical significance of the subject. Therefore, the traditional course teaching model is not suitable for the teaching of land engineering. Therefore, after consulting a lot of literature, it is considered that no matter from the perspective of teaching goal or teaching mode, task-driven teaching method is more helpful to cultivate students' interest in learning, practical ability, innovative spirit, unity and coopera-

tion ability and the ability to combine theory with practice. Through the examples of course teaching, this paper will prove the applicability of task-driven teaching method in the teaching of land engineering.

3 Brief introduction to task-driven teaching method

Task-driven teaching method is a new teaching method based on the learning theory of constructivism. It is separated from the traditional teaching method and transformed into an interactive teaching method which focuses on accomplishing pre-set tasks. It requires teachers to have clear tasks to reflect teaching goals in the process of classroom teaching, so as to enable students to explore and learn in the discussion with real tasks. This teaching method can further stimulate students' interest in learning, further master knowledge in the process of completing tasks independently, and apply what they have learned, so that students can change from passive acceptance to active creation[3]. In the domestic teaching practice, the task-driven teaching method has a lot of tentative practical research in the courses of sediment dynamics, engineering drawing, computer operation and so on. Among all the courses of land engineering major, the course *Introduction to Land Engineering* has its distinct characteristics, highlighting the cultivation of students' professional knowledge theory and application ability. However, it is difficult for traditional teaching method to achieve this teaching goal. The main reason is that the professional theory involved in the course is more complex, there are many empirical parameters, and the students think it very boring. Therefore, based on the characteristics of the discipline and the teaching objectives of professional courses, this practical teaching study intends to use the method of comparative research, to prove that the task-driven teaching method will achieve better teaching results in the teaching of land engineering.

3.1 Implementation process of teaching method The traditional teaching method is adopted, namely the teaching idea of "the teacher to explain, the students to listen, and the teacher as the main body". The teaching flow chart is shown in Fig. 1. The lecturer can adjust the teaching content timely according to the existing teaching conditions or the situation of the students, and let the students have a deep impression on the professional knowledge through the wonderful explanation. However, this method will make students mistakenly think that as long as they listen carefully, they can master professional knowledge, resulting in serious dependence and expectation, so that their thinking may completely follow the lecturer. In this way, the problems encountered in reality will be ignored, resulting in the disconnection between knowledge transfer and ability development. Besides, the task-driven teaching method is adopted, and the basic idea of this course is "project selection-task definition-task completion-task evaluation". A brief summary is that the lecturer first classifies the content of each course and assigns it to the students in advance after forming different tasks, so that the students can consult the relevant materials independently and complete them on their own. Secondly, in the classroom teaching, students are the main body, who introduce the completion of the task, interact with teachers and evaluate each other. Finally, it is summarized by the lecturer, and the leaks and gaps of the missing knowledge are checked and filled. The teaching process of task-driven teaching method is shown in Fig. 2.

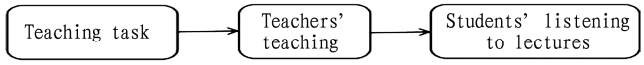

Fig. 1 Traditional teaching flow chart

Taking the course *Introduction to Land Engineering* as an example, the task-driven teaching method is adopted this time. The teaching content is "technology related to land engineering", which mainly refers to the basic theories of various construction techniques involved in the construction of comprehensive land consolidation. It includes some basic theories such as surveying and mapping, land engineering, irrigation and drainage, roads, bridges and electric power construction. It involves a wide range of knowledge and strong expertise, and is the most representative in the discipline of land engineering. Before the course, the teaching task is divided into six items according to the above teaching flow chart.

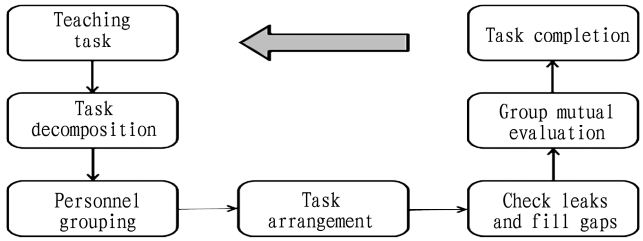

Fig. 2 Teaching flow chart of task-driven teaching method

The details are as follows: (i) Surveying and mapping technology foundation: Basic surveying techniques and methods, digital mapping. (ii) Land engineering basis: Soil technical parameters, farmland leveling and earthwork calculation. (iii) The basis of soil formation technology: Mass balance method, Barth model method, Sr isotope ratio method and other soil formation rate methods. (iv) The basis of irrigation and drainage technology: Calculation of crop water demand, calculation of irrigation water consumption, calculation of irrigation water flow, calculation of available water supply for diversion irrigation project, calculation of water head loss of pipeline, calculation of water logging drainage discharge, calculation of drainage discharge of subsurface water. (v) Road (bridge) technical foundation: Road bend widening calculation, flooded bridge height calculation, arch ring thickness calculation, bridge aperture calculation. (vi) The technical basis of power engineering: Voltage loss calculation, wire section calculation, insulator safety factor calculation, distribution transformer capacity calculation. Based on the above six contents, it is planned to divide the students into six groups. The course content is randomly assigned to ensure that one group is assigned at least one task. At the same time, each team can also choose the other 1 – 2 tasks to complete. The teaching tasks of the six groups

are statistically analyzed as shown in Table 1 below.

Table 1 Statistical table of six groups of teaching tasks

Group	Surveying and mapping	Land engineering	Soil formation	Irrigation	Road	Electric power
1	1			1		
2			1			1
3	1	1				
4		1			1	
5	1			1		
6	1					1

It can be seen from Table 1 that students are more interested in surveying and mapping, land engineering, electric power and other subjects. The content of these subjects is more practical, and every student can participate in it. Therefore, through the decomposition and arrangement of the teaching content, the task-based teaching method can help to clearly understand where the students are interested in the teaching content. This is also very beneficial for the lecturer to choose the focus of the lecture. Task-driven teaching method requires that at the beginning of the course, each student in the group should participate in the explanation of the selected task, which is randomly selected by the teacher. The whole process requires students not only to think independently, but also to practice on their own, and pay attention to both the quality and speed of the task, without limiting the method of completion at the same time. It should be emphasized that grouping is not immutable. Teachers can change the members of the group from time to time, and they can learn from each other to make up for our weaknesses in the process of cooperation and make progress together. Generally speaking, it is not necessary to specify the specific extent to which the task of the group is completed in advance, otherwise, it is easy for each team to complete the task only according to the prescribed problems, thus reducing thinking and making the task smaller. It should not be completely limited, otherwise it will cause each team to face too many tasks to complete all the items in the task, and the completion effect is not good. Therefore, it is necessary for the lecturer to list the key points and difficulties in each task in advance, so that students can distinguish the different priorities of each task and think more clearly when they complete it. By using the task-driven teaching method to decompose and arrange the teaching tasks, the six groups are basically able to complete the specified tasks on time.

3.2 Comparative analysis of teaching effect Classroom teaching effect is an index to evaluate the completion of course teaching tasks. It is generally reflected in two aspects: one is the students' classroom learning status, and the other is the students' learning effect. The state of classroom learning is as follows: (i) Whether you can use both hands and brain to actively collect, share, and understand new knowledge. (ii) Whether you think independently, have the courage to practice, draw lessons from others, and master and apply knowledge flexibly. (iii) Whether you dare to speak, accept criticism, listen to and accept the opinions of others. (iv) Whether you can work as a team, dare to take responsibility, help and learn from each other. The evaluation of learning effect is reflected in four aspects: (i) Students' evaluation of the course, such as whether the learning effect is significant, whether the classroom atmosphere is active. (ii) Mastery of professional knowledge and skills. (iii) Whether students have the ability to use professional knowledge to solve practical problems. In order to compare the teaching effect of the two teaching methods more clearly, in view of the above content, this study chooses the actual situation of attendance, student participation, learning enthusiasm, classroom evaluation, teaching effect and student evaluation to analyze, as shown in Table 2.

Table 2 Comparison of teaching effects between task-driven teaching method and traditional teaching method

Items for comparison	Task-driven teaching method	Traditional teaching method
Student attendance rate	98%, absence will affect the team performance, and the team performance is linked to the final grade	70%, students only as individuals
Student participation	100%, every member of the team is required to participate in the task explanation	30% -40%, the teacher as the main body of the class
Learning enthusiasm	Active, with students as the main body of explanation	Not active, the learning atmosphere is rigid
Classroom evaluation	85 points and above (85%)	85 points and above (55%)
Teaching effect	Excellent, high degree of student participation	Average, not high interaction between teachers and students
Student evaluation	Excellent, learning effect is obvious	Average, the degree of fit between teachers and students is not high

Through the analysis of Table 2, it is easy to conclude that the teaching effect of task-driven teaching method has outstanding advantages in all comparative items, especially in terms of student attendance. In the traditional teaching method, students only represent themselves, and the subjectivity of the attendance is strong, which cannot effectively guarantee the classroom attendance rate. In fact, even if call-over in the classroom is adopted, it is difficult to guarantee a 100% attendance rate, especially when there are more students. It not only takes time and efforts, but also weakens students' initiative. After adopting the task-driven teaching method, the attendance rate fluctuated around 98%, which increased significantly. The main reason is that each student after the grouping is a member of each group, has its own task, and needs to participate in it in person. This requires every student to have a strong sense of cooperation. The absence of any team member will affect the team performance, as well as the final exam results. So students have a restrained mentality, and will come to class on time when there is no special circumstance. In terms of student participation, the student participation in the traditional teaching method is low, which is related to the traditional teaching process. It is mainly to listen to the teacher's explanation, even if they encounter difficulties, most students choose to

be silent, resulting in the psychology of relying on the teacher's answers. After adopting the task-driven teaching method, every member of the group has to participate in the task explanation, and the participation of students is greatly increased. It is not only the teachers standing on the podium, the learning atmosphere has become active, and the learning enthusiasm has also been significantly improved.

Finally, through the investigation of the students involved in the research, they generally speak highly of the task-driven teaching method. They believe that compared with the traditional teaching method, task-based teaching method improves the initiative of learning. When they encounter difficult problems, they will take the initiative to search for information, which in itself is a way to cultivate learning ability. Second, it cultivates the ability to find and solve problems. In the process of solving the problem, they also learned a variety of cutting-edge knowledge related to the course. Third, it strengthens the sense of unity and cooperation among students and strengthens the cohesion.

4 Conclusions and discussions

Taking *Introduction to Land Engineering* as an example, this study applies task-driven teaching method and traditional teaching method to classroom teaching. The results show that compared with the traditional teaching method, the task-driven teaching method has obvious advantages. Whether in terms of students' attendance rate, participation or learning enthusiasm, it is better than the traditional method. Besides, it also reflects that the teaching is student-oriented, realizes the concept of quality education, and fully demonstrates its superiority in the teaching of land engineering. However, there are several points that need to be paid attention to. First of all, the classroom tasks should be evenly distributed in terms of important and difficult points. Second, the assignment of tasks should not be too rigid or too flexible. It is necessary to arouse the enthusiasm of students as much as possible and give full play to the spirit of group cooperation. Finally, when the students become the main body of the classroom, the lecturer should also pay attention to controlling the classroom schedule. In the explanation, when students encounter problems, the lecturer should give guidance, remind and correct them in time.

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