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Exploration of Three Stage Task Driven Interactive Teaching for Internalization of Undergraduate Knowledge

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Abstract

With the increasing demand for undergraduate knowledge construction and application abilities in society, the traditional teaching methods of teacher explanation and student discussion in undergraduate education are difficult to cultivate students' practical abilities through knowledge internalization. This article is based on the idea of task completion driven knowledge construction and internalization, and proposes to construct a three stage teaching model based on task driven teaching method, which includes teacher design and student decomposition, and mixed and interspersed large and small tasks before, during, and after class. Through the undergraduate course 'Big Data Security Technology', a comparative experiment was conducted between classes using this teaching method and classes using traditional teaching methods. Through the display and inspection of students' initiative, enthusiasm, and learning outcomes during the learning process, the results showed that task-driven teaching method not only enhances the initiative and enthusiasm of college students in learning, but also enhances their initiative in knowledge internalization.

Keywords

Task driven; Task design; Teaching design; Teaching application.

1. Introduction

Task driven teaching method is a teaching method that enables specific teaching tasks to become the driving force or motivation for students' learning, thereby driving the learning process of students through the completion process of tasks, and presenting teaching results through the display of task results [1]. Constructivist learning theory emphasizes that students' learning activities must be combined with problems or tasks in a certain problem context. By exploring tasks to guide and maintain students' learning interest and motivation, students have more autonomy in learning [2]. In learning activities, teachers are organizers, guides, and helpers in the teaching process, no longer in a dominant position, to cultivate students' ability to learn independently and collaborate with each other.

2. Theoretical Framework

2.1. Create a scenario and propose tasks

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Teachers introduce examples from daily life and vividly express the concept of "container technology". To arouse students' curiosity, the teacher then throws out tasks and asks them to analyze their respective tasks. Regarding the content of the "container technology" lesson, compare the concept of "container" in the computer field with the containers that students are exposed to in daily life, and allow students to transfer their knowledge of containers to the "container technology" of computers through daily contact. Under the existing knowledge of

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containers, students have a certain curiosity about the concepts and knowledge related to container technology and begin to actively seek relevant knowledge.

the Container Technology course tasks see Table 1.

Table 1. Task List

objectives	Enable students to learn and understand container technology
task requirements	Require students to actively collect learning resources and solve corresponding tasks through exploratory learning, such as reading books, searching the internet, and interacting with classmates
task decomposition	1. Concept of container technology 2. Characteristics of container technology 3. Deployment of containers 4. Security attacks on containers 5. Application Container Specification

2.2. Group discussion and data collection

Teachers provide academic papers, e-books, some technical codes, and other teaching resources related to teaching tasks to help students solve the time spent searching for resources, clarify learning ideas, and guide students to complete learning tasks[3]. In class, group members exchange information they have collected before class, and then divide and provide detailed answers based on the tasks.

2.3. Cooperation and communication, completing tasks

During the process of completing tasks, teachers and students, as well as students and students, can communicate with each other to better complete the tasks. Each subtask is a part of the overall task, and there is a correlation between tasks. Through cooperation, communication, and resource sharing, students can better and more effectively complete tasks. Each student has their own unique understanding of tasks, achieving collision of ideas during communication, and adding a new direction to their thinking. The tasks between groups are not the same, and when communicating between groups, students can expand their existing knowledge and obtain complete container technology knowledge with the help of other classmates. Teachers conduct inspections during the process of students completing tasks, helping students in difficulty find ideas and guiding them to solve problems.

2.4. Presentation of results, multiple evaluations

After completing the task, students will showcase their learning outcomes and need to evaluate them. The process of students watching this group and other group presentations is also a process of learning from each other. During this process, the teacher and group leader will evaluate each student presented. The evaluation includes two aspects: the mastery of professional knowledge and skills, and the cultivation of general abilities. In terms of professional knowledge and skills, it mainly examines students' mastery of knowledge points; General abilities focus on examining students' learning attitudes, cooperation and communication abilities.

3. Experimental Design of a Three Stage Task Driven Teaching Method

The purpose of this experimental design is to test students' mastery of knowledge and acceptance of task driven teaching methods. In the experimental design, the teacher will prompt students to focus on the content they need to master through task lists, and promote students' learning initiative and enthusiasm by organizing their learning and discussion. The

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three stage task is gradual for students and can guide them to constantly reflect on the knowledge they have learned.

3.1. Experimental Design and Sampling

3.1.1. Quasi experimental mode

The study adopts a combination of non peer group quasi experimental design and questionnaire survey methods. There are four free classes in the experimental group and the control group, each taught by two teachers on the same course. This course consists of 16 weeks and 32 class hours. The first 13 weeks were taught using traditional teaching methods, while the 14th week was devoted to container technology (27, 28 hours). The control group was taught using the original method, while the experimental group was taught using the task driven teaching method mentioned above. After the end of Lesson 28, a survey questionnaire will be distributed in the experimental class to investigate students' attitudes and acceptance of task driven teaching methods.

3.1.2. Description of experimental and control groups

The selected experimental subjects were students from four parallel classes in the 19 year old big data major of a certain university. 1. Class 2 is the control group, with a total of 149 students; 3. Class 4 is an experimental class with a total of 148 students. The majority of students in the experimental and control groups are from their third year of university. Among them, 98.6% of the third year students in the experimental group and 97.3% of the third year students in the control group, while the other students are all senior students who need to retake courses.

3.1.3. Content Selection and Teachers

The two classes are taught by two teachers with years of teaching experience. Prior to the implementation of this task driven teaching method research, neither teacher used task driven teaching method in their teaching.

The two classes use the same textbook, and the teaching progress is completely the same. The 27th to 28th classes using task driven teaching method cover the content of "container technology".

3.2. Measurement of teaching effectiveness

3.2.1. Survey questionnaire

To analyze the teaching effectiveness of task driven teaching method and traditional teaching method, a questionnaire survey was conducted on students. The survey questionnaire was designed by Xiaoxiang Huang [Xiaoxiang Huang,2020], specifically to understand students' psychological activities and analyze teaching effectiveness. The questionnaire consists of twelve questions, scored using the Likert 5-point scale. The higher the score, the better the student's learning effectiveness. The reliability of the questionnaire was analyzed using SPSS software, and the result coefficient reached 0.74, indicating that the questionnaire has good reliability. The Bartlett spherical test was conducted on the test data of 12 items in the questionnaire, and the results, showed that the consistency of the questionnaire was ideal.

3.2.2. Teacher and student evaluation

The teacher and team leader in the presentation section use a designed evaluation form to evaluate each student. The teacher evaluation form mainly examines five aspects of students, namely knowledge mastery, development of thinking ability, problem-solving ability, cooperative communication, and learning attitude. The specific content see Table 2.

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Table 2. Teacher Evaluation Form

Rating Elements	weight	A	B	C	Teacher Evaluation
Knowledge mastery	20%	Master basic knowledge and be able to complete deformation and expansion exercises.	Master basic knowledge and be able to complete a moderate amount of demanding assignments.	Master basic knowledge and complete basic exercises.	
Development of thinking ability	20%	Possess divergent and comprehensive thinking abilities.	Have the courage to question and the ability to think independently.	I can only think in a fixed pattern.	
Problem solving ability	20%	Able to solve problems through multiple solutions.	Basically able to independently solve problems.	Only through cooperation can problems be solved.	
Cooperation and exchange	20%	Good at cooperating with others, assertive, humbly accepting the opinions of others.	Ability to work with others and accept other people's opinions.	Lack of cooperation and stubbornness.	
Learning attitude	20%	Attend class seriously and actively participate in class activities.	Listen carefully in class and occasionally participate in class activities.	I don't care to listen to lectures and rarely participate in class activities.	

The student evaluation form is mainly completed by the group leader, which examines the completion of students' tasks and the cultivation of general abilities, see Table 3.

Table 3. Student evaluation form

Evaluation indicators		Evaluation criteria	score	
Professional knowledge	Knowledge Point 1	Understand the concepts and characteristics of container technology	10	123
	Knowledge Point 2	Understand the principles of container technology	10	644
	Knowledge Point 3	Understand container security	10	649
	Task completion	Performance of task completion	30	
General competency development	Moral self-discipline	Be disciplined and don't be late or leave early	10	
	Learning attitude	Be proactive and not afraid of difficulties	10	
	Team division and cooperation	Have a collective spirit and be willing to accept tasks and complete them	20	
		total	100	

4. Exploratory Analysis of Experiments

4.1. Evaluation of teachers and students

According to the above evaluation table, the teachers and students of the experimental class evaluate the learning results of the experimental class respectively and examine the students' mastery of knowledge. The total score for teachers and students is 100, with a score of 90 or

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more as excellent, 70-89 as good, 60-69 as pass, and below 60 as unqualified. Faculty ratings are averaged by teachers and graduate assistants together, and student ratings are averaged by group leaders. Most of the students were able to complete the task, and 7 students in the teacher evaluation and 24 in the student evaluation performed well, indicating that the overall learning effect was better. In the learning pot display session, students can show their learning results through PPT, code and other forms. In the process of speaking, many students express themselves fluently and think clearly, which indicates that students' learning confidence and expression ability have also improved in the process of completing tasks. Of course, some problems were also found in this link: some students have a more superficial understanding of knowledge, and students who focus on theory do not apply knowledge enough. Some students have a thorough grasp of knowledge, but they cannot fully express it in the presentation session. Overall, students use task-driven pedagogy to effectively promote knowledge assimilation.

4.2. Analysis of questionnaire results

A total of 123 questionnaires were issued in this experiment, including 99 valid questionnaires and 24 invalid questionnaires, with an effective rate of 80.4%. According to the experimental design, the students' mastery of learning objectives and classroom experience were mainly analyzed in the research process, and the questionnaire and results see Table 4.

Table 4. Course questionnaires and results

serial number	issue	Option/Percentage (strongly disagree/disagree/not necessarily/agree/strongly agree)
1	The task-driven approach allows me to continuously learn and improve my proficiency in knowledge	19.19%/53.53%/30.30%/6.01%/1%
2	I was able to take the initiative to preview the content of this course before class	37.37%/35.35%/32.32%/7.07%/2%
3	To be able to promote my understanding and mastery of knowledge	24.24%/42.42%/20.20%/3%/0
4	It has increased my enthusiasm for actively participating in class activities	28.28%/37.37%/28.28%/5.05%/1%
5	Being able to help me think for myself	31.31%/44.44%/20.20%/4.04%/1%
6	It allows me to have more communication and interaction with my classmates and teachers	39.39%/30.30%/24.24%/6.06%/0
7	Being able to find ways to get things done	40.40%/42.42%/14.14%/3.03%/0%
8	It allows me to pay more attention to the teacher's explanation	29.29%/37.37%/26.26%/6.06%/1%
9	Be able to gain the joy of knowledge during the lesson	24.24%/43.43%/22.22%/6.01%/1%
10	It makes me feel that knowledge is more useful	37.37%/37.37%/24.24%/3%/2%
11	Let me enjoy the classroom more	37.37%/35.35%/32.32%/7.07%/2%
12	I would like to use this method for future courses	33.33%/32.32/20.20%/10.10%/4%

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(1) Mastery of learning objectives

This dimension mainly examines students' understanding and mastery of the three knowledge points in the professional knowledge in Table 3 from the three levels of knowledge skills, classroom interest and problem solving.

The knowledge and skills level consists of questions 1, 3 and 10 of the questionnaire, and the classroom interest aspect mainly examines students' interest in task-driven pedagogy, which consists of questions 4, 6, 8, 9 and 11 of the questionnaire. Problem-solving focuses on the improvement of students' problem-solving skills, which consists of questions 5, 6 and 7 of the questionnaire. According to the survey results, most students believe that task-driven teaching methods can greatly promote their learning. After receiving the task, students can take their tasks seriously, through consulting literature, flipping through books and other ways, understand the relevant concepts of container technology, understand the principle of container technology, in addition, some students have made certain attempts on the code implementation of container technology, although the process is a little tortuous, but finally with the help of teachers are still realized. This shows that students are able to grasp the basic concepts and principles of container technology through self-study through tasks and interaction with teachers, and are willing to explore knowledge beyond the content of individual tasks. In the process of completing the task, students have tried a variety of means, a variety of learning styles, and their problem-solving skills have improved.

(2) Classroom experience

The classroom experience mainly examines whether students accept the task teaching mode, and this dimension is mainly composed of questions 11 and 12 of the questionnaire. Most students are sympathetic to the task-driven approach and are happy to try it again in their future studies.

Through the questionnaire analysis, it can be seen that the implementation of task-driven teaching method has a great effect on students' mastery of knowledge and skills, classroom participation and problem solving. It also improves the classroom experience of students to a certain extent, and they are more inclined to task-driven teaching methods than traditional teaching. Of course, in this process, some problems were also found: some students think that their understanding and mastery of knowledge is not enough, and the entire knowledge point is divided into several small tasks, which is not conducive to the integration of students' knowledge, and the understanding of some knowledge points is not thorough enough.

The implementation effect of task-driven teaching method in container technology courses was evaluated from two aspects: teacher-student evaluation and after-class questionnaire distribution. Through the collation and analysis of data, it can be found that information technology courses are highly updated and integrated, require continuous learning, and task-driven teaching methods can allow students to actively and continuously learn in the form of completing tasks. This learning mode can improve students' learning initiative and interest in learning, and has a good guiding effect on the mastery and application of knowledge. Students are more willing to experiment with task-driven pedagogy than traditional classrooms; Through task-driven teaching, teachers have found that they can improve students' enthusiasm and initiative in learning, but the knowledge points learned by students are scattered, and teachers need to help students organize systematically.

However, the experiment still has some shortcomings. First of all, in the selection of experimental subjects, the form of natural classes is adopted, and the differences between experimental subjects cannot be well controlled. Secondly, in the task design, the difficulty is still not well grasped, and some tasks are more difficult for students with a weak foundation in the subject. There are fewer task-driven teaching courses, and some students may show strong motivation and expression out of novelty.

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5. Conclusion

This paper discusses the theoretical framework of the three-stage task-driven teaching model and sets up controlled experiments. In the control experiment, the experimental group used task-driven teaching method in the content of "container technology", and the control group used traditional teaching methods. Through comparison, it is found that the task-driven teaching method is effective in the teaching of computer education in universities, and in this teaching mode, students are more willing to explore knowledge in depth. Compared with traditional teaching methods, task-driven teaching methods can arouse students' interest in learning, promote students' understanding of knowledge, and the classroom effect is good, and students' ability to take the initiative to solve problems is improved. However, the time consumption is relatively large, and experiments have proved that the task-driven teaching method is effective for classroom teaching of undergraduate engineering majors, and students can also accept the task-driven method in the classroom.

6. Author Profile

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