THE EFFECTS OF TASK-DRIVEN TEACHING METHOD TO STUDENTS' LEARNING OUTCOME ——TAKING THE "MECHANICAL CAD/CAM" COURSE OF SHANDONG UNIVERSITY OF ENGINEERING AND VOCATIONAL TECHNOLOGY AS AN EXAMPLE

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6317195914

AN INDEPENDENT STUDY SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE MASTERS DEGREE OF BUSINESS ADMINISTRATION GRADUATE SCHOOL OF BUSINESS SIAM UNIVERSITY

2022

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This Independent Study has been Approved as a Partial Fulfillment of the Requirement of International Master of Business Administration in Education Management

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Title: The Effects of Task-driven Teaching Method to Students' Learning Outcome----Taking the "Mechanical cad/cam" Course of Shandong University of Engineering and Vocational Technology as an Example

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Degree: Master of Business Administration

Major: Education Management

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.......27 /...............7.........../...........2023..........

ABSTRACT

This study is aimed to study the effects of task-driven teaching method to students' learning outcome——Taking the "Mechanical CAD/CAM" Course of Shandong University of Engineering and Vocational Technology as an example. The objectives of the study were: 1) To verify there is a positive effect on students' participation and performance after apply the task-driven teaching method; 2) To verify there is a positive effect on students' autonomous learning ability after apply the task-driven teaching method; 3) To verify there is a positive effect on students' interest and attitude after apply the task-driven teaching method.

This paper adopts the quantitative research method, through the review of the existing research results, combined with the learning effect pyramid theory, presentism theory, and motivation achievement theory analysis, 81 students of the School of Intelligent Manufacturing of Shandong University of Engineering and Vocational Technology were conducted. The result founds that: 1) there is a positive effect on students’ participation and performance after apply the task-driven teaching method; 2) there is a positive effect on students' autonomous learning ability after apply the task-driven teaching method and 3) there is a positive effect on students' interest and attitude after apply the task-driven teaching method.

Keywords: task-driven teaching method, mechanical cad/cam, learning effects, instructional design

Acknowledgements

I would like to express my deepest gratitude to my advisor, for his invaluable guidance, support, and encouragement throughout my independent study. His insightful comments and constructive criticism have significantly improved the quality of my work.

Additionally, I am grateful to Associate Professor Dr. Jomphong Mongkhonvanit, Dean, Graduate School of Business, for his support and encouragement throughout my studies. His dedication to the graduate program and commitment to excellence have inspired me to strive for academic excellence.

Finally, I would like to extend my appreciation to all the faculty members and staff of the Siam University who have contributed to my growth and development as a student. Their unwavering support and encouragement have been a source of inspiration and motivation tome.

Declaration

I, Fang Liwen, hereby certify that the work embodied in this independent study entitled "The effects of task-driven teaching method to students' learning outcome----Taking the "Mechanical cad/cam" Course of Shandong University of Engineering and Vocational Technology as an example" is result of original research and has not been submitted for a higher degree to any other university or institution.

Fang Liwen

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JUN 28, 2023

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Chapter 1 Introduction

1.1 Research Background

At present, we are in an era of rapid economic and technological development, society is changing rapidly, and the standards for talents are constantly changing. Nowadays, people can no longer solve various problems in work and life only by relying on the knowledge they have learned in school. In order to achieve better development in the future society, people must realize the importance of independent learning and lifelong learning (Wu, 2021).

The book "Learning to Survive" published by UNESCO emphasizes the importance of learning to learn. The book points out: "The illiterate in the future is not the illiterate people, but the people who have not learned how to learn." It can be seen that the self-learning ability has already It has become an indispensable ability for human beings to survive in today's world, and a person's lifelong learning also depends on individual independent learning (Luo, 2010). In other words, what the world needs today are innovative talents with a sense of independent learning and a sense of win-win cooperation. The famous educator Mr. Tao Xingzhi also said: "A good teacher does not teach or teach students, but teaches students to learn" (Sang, Li., & Xie, 2013).

Therefore, what teachers pay attention to is not only knowledge and skills but more importantly, cultivating the ability to help students better adapt to social changes, specifically, the ability to learn independently. Only when students learn how to learn can they achieve the goal of lifelong learning (Xu, 2014).

Classroom teaching is a systematic practical activity guided by a certain educational philosophy. It is structured. The classroom teaching structure is the way of organizing teaching content, teaching media, teaching methods, teachers and students, etc (Ye, 2016). The traditional classroom structure is based on the class teaching system, emphasizing the main role of teachers, generally adopting the method of teaching first and learning later, and students are in a passive state in this process (He, 1997). In recent years, the new curriculum reform has become a hot word in my country's education circles, and education reform experiments are being carried out all over the country. The new curriculum reform not only emphasizes the innovation of specific teaching methods and methods and teaching materials but also emphasizes the innovation of abstract ideas and concepts. Changes in the teaching structure are imminent (Wu, Yang, & Hao, 2019).

The ultimate goal of teaching reform is still classroom teaching. How to reflect on "improving students' comprehensive professional ability", "cultivating students' future job competency" and truly realizing "student-centered" in professional classroom teaching is the need in the reform process. Questions for Further Exploration and Discussion (Wu, 2011). Based on the requirements of the new curriculum reform, our basic education classrooms should focus on students, be student-centered, focus on cultivating students' learning ability and creativity, and provide students with a good learning environment and rich learning resources to support students' active learning. , independent learning, and discovery learning, then the new classroom teaching structure is bound to emphasize the student's dominant position, active class status, and learning methods such as learning first and teaching later (Yu, & Hu, 2015).

As the leading major of Shandong University of Engineering and Vocational Technology, the mechanical major must set an example and classroom teaching must be reformed. However, in the study of mechanical majors, students still carry out traditional classroom learning, which makes the learning efficiency low and the learning effect poor (Lu, 2013). "Mechanical CAD/CAM" for higher vocational colleges is a software course with strong theoretical and practical features. At present, the teaching mode adopted by most teachers is still teaching by lecture method, or using multimedia teaching management software to demonstrate and assist computer practice (Sun, Cheng, & Zhu, 2015). However, students often sit scattered in the back rows, focusing on their affairs, lacking the necessary attention and attention, and lacking the necessary "attraction" and "attraction" to the classroom. This teaching method is difficult to stimulate students' interest in learning, and it is not conducive to giving full play to students' subjective initiative and is not conducive to students' understanding, innovation, and application of basic knowledge and basic skills (Liu, 2013). In other words, the traditional classroom learning model has become incapable of learning professional knowledge. Difficult to cover required content with limited classroom time alone, and Unable to adapt to the high requirements of modern industry for professional ability (Gao, 2014). Therefore, to meet the country's requirements for professional talents, schools must change the learning mode, develop diversified learning methods, and improve students' independent learning ability and lifelong learning abilities (Liu, 2012).

To carry out the reform of classroom learning, many scholars began to explore and research and finally found a learning mode that can adapt to the integration of higher vocational theory and practical courses. This learning mode takes tasks as the main clue proposes tasks through the creation of situations, and integrates teaching content into each situational task. Students analyze and discover problems in the situation, and solve various problems under the guidance of teachers. This way of learning is the task-driven teaching method (Dai, 2007). Compared with traditional teaching methods, the task-driven teaching method helps students improve their ability to analyze and solve problems through the process of allowing students to complete tasks and is conducive to cultivating students' innovative ability and forming good habits of active learning. Students learning interests and attitudes to achieve the teaching objectives of the course (Ma, Zhao, &Wu, 2013).

The application of task-driven teaching methods in the higher vocational "Mechanical CAD/CAM" course also faces many problems. Teachers need to combine course knowledge and consider the actual situation of students to make the course and task-driven teaching method better and more perfectly integrated （Xu, 2016). More relevant research and exploration are needed to make the task-driven teaching method perfectly applied in the "Mechanical CAD/CAM" course.

1.2 Research Problems

Generally, classroom activities adopt the teaching mode of teaching first and learning later, and lecture-demonstration-practice, especially for operational skills courses. Generally, teachers teach one step and students practice one step. Students just imitate and lack deep thinking. and personal creativity, students are passively accepted throughout the process, and student participation is not high; teachers usually only pay attention to the results of homework completion or evaluation of works, praise excellent homework works, and ignore comments on poor homework works, which is more important The most important thing is that the evaluation of the completion process of homework is neglected, which leads to students' low attention to the grades of homework and discourages students' enthusiasm; students in higher vocational colleges generally have low independent learning ability, poor internal drive, and weak concentration. The scope of attention is narrow, the interest in learning is low, and the attitude towards learning is also indifferent. The Real classroom activities should reflect students' initiative, autonomy, and inquiry, and cultivate students' problem-solving ability. Therefore, based on the above research background and the relevant theoretical basis of the task-driven teaching method, mainly researched the following three problems:

1. Does the classroom participation and performance of the students' works improved after apply the task-driven teaching method?

2. Does it have a positive effect on students' autonomous learning ability after apply the task-driven teaching method?

3. Does the implementation of task-driven teaching help to improve students' interest and attitude?

1.3 Objectives of the Study

The current traditional teaching methods lead to problems such as low classroom participation, low grades of work, low learning enthusiasm, weak independent learning ability, low learning interest and attitude of students, etc. This study integrates task-driven teaching into real classrooms Teaching, combined with learning effectiveness pyramid theory, constructivism theory, and achievement motivation theory, to solve the problems existing in the implementation of current teaching activities. In the teaching design, reorganize and optimize the conventional teaching links, integrate tasks into different links to give full play to the advantages of task-driven teaching, and explore the impact of the teaching design scheme on students' learning effects through teaching experiments, to achieve the following three research objectives:

1. To analysis the effects of task-driven teaching method to the improvement of students' participation and performance of the students' works.

2. To verify there is a positive effect on students' autonomous learning ability after apply the task-driven teaching method.

3. To verify the improvement of students' interest and attitude after apply the task-driven teaching method.

1.4 Scope of the study

In order to determine the theoretical scope of this thesis, a total of more than 10,000 documents on task-driven teaching methods were found through literature websites such as CNKI and Google Scholar, and then the scope was further narrowed down to search for documents related to task-driven teaching and learning effects, and then from 2013 The search was carried out between January 1 and June 15, 2023, and finally the scope was narrowed down by means of citations and download times, and finally 68 relevant literature journals and 54 dissertations were obtained. Through the reading of the literature, it is found that constructivism theory, learning effectiveness pyramid theory and achievement motivation theory are widely used, which is consistent with the research of this paper, so these three theories are finally selected as the theoretical basis of the research paper.

In the study, given that the determination of the research population, sample selection, and sample size have a significant impact on the quality of the data and the quality of interpretation of the overall research data, this paper aims to investigate the application of task-driven pedagogy in mechanical courses. From a theoretical point of view, students taught in mechanical specialization courses and specialized courses covering mechanical theory and practice can be considered as the totality of research objects. However, due to resource and time constraints, it is not possible to study all members of the population, so sample selection is required. Therefore, a representative sample will be selected in the study to effectively represent the overall situation.

This study adopts a quantitative research method, taking 81 students majoring in mechatronics technology in the 2021 grade of Shandong University of Engineering and Vocational Technology and the course "Mechanical CAD/CAM" as the research objects, and dividing them into two classes. The data collection time is March 2022 - July 2022. A total of 81 questionnaires were distributed, and 81 were returned, with a recovery rate of 100%. The research results will provide a theoretical basis for the practice of task-driven teaching methods in mechanical professional courses, and guide educational practice.

1.5 Research Significant

This study introduces the task-driven teaching mode into the real classroom, and incorporates the task-driven teaching design into the "Mechanical CAD/CAM" classroom of higher vocational education, and verifies the positive effect of the task-driven teaching design on the learning effect.

1. This study introduces the task-driven teaching method into teaching, and builds a task-driven teaching design under the guidance of constructivist learning theory, achievement motivation theory and learning effectiveness pyramid theory, so as to meet the requirements of students' dominant position and Learn to learn the requirements (Zhang, 2014). This design scheme enriches the task-driven teaching model, and provides a certain reference for the reform of Chinese higher education teaching model and how to train students to learn to learn.

2. This study integrates the task-driven teaching method into the existing teaching mode, and gradually adapts to China's objective and real environment by means of improvement and change. This study provides a new perspective for the current information technology to better adapt to the Chinese educational environment, and also provides ideas and methods for improving the existing educational environment (Zou, 2019).

3. Through the teaching experiment process, the positive effect of task-driven instructional design on students' learning effects is verified, such as improving students' classroom participation and homework performance, cultivating students' ability to learn independently, improving students' learning interest and attitude, and improving students' learning interest and attitude. The application of task-driven teaching is explored practically, which provides guidance for the specific implementation of this teaching method, so as to better exert its application value (Wu. 2022).

Chapter 2 Literatures Review

The application of task-driven teaching method in the course of "Mechanical CAD/CAM" in higher vocational colleges has attracted much attention. Through the review of relevant literature, this paper discusses the research status and application effect of task-driven teaching method in this field. In-depth research on the theoretical basis, application, effect evaluation and limitations of the teaching method. This will help provide guidance for educational practice and provide new ideas and directions for future research.

2.1 Task-driven teaching method

The idea of task-driven teaching in foreign countries originated from the idea of "learning by doing" proposed by the great educator Dewey in the early 20th century. The proposed models and models all embody task-driven methods to varying degrees under the influence of the task-driven approach (Guo, 2014).

Indian linguist Prabhu is recognized as the founder of the task-driven teaching method. He first applied the task-based teaching method in the teaching syllabus and teaching practice. In his linguistics teaching, he designed multiple communicative tasks, Integrate the required knowledge into it, students complete the communicative tasks, and also realize the memory and understanding of knowledge. The constructivist learning theory of Jean. Piaget and the "situational learning" of J.S. Brown and others all provide theoretical guidance for the task-driven teaching method, and the task-driven teaching method has begun to be widely used in the world and research (Li, 2022).

The more influential task-driven teaching model abroad was proposed by British linguist Jane Willis. In "A-Frame Task-Based Learning （Willis, 2021)", Jane Willis divides task-driven teaching into three stages: Pre-Task: the teacher introduces the teaching topic and introduces the task; Task Cycle: Task—students complete the task, plan—each group prepares for the report, report—students report on the task; Language Focus: analysis—students analyze the task of other groups, practice—under the guidance of the teacher Practice again.

The anchored teaching method represented by John Bronsford is also called the situational teaching method, which is constructed based on the influence of doctrine, teaching is based on contagious real events or real problems. By setting events or problems, determining the entire teaching content and teaching process (like a boat being anchored), and through multi-angle and multi-level solutions to events or problems, students can develop their ability to learn independently and solve problems. Five steps in the anchored teaching process: creating scenarios, determining problems, independent learning, collaborative learning, and effect evaluation (Man, 2013).

In China National Knowledge Network, the subject of "task-driven" was searched. In 1998, my country published the first related literature. In the seven years from 1998 to 2005, there was little research on task-driven teaching in China, and the growth rate of literature was Also slower. From 2006 to 2012, the number of literature related to task-driven teaching increased greatly, which is the peak period of task-driven teaching research. After that, as a popular teaching method, the number of relevant papers published each year remained at about 1,200.

Most domestic studies focus on the basic characteristics, basic connotation, model construction, applied research, and implementation strategies of the task-driven teaching model. In terms of basic content research, the most cited article is Guo Shaoqing's article. He made a detailed analysis of the meaning of the task-driven teaching method, the design of the task, and the behavior of teachers, students, and evaluation during the implementation of the task. With discussion (Guo. 2006). Subsequently, many researchers continued to conduct in-depth research on the types and designs of teaching tasks.

In terms of model construction, the early research was mainly to determine the basic process of task-driven teaching. The task-driven teaching model proposed by Professor He Kekang specifically includes teaching goal analysis, situation creation, independent learning design, collaborative learning environment design, learning effect evaluation design, and reinforcement. Practice (Lin, Zhang & He, 2006). Professor Chen Xinghuo also proposed four main links, including creating situations, identifying problems, independent learning and collaborative learning, and learning effect evaluation (Liu, 2017).

In addition, Professor He Kekang of Beijing Normal University proposed the task-driven instructional design idea of "teaching goal analysis - situation creation - information resource design - independent learning design - collaborative learning environment design - learning effect evaluation design - strengthening exercises" (He, 1998).

In terms of application and strategy, the field of task-driven teaching is becoming wider and wider, extending from the computer field to the medical field and language teaching, involving higher education, secondary vocational education, and basic education, focusing on teaching task design strategies, as proposed by Zhang Lijuan The task design should be lively, passionate and interesting, practical and practical, pay attention to the design of different types of tasks, leave specific development space for students, use "soft tool" resources skillfully, leave students "blank" in task design, and strengthen cooperation with other tasks. Integration of disciplines, etc (Zhang, 2018).

Through research and practice, these scholars have demonstrated that the task-driven teaching method is of great significance to the improvement of learning effects, providing strong theoretical and targeted support for teaching reform and practice in the field of education.

To sum up the various studies on "task-driven" teaching, although there are differences in the operation process, they have the following common features:

First, the task-driven teaching method emphasizes the design of teaching details, advocates student-centered learning and small learning in groups;

Second, new knowledge points are integrated into one or more specific problem or task situations;

Third, students are the main body of learning, and tasks are the center of student learning activities;

Fourth, students realize the construction of knowledge meaning by analyzing tasks and completing tasks in groups.

2.2 Mechanical CAD/CAM courses

CAD/CAM technology is a multidisciplinary application technology that combines theory and practice closely with the development of computer technology. With the popularization and promotion of digital design and manufacturing technology, CAD/CAM technology has become an important tool for improving manufacturing productivity and product quality. Key technologies for competitiveness. CAD/CAM technology is a professional core course of mechatronics technology major in higher vocational schools. It is based on courses such as mechanical drawing, mechanical design foundation, numerical control machining technology, and programming, and covers computer-aided design and computer-aided manufacturing. , which is comprehensive and practical (Zhang, &Wang, 2006).

Anthony J. Petrosino (2010) examines teaching reforms to introduce problem-solving in mechanical CAD/CAM courses. He focused on students' ability to apply CAD/CAM technology to practical problems, and explored how to improve students' design and problem-solving abilities through curriculum design and teaching strategies (Marshall, J. A., Petrosino, A. J., & Martin, T., 2010). Scott Greenhalgh's (2016) research focuses on reforming the mechanical CAD/CAM curriculum by introducing hands-on projects and teamwork. He explores how to combine classroom learning with practical engineering projects to develop students' practical engineering abilities and teamwork spirit (Greenhalgh, S.,2016). Paul Witherell (2022) has researched the use of virtual simulation to revolutionize the teaching of mechanical CAD/CAM courses. He explores how virtual simulation tools can be used to provide students with a more realistic and immersive design and fabrication experience, and evaluates the impact of this teaching method on student learning outcomes (Qin, J., Hu, F., Liu, Y., Witherell, P., Wang, C. C., Rosen, D. W., ... & Tang, Q., 2022).

Gregory Bucks' research focuses on reforming mechanical CAD/CAM courses by introducing interdisciplinary content and hands-on experience. He explored how to combine mechanical CAD/CAM with materials science, computer science， and other fields to provide a more comprehensive learning experience and develop students' comprehensive abilities.

Through research and practice, these scholars have promoted the teaching reform of mechanical CAD/CAM courses, explored a variety of teaching methods and teaching modes, and aimed to improve students' learning effect and career preparation ability. Their research provides useful experience and reference for the teaching practice of mechanical CAD/CAM courses.

According to the above literature analysis, we will study the "Mechanical CAD/CAM" course, adopt the learning mode of task-driven teaching, carry out teaching design, and evaluate and improve the mechanical CAD/CAM course using a questionnaire survey, student performance evaluation, and course improvement. Teaching effect, teachers pay attention to cultivating students' innovative ability and practical operation ability in the classroom, and improve students' learning effect by stimulating students' learning interest and motivation.

2.3 Learning effect

2.3.1 Learning Outcome Pyramid Theory

The learning effect refers to the psychological and behavioral changes of learners after some teaching activities, generally manifested in knowledge, skills, emotional attitudes, or values (Yu, 2007).

Learning Pyramid Theory (or Pyramid Theory of Learning Effectiveness) (as shown in Figure 2-1) is an audio-visual teaching theory proposed by American educator Edgar Dale in 1946. It is a national training program in Maine, USA. The result of laboratory research in the 1960s. This theory reveals the knowledge retention rate of learners under different information dissemination methods. After two weeks of learning in passive learning methods such as listening, reading, audio-visual, demonstration, etc., the average retention rate of learning content is lower than 30%; and after two weeks of learning using active learning methods such as discussion, practice, and teaching others, the average retention rate of learning content is higher than 50% (Cheng, Zhang & Li, 2017).

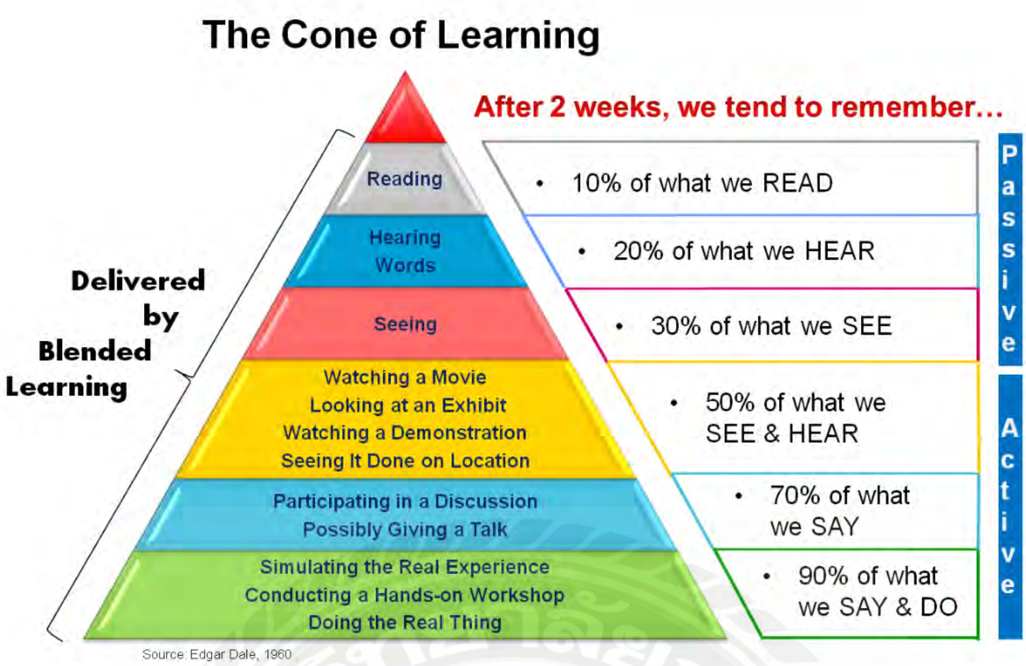

Figure 2.1 The Cone of Learning

The theory and diagrams graphically show how much learners can remember after two weeks of using different learning styles. This theory is also known as the "Tower of Experience" and is widely spread.

Listening, that is, the teacher speaks at the top, and the students listen at the bottom. The most familiar and commonly used method has the lowest learning effect, and only 5% of the learning content can be left after two weeks. Learning by demonstrating and doing "demonstration" can remember 30%, which is also the best way of passive learning (Wu, 2014). The traditional methods with a learning effect of less than 30% are all individual learning or passive learning; while those with a learning effect of more than 50% are team learning, active learning, and participatory learning (Li, 2014).

Through active discussion, "learning by doing" or "hands-on practice" learning methods, the learning effect can reach 75%. One of the best ways of learning is "teaching". By imparting knowledge to others, you can have a deeper understanding of the knowledge itself.

According to the guidance of the learning pyramid theory, different learning methods have a huge impact on students' learning effects. Therefore, the initiative of students should be emphasized in the teaching design, and the way of practical discussion should be given priority. To achieve better learning effects, both teachers and students need to choose reasonable and efficient methods in the teaching process. To improve the learning effect, students need to adjust their learning methods, change from passive learning to active learning, and pay attention to using multiple sensory organs such as ears, eyes, brain, mouth, and hands.

In this study, task-driven teaching is adopted to stimulate students' multiple senses and improve learning interest by creating an environment and teaching aids; at the same time, use interesting and life-like tasks to drive students to learn actively, and internalize knowledge and skills by completing tasks Specifically, students are based on practical problems in the process, learn by doing, practice themselves, solve problems, and learn new knowledge in solving problems.

To sum up, the learning effect, as the result of learning, refers to the ability learned by learners during a period, including cognitive ability, motor skills, emotional attitude, and behavior. It not only pays attention to learners' knowledge mastery but also pays attention to learners' knowledge mastery. Follow their development in thinking, practice, and emotion.

2.3.2 Constructivist learning theory

Constructivism theory believes that knowledge is not acquired through teachers' lectures, but learners realize the meaning construction of knowledge through interpersonal (including teachers and learning partners, etc.) collaboration and discussion under certain circumstances (Ji, 2014).

Constructivist learning theory emphasizes the subjectivity of students' learning; emphasizes the four elements of "situation", "collaboration", "conversation" and "meaning construction"; emphasizes the teacher's leading work, mentors, inductive inspiration in the process of meaning construction Organizers, organizers, participants.

Under the guidance of constructivist learning theory, the implementation of task-driven instructional design should fully reflect the initiative of learners, the leading role of teachers, and the construction of knowledge. Specific manifestations can be that students' real life is considered in task design, the situation is created in line with the zone of proximal development, students actively carry out learning activities around the task, students are given opportunities for communication and discussion after teaching, and students' participation is emphasized in the evaluation of works. Self and others evaluate.

2.3.3 Achievement Motivation Theory

Achievement motivation theory is a kind of motivation theory put forward by Professor McClelland of Harvard University in the United States. He believes that achievement motivation is an internal driving force for people to pursue excellence and strive for success. It is challenging and can bring people a sense of accomplishment and enhance the spirit of struggle, and have an important impact on people's behavior. As an intrinsic motivation that promotes individuals to achieve their goals and success, achievement motivation can motivate and sustain individual behaviors, promote their success, and thus affect personal development (Lan, 2013).

Therefore, based on the theory of achievement motivation, how to mobilize students' achievement motivation should be considered in the application of task-driven instructional design. Teachers can create moderately difficult and multi-level tasks so that students feel certain difficulties but can complete them without feeling frustrated. At the same time, teachers can use vivid online videos to reduce students' fear of learning and enhance students' confidence. Form a virtuous circle of active learning and independent construction.

2.4 Instructional Design

Instructional design is an important concept in the field of education, which involves the planning, organization, and implementation of educational and teaching activities. In teaching design, teachers formulate a systematic teaching plan based on subject content, students' needs, and teaching objectives, combined with various teaching resources and teaching methods, to promote students' learning and development. This article explores concepts and theories related to instructional design from both theoretical and practical perspectives (Sun, Cheng & Zhu, 2015).

First, instructional design involves several key concepts and theories. Among them, curriculum design is an important part of instructional design. Curriculum design emphasizes the selection, organization, and arrangement of teaching content to ensure that students can achieve the expected learning goals during the learning process. In addition, instructional design also involves the selection and application of teaching methods. Teaching methods refer to the specific teaching methods and strategies that teachers use in the teaching process, including lectures, discussions, experiments, case studies, etc., to promote student participation and learning effects (He, 1997).

In the theoretical aspect of instructional design, constructivist instructional design theory provides an important framework. Constructivist instructional design theory emphasizes students' active participation and independent learning, and believes that students construct their own knowledge and understanding through interaction and construction with the real world. In constructivist instructional design, the role of teachers is the guide and facilitator. By designing meaningful tasks and situations, students' desire for inquiry and thinking ability are stimulated to promote their learning and development (He, 1997).

In addition, task-driven instructional design is also an important direction of instructional design. Task-driven instructional design emphasizes placing learning tasks at the core of teaching, and promoting students' learning and development by allowing them to complete real and meaningful tasks. The task-driven instructional design emphasizes students' active participation and cooperation and develops their problem-solving and practical abilities. The task-driven instructional design theory and the constructivist instructional design theory complement each other, and both emphasize the subject status of students and the significance of the learning process (An, 2014).

On the practical side, instructional design needs to consider several factors. First of all, it is necessary to consider the characteristics and needs of students and design corresponding teaching activities according to their background knowledge, learning style, and hobbies. Secondly, it is necessary to consider the support of teaching resources and the environment. Teaching resources include teaching materials, multimedia materials, experimental equipment, etc., while the teaching environment includes classroom layout, technical equipment, etc. Instructional design also needs to pay attention to the mechanism of evaluation and feedback, and timely adjust and improve instructional design by evaluating students' learning outcomes and processes (He, 1997).

To sum up, instructional design is a crucial link between education and teaching. It involves several key concepts and theories in curriculum design, teaching method selection, and task design. Constructivist instructional design and task-driven instructional design are two important theoretical frameworks that emphasize students' active participation and meaningful learning. In practice, instructional design needs to comprehensively consider student characteristics, teaching resources and environments, as well as assessment and feedback mechanisms. Through reasonable teaching design, students' learning effects and all-around development can be promoted.

2.5 Theoretical framework

In the research on the application of task-driven teaching method in the course of "Mechanical CAD/CAM" in higher vocational colleges, the theory of constructivism learning, learning effect theory, and achievement motivation theory are used as the theoretical research basis. Affect students' learning strategies, learning ability, and learning motivation, and ultimately improve students' learning effects.

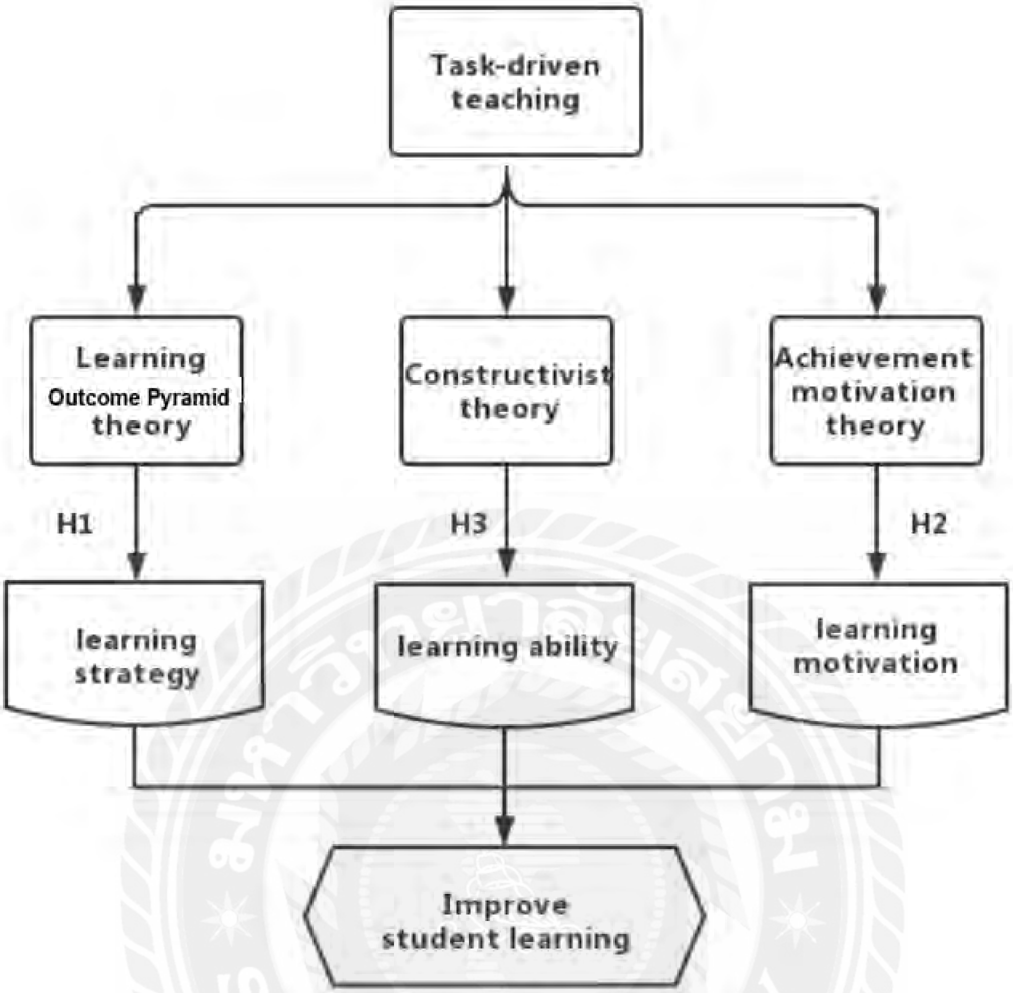

Figure 2.2 The theoretical framework

Chapter 3 Research Methodology

This paper adopts the quantitative research to collect method. The purpose of this paper is to explore the application of task-driven teaching methods in the course of "Mechanical CAD/CAM" in higher vocational colleges and take the classroom of Shandong University of Engineering and Vocational Technology as an example. The research method mainly includes the following steps:

3.1 Literature research method

Through the collection and sorting of a large number of documents, the previous research was analyzed and summarized, and the task-driven teaching method, CAD/CAM courses, and related concepts and theories were sorted out mechanically, and the task-driven teaching method at home and abroad was understood. The basic characteristics of the task-driven teaching model are "the main line of tasks, students as the main body, and teachers as the mainstay". Through the teaching analysis of different contradictory research results, this study divides task-driven teaching into the following four stages; creating an environment, clear tasks, independent learning/cooperative learning, and effect evaluation. This teaching method is suitable for courses combining theory and practice such as "Mechanical CAD/CAM", which provides a theoretical basis and background knowledge for subsequent research.

3.2 Sample size and sampling

The research object of this experiment is a total of 81 students in two classes of the three-year senior vocational 2021 mechatronics technology major in the School of Intelligent Manufacturing of Shandong University of Engineering and Vocational Technology. One class is used as an experimental class and the other class is used as a control class. The number of students, the ratio of male to female, and other aspects of the two classes are the same. The experimental group uses the task-driven teaching method for teaching, and the control group uses the traditional lecture teaching method for teaching. By distributing questionnaires (see appendixes 1 and 2 for the pre-test questionnaires), SPSS software is used to conduct independent sample T-tests on the student's grades, class participation, and questionnaire data for further analysis. During the teaching process, data such as students' academic performance, learning attitude, and autonomous learning ability are collected.

Next, collect and analyze experimental data. Through the statistical analysis of academic performance, learning attitude questionnaire, and self-learning ability evaluation, the difference in learning effect between the experimental group and the control group was compared. Statistical methods are used to quantitatively analyze the data to verify the application effect of the task-driven teaching method in the course of "Mechanical CAD/CAM" in higher vocational colleges.

Through the test, it can be concluded that there is no significant difference in the academic performance, learning attitude, and learning initiative of the two classes, which can be used as the experimental object. In this experiment, class 1 of class 2021 is used as the control class, and class 2 of class 2021 is used as the experimental class for comparative teaching.

The teacher of the two classes is the researcher herself, the teaching software and hardware conditions are the same, both are equipped with multimedia classrooms,
Classes are held in the computer room equipped with multimedia teaching software, and the superstar learning communication platform is installed on the mobile phones of the students. The "Using Solid Works Software Digital Design Project Tutorial for Mechanical Products (Second Edition)" by the Higher Education Press is used as the teaching material. Class 1 The traditional teaching method is used for teaching, and the task-driven teaching method is used for teaching in Class 2.

3.3 Data collection

The research object of this experiment is a total of 81 students in two classes of the three-year senior vocational 2021 grade mechatronics technology major in the School of Intelligent Manufacturing of Shandong University of Engineering and Vocational Technology, and the data collection time is from March 2022 to 2022. In July, before the implementation of the research, a simple pre-test was made on the students' learning attitude, interest, and autonomous learning ability (see Appendix 1 and 2 for the pre-measurement form). 81 questionnaires were distributed, and 81 questionnaires were returned, all of which ensured that students answered in a state of complete relaxation and without any pressure.

At the beginning of the semester, understand the specific situation of the experimental class and the control class, and at the same time establish a good relationship with the students, get familiar with them as soon as possible to reduce the strangeness, and shorten the distance with the students. And introduce the task-driven teaching method to the students in the experimental class, introduce the teaching design of the task-driven teaching method, help each student familiarize themselves with and change their learning ideas and habits as soon as possible, and lay the foundation for the use of the task-driven teaching method.

During the implementation of the teaching design, real-time staged evaluations are carried out on the grades of students' works and classroom participation to test the implementation effect in the learning process. Finally, through a semester of study, students' grades in work, classroom participation, learning attitudes, and interests are collected. , A post-measurement table of self-learning ability to test the learning effect of students in the "Mechanical CAD/CAM" class of the task-driven teaching method.

3.4 The experimental tools

3.4.1 MSLQ Questionnaire

This research uses a questionnaire survey as a tool, based on the English version of the Learning Motivation Strategies Questionnaire (MLSQ) designed by Pintrich (1991), and combined with the actual learning of contemporary college students to compile the Chinese version of "Chinese College Students' Learning Motivation and Strategies Questionnaire" (MSLQ- CAL) to test students' use of self-regulation in professional learning (see Appendix II for the questionnaire).

To form a final scale with ideal reliability and validity, scientific exploratory factor analysis and confirmatory factor analysis have been carried out on MSLQ-CAL. The model fitting index of motivation scale is CFI = 0.880; SRMR = 0.057; RMSEA = 0.059; the model fitting index of the learning strategy scale is CFI = 0.896; SRMR = 0.044; RMSEA = 0.046, reflecting a high overall fitting degree, and formed 25 obvious variables and 6 latent variables /dimension (including self-efficacy, task value, test anxiety, extrinsic motivation, positive and negative self-confidence) motivation scale and 27 obvious variables, 9 latent variables/dimension (including repetition strategy, finishing strategy, Organizational Strategies, Critical Thinking, Cognitive Strategies, Self-Regulation, Teacher Support, Time Management, Learning Environment) Learning Strategies Scale (Tong, Guo, Wang, Guo & Min, 2017).

The questionnaire consists of two parts: the first part is the subject's personal information, including place of origin, gender, major, grade, etc. The second part is the Chinese version of the Learning Motivation and Strategies Scale, with a total of 52 questions, all of which are evaluated with a seven-point Likert scale. Not quite like me", "Neutral", "Somewhat like me", "Basically like me", and "Extremely like me". Participants were required to select the variable option that best suited their situation (Tong, Guo, Wang & Min, 2017). Finally, the higher the score of each dimension of the questionnaire, the better the learner's performance in the current dimension; the higher the total score of the questionnaire, the better the learner's autonomous learning ability.

Table 3.1 MSLQ questionnaire structure table

latent variable	Dimension	Item	Description of the reverse question
learning motivation	self-efficacy	1、2、3、4、5、6、7、8	no reverse questions
	task value	9、10、11、12、13	no reverse questions
	test anxiety	14、15、16、17、18	no reverse questions
	extrinsic motivation	19、20、21	no reverse questions
	positive self-confidence	22、23	no reverse questions
	Negative self-confidence	24、25	all reverse questions
learning strategy	retelling strategy	26、27	no reverse questions
	finishing strategy	28、29、30	no reverse questions
	organizational strategy	31、32、33	no reverse questions
	critical thinking	34、35、36、37	no reverse questions
	cognitive strategy	38、39、40、41、42	no reverse questions
	self-regulation	43、44	all reverse questions
	mutual learning	45、46、47、48	no reverse questions
	time management	49、50	no reverse questions
	learning environment	51、52	no reverse questions

3.4.2 Interest and Learning Attitude Questionnaire

The interest and attitude questionnaire used in this study comes from the questionnaire designed in Li Yujia's "Application Research of Project Teaching Method in Primary School Information Technology Teaching". The original author has conducted a reliability and validity test on it. The chi-square value of the sphericity test is significant (sig <0.001), which means that the questionnaire has validity; the Alpha coefficient in the reliability test analysis is 0.776, which meets the reliability requirements of the questionnaire (see Appendix 1 for the questionnaire) (Li, 2013).

3.4.3 Classroom Observation Record Form

The classroom observation method is mainly reflected in the observation of students' classroom behavior by researchers and teachers in the process of teaching experiments. It is an important method for teachers to collect relevant data about student activities and evaluate classrooms. Generally, teachers can roughly judge the degree of student's mastery of knowledge by observing the students' external performance, such as performance and actions. To make the observation more accurate and reliable, this study adopts the classroom observation record form (see Appendix 4 for details) proposed by the scholar Luo Yali to record the observation results. The observation record table mainly examines five aspects: knowledge mastery, skill mastery, students' attention status, participation status, communication status, and thinking status. Specifically, the degree of participation of students in discussion, communication, and cooperation in classroom learning, the ability to ask and solve problems in the process of thinking and acquiring knowledge, and the hands-on ability and expressive ability in the operation process are all important aspects of classroom observation. content. According to the overall performance of the students in the classroom, the teacher will score each aspect in three grades corresponding to 3 points, 2 points, and 1 point (Luo, 2003).

3.5 Experimental effect analysis

To check the quality and operability of the questionnaire, Class 1 and Class 2 of the 2021 grade Mechatronics Technology Major of the three-year vocational technical college of the Shandong University of Engineering and Vocational Technology were used as test objects. Unified instructions, after the test is completed, the questionnaire will be collected on the spot. A total of 81 questionnaires were distributed, and 81 were recovered. The recovery rate was 100%. There were 81 valid questionnaires, and the effective rate was 100%., the questionnaire is valid. After inputting the test data into the computer, SPSS 22.0 was used to conduct statistics and management of the data and analyze its reliability and validity.

3.5.1 Trust level analysis

Reliability test indicators, using the relatively standard Cronbach (Cronbach α) consistency coefficient and test-retest reliability to test the reliability of the questionnaire on the current situation of learning of the course "Mechanical CAD/CAM" in higher vocational colleges. The results show that the homogeneity reliability coefficient α=0.8716 and the test-retest reliability r=0.8168 ($p<0.01$) of the learning status survey; considering the practice effect, the test-retest reliability is not used for this subscale. The internal consistency coefficient of the total scale is $\alpha = 0.8724$. The results show that the homogeneity among the items of the questionnaire is high, and the measurement results of the questionnaire are reliable and credible.

3.5.2 Validity analysis

This study uses content validity. The form refers to the mature scales of other scholars, and senior professors are invited to evaluate the items in the form. It is considered that the form covers all aspects of the investigation of the current situation of classroom teaching, and typical sexual questions, and can effectively measure the current situation of classroom teaching. The form has good content validity.

Chapter 4 Finding

This study integrates the task-driven teaching method into real classroom teaching, combines learning effectiveness pyramid theory, constructivism theory, and achievement motivation theory, and distributes questionnaires, and uses SPSS software to conduct independent sample T-tests, further analysis, draw the following conclusions.

4.1 Analysis of students' participation and performance of the students' works

4.1.1 Analysis of students' participation

In this study, the researcher invited a teaching assistant to the classroom to help observe the situation of the students and teach the grading of the classroom discipline table. The researcher participated in the teaching of 15 class hours, and there was a classroom observation record for the two classes. In the end, a total of 7 records were recorded (see Appendix IV for specific data). For the results of classroom observation records, the average values are calculated in each aspect and the total level (Table 4.1 below), and finally the averages of the two classes are compared.

Table 4.1 The average statistical results of the classroom observation records of the experimental class and the control class

	Knowledge content	Skill operate	attention	participate Condition	cooperative	thinking situation	total score
Experimental class	2. 71	3.00	2. 86	3	2. 28	2.71	16. 57
control class	2. 29	2.42	2. 29	2.42	2. 00	2. 43	13. 85

According to the statistical results, the attention and class participation of the students in the two classes in the "Mechanical CAD/CAM" course of Shandong University of Engineering and Vocational Technology were mainly analyzed. The average value of attention in the experimental class was 2.86 in the 7 records, and the average value of participation was 3; while the control class recorded 7 times The mean of attention was 2.28 and the mean of participation was 2.00. According to the data, the students in the experimental class are more focused in class and actively participate in class. It can be said that during the teaching period, the classroom atmosphere in the experimental class was more relaxed and active, with a certain degree of relaxation. Students actively used network resources to carry out learning activities. When faced with simple problems, students more often used network resources to solve them.

Students' assistance and guidance are more to promote students' high-level learning and creative design; the communication and discussion links after teaching activities in the teaching design model give students a performance stage, and students actively communicate to deepen their understanding of new knowledge and broaden their horizons. Thinking, students' classroom participation has improved significantly.

4.1.2 Performance of the Students' works

In this study, the academic performance is mainly reflected in the grades of students' works, which is through the teacher's grades of students' works in different classes (students' grades of works are comprehensively considered in the usual classroom works and the major works of the exercises behind each unit, and the proportions of their scores account for the total grades 50% of During this experiment, students completed 6 relatively complete small works and 1unit large work. Finally, according to the work evaluation form provided by the textbook (as shown in Appendix 3), students' works are scored and graded for evaluation. The figure below shows the comparison of the number of students in different classes at different levels.

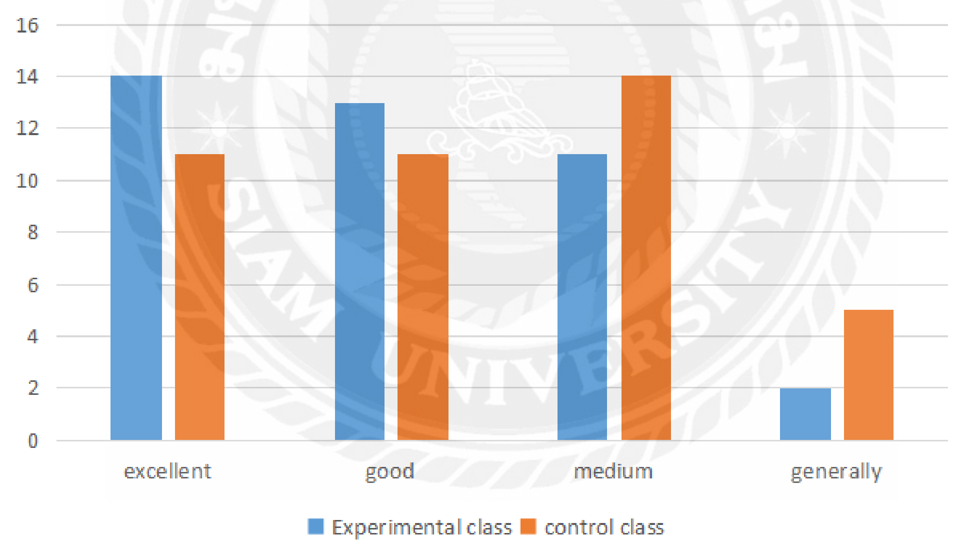

Figure 4.1 Comparison of the number of students in different grades of works

It can be seen from Figure 4.1 that in the course "Mechanical CAD/CAM" at Shandong University of Engineering and Vocational Technology, The number of students in the experimental class in excellent and good grades is higher than that in the control class, while the number of students at the middle and average levels is less than that of the control class, so it can be said that the experimental class is better than the control class in terms of work performance in the end class. In this study, the task-driven teaching method provides students in the experimental class with a more instructive task list, so that students can complete the teacher's requirements within the specified time and have the opportunity to develop their creativity and obtain better results level grade.

4.2 Verify of autonomous learning ability

4.2.1 Pretest data analysis

In this study, the evaluation of students' autonomous learning ability also adopts the way of comparing the experimental class and the control class before and after the test. Before the start of the teaching experiment, the "Self-Report Scale of Autonomous Learning Ability" was distributed to the experimental class and the control class, and the data analysis was used to judge whether there were differences in the autonomous learning ability of the two classes, to ensure the scientificity and credibility of the teaching experiment. The collected data is processed and analyzed by SPSS 22. Table 4.2 is the result of the independent sample t-test on the pre-test data, and all dimensions of the scale are tested.

Table 4.2 Statistical results of autonomous learning ability pre-test data

test variable	class	Number of samples(N)	average	standard deviation	t Statistics	*P*
The total score of independent learning ability	Experimental class	40	186. 87	34. 069	.179	.858
	control class	41	185. 13	46. 019		
self-efficacy	Experimental class	40	41.01	10.038	.013	.992
	control class	41	40.98	10.575		
Intrinsic Value	Experimental class	40	41.67	9. 209	.477	.636
	control class	41	40. 42	12. 275		
test anxiety	Experimental class	40	14. 93	5. 843	.038	.971
	control class	41	14. 88	6. 504		
cognitive strategy	Experimental class	40	56. 27	12.697	.554	.583
	control class	41	54. 35	16. 038		
self-regulation	Experimental class	40	37.43	9. 588	.546	.585
	control class	41	38. 76	10.091		

According to the data results in Table 4.2, the results of the test on the total score variable of autonomous learning ability between the experimental class and the control class did not reach a significant level, t=0.178, 0=0.859>0.005, indicating that the experimental class and the control class did not reach a significant level, There is no significant difference in the total score of autonomous learning ability in the control class; at the same time, the results in Table 4.5 also show the test results on the five dimensions of the autonomous learning ability scale: the significance probability value of the self-efficacy dimension is p=0.992, and the internal The significant probability value of the value dimension p=0.636, the significant probability value of the test anxiety dimension p=0.971, the significant probability value of the cognitive strategy dimension p=0.583, the significant probability value of the self-regulation dimension p=0.585, five probability values All p values are greater than 0.05. It shows that in the "Mechanical CAD/CAM" course of Shandong University of Engineering and Vocational Technology, there is no significant difference between the experimental class and the control class in all dimensions of the independent learning ability scale. The above results show that the teaching experiment can be carried out, and the data obtained after the teaching experiment is scientific and credible.

4.2.2 Post-test data analysis

After the experiment, the experimental class and the control class were distributed the "Self-report Scale of Autonomous Learning Ability" respectively, and the collected data were statistically processed, and the reverse questions in the scale were firstly scored by using SPSS 22 software, and then the the data is aggregated in different dimensions, and then the total score of autonomous learning ability and each dimension are subjected to an independent sample t test. The results are shown in Table 4.3 below.

Table 4.3 Statistical results of self-learning ability post-test data

test variable	class	Number of samples(N)	average	standard deviation	t Statistics	*P*
The total score of independent learning ability	Experimental class	40	225.93	46. 535	2. 537	.013
	control class	41	200. 22	37. 288		
self-efficacy	Experimental class	40	50. 69	11. 437	3.274	.003
	control class	41	42.41	9. 510		
Intrinsic Value	Experimental class	40	49.86	13. 348	1.572	.123
	control class	41	45. 64	8. 345		

test anxiety	Experimental class	40	14.43	7. 747	.462	.647
	control class	41	13.65	6. 298		
cognitive strategy	Experimental class	40	66. 88	17.433	2.217	.032
	control class	41	58. 88	11.948		
self-regulation	Experimental class	40	44. 11	9. 596	2. 058	.045
	control class	41	39. 68	8. 272		

The statistical results in Table 4.3 show that the significant p-values of the independent sample t-test for the total score of autonomous learning ability, self-efficacy dimension, cognitive strategy dimension, and self-regulation dimension are 0.013, 0.003, 0.032, and 0.045, respectively. It shows that in Shandong University of Engineering and Vocational Technology's "Mechanical CAD/CAM" course, the experimental class and the control class have significant differences in autonomous learning ability, self-efficacy, cognitive strategy, and self-regulation. The total score and the scores of the above three dimensions of the class were higher than those of the control class. For the intrinsic value dimension and the test anxiety dimension, the significant p-values are 0.123 and 0.647 respectively, and both are greater than 0.05, which means there is no significant difference.

4.3 Verify of learning interest and attitude

4.3.1 Learning interest pretest data analysis

This study adopts a comparative experiment. To ensure the accuracy of the experimental data, before the teaching experiment begins, the students in the experimental class and the control class are investigated on the interest and attitude of the "Mechanical CAD/CAM" course. The pre-test data were analyzed by using spss22 software to carry out an independent sample t-test on the pre-test data. The results of data processing are shown in Table 4.4.

Table 4.4 Statistical results of the pre-experiment test

test variable	class	Number of samples（N）	average	standard deviation	t Statistics	*P*
interest attitude	control class	41	68.40	13. 03	-.605	.543
	experimental class	40	70.02	8. 74		

The results in Table 4.4 show that although the average number of the experimental class is slightly higher than that of the control class before the experiment, the significant probability p-value is 0.543 greater than 0.05. It shows that in the Shandong University of Engineering and Vocational Technology's "Mechanical CAD/CAM" course, in terms of interest and attitude, there is no significant difference between the experimental class and the control class before the experiment, and teaching experiment activities can be carried out.

4.3.2 Learning interest post-test data analysis

After the teaching experiment is over, the interest and attitude questionnaire is distributed again for data collection, and the data in the later stage of the experiment are processed and analyzed. Also, use SPSS 22 to conduct an independent sample t-test on the data collected after the experiment, and the results are shown in Table 4.5.

Table4.5 Statistical results of experimental post-test data

test variable	class	Number of samples（N）	average	standard deviation	t Statistics	*P*
interest attitude	control class	41	69. 11	11.25	-2. 074	.041
	experimental class	40	73. 52	5. 64		

According to the statistical results in Table 4.5, the significant probability value p=. 041<0. 05, which shows that there is a significant difference in the interest and attitude of the students in the experimental class and the control class in the course "Mechanical CAD/CAM". The interest attitude of the students (M=73.52) was significantly higher than that of the control class after the test (M=69.11). In addition, the standard deviation of the experimental class is 5.64, which is quite different from the standard deviation of the control class (11.25), indicating that the experimental class has relatively consistent interest and attitude towards the course "Mechanical CAD/CAM", while the control class has relatively different opinions big. At the same time, a comprehensive comparison of the data in Tables 4.4 and 4.5 shows that after the end of the teaching experiment, the students in the experimental class and the control class of Shandong University of Engineering and Vocational Technology showed a change in their interest in the course "Mechanical CAD/CAM". The interests and attitudes of both the experimental class and the control class have improved to a certain extent, but the experimental class has a larger increase.

From this, we can conclude that in the Shandong University of Engineering and Vocational Technology classroom teaching of "Mechanical CAD/CAM", task-based teaching can better improve learners' interest and attitude towards this course. Create a relaxed and pleasant atmosphere for the classroom by creating a situation, stimulating students' enthusiasm for learning, and maintaining an efficient and durable state. The important and difficult content of the classroom is displayed in the form of video, which reduces the students' classroom pressure and new knowledge to a certain extent. Fear, students are more confident in learning knowledge and completing tasks. At the same time, teachers continue to adopt strengthening strategies in the learning process of students, which can effectively maintain students' learning interests and attention.

4.3.3 Learning attitude data analysis

In addition to comparing the total data of all items in the interest and attitude questionnaire, this study also surveyed on the 13th question in the questionnaire (question 13: I will find ways to solve the difficulties encountered in the course of studying "Mechanical CAD/CAM" course). For simple analysis, the independent sample t-test is still adopted, and the results are shown in Table 4.6.

Table 4.6 Statistical results of test item 13 after the experiment

test variable	class	Number of samples（N）	average	standard deviation	t Statistics	*P*
Question 13	control class	41	4. 48	.743	2. 145	.038
	experimental class	40	4. 79	.411		

The results in Table 4.6 show that for the data of question 13, the significance probability value of the two classes is p=.038<0.05, that is, there is a significant difference between the students in the experimental class and the control class in answering this question, and the students in the experimental class have a significant difference in the answers to this question. This question is more acceptable. We believe that task-driven teaching provides a good classroom environment for students in the experimental class, enhances the fun of learning, and provides available resources for students to solve problems efficiently. Students in the experimental class can make full use of the Internet under the impetus of interest. Resources try to solve problems and overcome difficulties. It can be seen from this that based on task-driven teaching, students of Shandong University of Engineering and Vocational Technology have more confidence and courage to solve problems and have a positive attitude towards the "Mechanical CAD/CAM" course.

Based on the above experimental data and result analysis, it is concluded that in the course of "Mechanical CAD/CAM" of Shandong University of Engineering and Vocational Technology, the autonomous learning ability of the students in the experimental class is significantly higher than that of the students in the control class. The sense of self-efficacy, the ability to use cognitive strategies, and the ability to self-regulate were significantly higher than those in the control group. Experiments have verified that task-driven teaching can enhance learners' autonomous learning ability in the classroom teaching of "Mechanical CAD/CAM" at Shandong University of Engineering and Vocational Technology. In the task-driven teaching design, create tasks that are close to students' daily life and meet students' hobbies to a certain extent, as well as flexible and interesting network resource teaching methods that represent new technology. These two points have improved students' interest in learning. At the same time, different levels of classroom task design and reusable network resources can meet the learning needs of different students, as well as the reinforcement strategies adopted by teachers throughout the independent learning stage, so that every student can Have the opportunity and support to complete the teaching tasks. Students will be more confident in their studies and their sense of self-efficacy will be improved. At the same time, in the process of task-driven teaching, students' use and control of network resources, understanding and grasp of task lists, and communication and understanding of important and difficult teaching points in videos have effectively improved students' ability to use cognitive strategies and self-awareness. Adjustment ability.

In general, the research method of this paper adopts an empirical research design, and analyzes the application effect of the task-driven teaching method in the course of "Mechanical CAD/CAM" in higher vocational colleges through experiments, to provide a strong empirical basis and guidance suggestions to promote teaching Practice improvement and innovation.

Chapter 5 Conclusion and Recommendation

Through literature review, questionnaire, and questionnaire, using SPSS analysis, it is found that the answer to the research purpose is found by verifying the application of the task-driven experimental teaching method in the classroom.

5.1 Conclusion

This paper attempts to design a teaching model that meets the requirements of teaching reform and talent training to meet the needs of teaching reform and talent training in China's educational environment. Innovate on the basis of the existing classroom teaching mode, introduce new technology means and teaching concepts in the current education field, construct a task-driven teaching design scheme, and apply it to the "Mechanical CAD/CAM" classroom in higher vocational education. The following are the main results of this study.

5.1.1 Analysis the effects of task-driven teaching method to the improvement of students' participation and performance of the students' works

In this paper, through research and analysis, the statistical results of the 7 classroom observation records of the "Mechanical CAD/CAM" course at Shandong University of Engineering and Vocational Technology show that the focus of the experimental class in the 7 records is 2.86, and the cadres involved in the situation are 3, the operator in skill operation was 3, with a total score of 16.57; while the operator in the control class was 2.14 in 7 recording center operators, 2.42 in participation, and the average in skill operation was 2.42, with a total score of is 13.85.

The data shows that the students in the experimental class are more focused in class, more active in-class participation, and more proficient in skill operation. During the teaching period, the classroom atmosphere of the experimental class was more relaxed and active, with a certain degree of relaxation. Students actively used network resources to carry out learning activities. When faced with simple problems, students mostly used network resources to solve them by themselves. Teachers assisted students. And guidance is more about promoting students' high-level learning and creative design; the communication and discussion links after teaching activities in the teaching design model give students a performance stage, and students actively communicate to deepen their understanding of new knowledge and broaden their thinking. Our classroom participation has improved significantly.

From the performance of works, the number of excellent works is 14 in the experimental class, accounting for 30% of the whole class, and 11 in the control class, accounting for 26.8% of the whole class; the number of excellent works is 13 in the experimental class, accounting for 30% of the whole class. 32.5% of the total number of students, 11 students in the control class, accounting for 26.8% of the total number of students in the class; 11 students in the experimental class, accounting for 27.5% of the total number of students in the class, and 14 students in the control class, accounting for 34.1% of the total number of students in the class; For the number of works, there are 2 students in the experimental class, accounting for 5% of the total number of the class, and 5 students in the control class, accounting for 12.2% of the total number of the class; the performance of the experimental class is better than that of the control class. Therefore, the task-driven teaching method provides students in the experimental class with a more instructive task list, so that students can complete the teacher's requirements within the specified time and have the opportunity to develop their creativity and obtain a better level.

Therefore, the task-driven teaching method has a positive impact on improving student participation and student homework performance in the "Mechanical CAD/CAM" course of Shandong University of Engineering and Vocational Technology.

5.1.2 Verify there is a positive effect on students' autonomous learning ability after apply the task-driven teaching method

Through data analysis, a questionnaire was used to compare the experimental class and the control class before and after the evaluation of the students' autonomous learning ability. The results showed that the test results of the total score variable of the autonomous learning ability of the experimental class and the control class before the test were $t=0.179$, $p=0.858>0.05$, that is, it did not reach a significant level. After the test, the test results on the total score variable of autonomous learning ability $t=2.537$, $p=0.013<0.05$, reached a significant level; before the test, the significance probability value of the self-efficacy dimension $p=0.992$, $p=0.003$ after the test, reaching a significant level; before the test, the significance probability value of the cognitive strategy dimension was $p=0.583$, and after the test, $p=0.032$, reaching a significant level; before the test, the significance probability value of the self-regulation dimension was $p=0.585$, $p=0.045$ after the test, reaching a significant level; after the test, the significant p-values of the independent sample t test are all less than 0.05, which means reaching a significant level, indicating that the experimental class and the control class have independent learning ability and self-efficacy dimensions, There were significant differences in the cognitive strategy dimension and the self-regulation dimension, and the experimental class scored higher than the control class in the total score and the above three dimensions.

Through the verification analysis, the task-driven teaching method has a positive impact on the autonomous learning ability of students in the "Mechanical CAD/CAM" course of Shandong University of Engineering and Vocational Technology.

5.1.3 Verify the improvement of students' interest and attitude after apply the task-driven teaching method

Through data analysis, the students in the experimental class and the control class investigated the interest and attitudes of the "Mechanical CAD/CAM" course. The average number of the experimental class before the test was 70.02, and the control class The average number of the experimental class is 68.40. Although the average number of the experimental class is slightly higher than that of the control class, the significance probability p is 0.543>0.05, indicating that there is no significant difference in interest between the experimental class and the control class before the experiment; The average number of the class is 73.52, which is significantly higher than the average number of the control class, which is 69.11. The standard deviation of the experimental class before the test is 11.25, and that of the control class is 5.64. There is a big difference between the two classes, which shows that the experimental class is aimed at the "Mechanical CAD/CAM" course. The interest and attitude are relatively consistent, while the views of the control class are more different. Significant probability value p=.543>0.05 before the test, p=.043<0 after the test. 05. There is a significant difference in the interest and attitude of the students in the performance experimental class and the control class towards the course "Mechanical CAD/CAM". The heart rate of the large difference has changed to a certain extent. The heart rate of interest in the experimental class and the control class has increased, but the increase in the experimental class has increased.

For the data of question 13, the significance probability value of the two classes is p=.037<0.05, that is, the students in the experimental class and the control class have significantly different answers to this question, and the students in the experimental class have a high degree of recognition of this question Higher, have a more positive attitude towards the "Mechanical CAD/CAM" course.

Through the verification analysis, the task-driven teaching method has improved the interest and attitude of students in the "Mechanical CAD/CAM" course at Shandong University of Engineering and Vocational Technology.

5.2 Recommendation

First of all, this study clarifies the effectiveness and advantages of the task-driven teaching method in the course of "Mechanical CAD/CAM" in higher vocational education. Therefore, it is recommended to widely promote the task-driven teaching method in the field of higher vocational education in order to stimulate students' interest in learning and improve their problem-solving ability. Educational institutions and teachers can learn from the task design and teaching strategies mentioned in this paper and actively apply them in actual teaching.

Secondly, this study takes Shandong University of Engineering and Vocational Technology as an example to carry out the application research of task-driven teaching method in the course of "Mechanical CAD/CAM" in higher vocational colleges. However, in order to gain a more comprehensive understanding of the application of task-driven pedagogy in different regions, different vocational colleges, and other subject areas, it is suggested that future research can expand the scope of the research sample to include more schools, different majors, and different grades student.

Third, although this study conducted a comparative experiment between task-driven teaching and traditional teaching methods, future research can further compare the effects of task-driven teaching and other teaching methods, such as problem-solving teaching, case teaching, etc. By comparing the advantages and disadvantages of different teaching methods, it can provide more choices and guidance for educational teaching practice.

Fourth, future research could pay more attention to individual differences and learning needs of students. For different types of students, such as groups of students with different learning abilities and interests, the application effect of task-driven teaching method in meeting individual learning needs can be further studied to achieve personalized teaching and differentiated education.

Fifth, the application of task-driven pedagogy requires continuous evaluation and improvement. It is recommended that researchers and educational institutions conduct regular evaluations after implementing the task-driven teaching method, collect feedback from students and teachers, and make appropriate adjustments and improvements based on the evaluation results. In this way, the effect of task-driven teaching method in the course of "Mechanical CAD/CAM" in higher vocational colleges can be continuously improved, making it more in line with the needs of students and teaching objectives.

Finally, with the development of educational technology, future research can combine teaching technology to explore the integration of task-driven pedagogy and educational technology. For example, use educational technologies such as virtual reality and online collaboration platforms to further enhance the effect of task-driven teaching methods in higher vocational education and create a more innovative and interactive learning environment.

References

Cheng, X, J. Zhang, W, L., & Li, B. (2017). Research on the application mode and effectiveness of electronic schoolbags in primary school Chinese reading teaching——Based on the perspective of learning effectiveness pyramid theory. *China Distance Education*, (4), 57-64.

Dai, Sh. H. (2007). *Vocational education curriculum teaching reform*. Tsinghua University Press.

He, K. K. (1997). Construction teaching model, teaching method and teaching design. *Journal of Beijing Normal University: Social Science Edition*, *5*, 74-81.

He, K. K. (1997). Constructionist—Theoretical basis for innovating traditional teaching (Part 1). *Audiovisual Education Research*, *3*(3), 9.

He, K. K. (1998). Constructionist—The theoretical basis for innovating traditional teaching (1). *Journal of Education*, (3), 29-31.

Gao, D. (2014). Cold thinking about MOOC fever. *Journal of Distance Education*, 2, 39-47.

Guo, J. (2014). *Practical research on task-driven teaching method in high school information technology teaching* (Doctoral dissertation). Central China Normal University.

Greenhalgh, S. (2016). The effects of 3D printing in design thinking and design education. *Journal of Engineering, Design and Technology*, *14*(4), 752-769.

Guo, Sh, Q. (2006). The connotation of task-driven teaching method. *China Audio-visual Education*, (7), 57-59.

Ji, X. (2014). Viewing information-based teaching from the perspective of constructivist learning theory. *Chinese Journal of Education*, (9), 106-106.

Lan, M, P. (2013). Exploring the application of achievement motivation theory in college students' career guidance. *Chinese Adult Education*, (16), 51-53.

Li, B, S. (2014). Collaborate experience teach others——learning the application of pyramid theory in politics teaching. *Middle School Politics Teaching Reference: First Ten-days*, (10), 24-26.

Li, F. (2022). *Analysis and research on task-driven teaching method based on task management* (Master's thesis). Hubei Normal University.

Li, Y, J. (2013). *Application research of project teaching method in primary school information technology teaching* (Doctoral dissertation). Tianjin Normal University.

Liu, F. (2017). *Research on the design and practice of task-driven primary school Scratch teaching activities* (Master's thesis). Hebei University.

Liu, X, M. (2013). On the construction of the training model of critical ability in college English teaching. *Foreign Language World*, 5, 59-66.

Liu, Y, D. (2012). *Deepen the reform of higher education and take the road of connotative development with quality improvement as the core*. Retrieved from http://www.moe.edu.cn/publicfiles/business/htmlfiles/moe/moe_176/201205/135808. html.

Lu, Q. (2013). Cold thinking of flipped classroom: Evidence and reflection. *Educational Research Reference Materials*, 48.

Luo, Ch, M. (2010). Exploring the "independent, inquiry, and cooperative" teaching mode under the new curriculum reform. *Chinese Journal: Basic Education Edition*, (9), 162-163.

Man, D. N. (2013). *Experimental research on anchored teaching mode in college English writing teaching* (Doctoral dissertation). Central China Normal University.

Marshall, J. A., Petrosino, A. J., & Martin, T. (2010). Preservice teachers' concepts and enactments of project-based instruction. J*ournal of Science Education and Technology*, 19, 370-386.

Qin, J., Hu, F., Liu, Y., Witherell, P., Wang, C. C., Rosen, D. W., ... & Tang, Q. (2022). Research and application of machine learning for additive manufacturing. *Additive Manufacturing*, *52*, 102691.

Sang, X, M. Li, Sh, H., & Xie, Y, B. (2013). Interpretation of "Steve Jobs' Question of Cultural Strategy." *Open Education Research*, *19*(3).

Sun, Y. Sh., Cheng, Y. N., & Zhu, L. J. (2015). Research on the construction of teaching mode in colleges and universities based on MOOC. *Educational Research Reference Materials*, 26.

Willis, J. (2021). *A framework for task-based learning*. Intrinsic Books Ltd.

Wu, J, X. (2014). Reflections on the theory of [educational pyramid]. *Teachers' Ways: Teaching and Research*, (2), 103-103.

Wu, Q. Y. (2022). *Application research of task-driven method in information technology teaching in secondary vocational education* (Master's thesis). Jiangxi Science and Technology Normal University.

Wu, W. (2011). *The application of the "project-introduced task-driven" teaching method in the teaching of computer application technology in higher vocational colleges* (Doctoral dissertation). Central China Normal University.

Wu, Y. (2021). Accumulate momentum and seek momentum, recognize changes and seek changes. *Chinese Higher Education*, 1, 4-7.

Xu, G, R. (2016). Promotion and management of vocational education teaching reform. *Tianjin Vocational College Joint Journal*, (2), 59-64.

Xu, J, F. (2014). Current situation and reflections on college students' English autonomous learning ability in my country. *Language Education*, *2*(4), 2-7.

Ye, J. (2016). Reform of teaching structure of literature retrieval course based on flipped classroom. *Contemporary Education and Culture*, *8*(4), 110-113.

Yu, Sh, Q, & Hu, X. (2015). STEM education concept and interdisciplinary integration model. *Open Education Research*, 4, 13-22.

Zhang, L, J. (2018). *Research on task design in task-driven teaching method* (Master's thesis). Shanghai Normal University.

Zhang, X. L. (2014). Practical exploration of problem-based task-driven training model. *Adult Education*, (10), 60-62.

Zhang, Y, J, & Wang, SH, J. (2006). *UG CAD/CAM Basic Tutorial/CAD/CAM Mold Design and Manufacturing Guidance Series*. Tsinghua University Press Co., Ltd.

Zou, R. R. (2019). *Research on task-driven instructional design based on micro-lecture and its impact on learning effect* (Master's thesis). Tianjin Normal University.

Appendix 1

Questionnaire on learning interest and learning attitude

Dear students:

Hello everyone! This is a questionnaire about students' interest in learning "Mechanical CAD/CAM". This questionnaire is only used for scientific research and has nothing to do with your grade evaluation, so you don't need to worry about it. The options for each question in the questionnaire are: 1-do not meet at all; 2-not quite meet; 3-not sure; 4-basically meet; 5-completely meet, tick "√" under the option closest to you. Thank you very much for your cooperation, I wish you all success in your studies!

Gender:________________ Class:________________ Name:_______________

NO.	Question	Comple-tely inconsi-stent	not quite fit	Uncert-ain	basically meet	Comple-tely suitable
1	I usually don't get distracted when I take the "Mechanical CAD/CAM" class.					
2	I am always full of energy in the "Mechanical CAD/CAM" class.					
3	I really like taking the "Mechanical CAD/CAM" class in the computer room.					
4	Although "Mechanical CAD/CAM" is not the main subject, I still like to learn it.					
5	When the teacher asks a question, I will actively think and answer the question actively.					
6	In the "Mechanical CAD/CAM" class, I am most interested in doing it myself.					
7	I will earnestly complete the homework assigned by the teacher.					
8	I think the knowledge of "Mechanical CAD/CAM" is easy to understand.					
9	To learn "Mechanical CAD/CAM" well, the main thing is to practice more, and there is no need to memorize it by rote.					
10	In the "Mechanical CAD/CAM" class, when learning new knowledge, I can always take the initiative to contact the old knowledge.					

11	I think the knowledge or skills learned in "Mechanical CAD/CAM" are very useful.					
12	In the "Mechanical CAD/CAM" class, I like to cooperate with my classmates to complete tasks together.					
13	In the process of learning "Mechanical CAD/CAM", if I encounter difficulties, I will try my best to solve them.					
14	I am not bored with the "Mechanical CAD/CAM" class.					
15	The "Mechanical CAD/CAM" class will not delay my study of other major subjects.					
16	The more you study "Mechanical CAD/CAM", the more interesting it will be.					

Appendix 2

Self-Report Scale for Autonomous Learning Ability

Dear students:

Hello everyone! This is a questionnaire about your learning and living conditions. Each question describes a situation. Please answer the questions one by one according to your own situation. This survey is only for scientific research and is not related to your study. It has nothing to do with moral evaluation, so don't have any concerns, please answer truthfully. Each item is scored from 1 to 7 from "not at all like me" to "extremely like me", and scored according to the degree of similarity to yourself. Please tick "√" on the score that meets your situation. Thank you very much for your cooperation, I wish you all success in your studies!

Gender:_______________ Class:________________ Name:______________

Questionnaire on Motivation and Strategies of Major Study in Chinese College Students

latent variable	dimen sion	NO.	project	Score						
				Not like me at all	**Basi cally unli-ke me**	**Not qui-te like me**	**ne-utr -al**	**Kin -d of like me**	**basi-cally like me**	**very much like me**
				1	**2**	**3**	**4**	**5**	**6**	**7**
Learn i-ng motiv-ation	**self effic-acy**	1	I think I can apply what I have learned in one specialized course to another							
		2	I believe my professional course can get a good score							
		3	I know that I will be able to study difficult study material in specialized courses							
		4	I am sure I can understand what is being taught in this specialized course							
		5	I am confident that I can understand the most complex material used by the teacher of this specialized course							
		6	I am sure that I will do well in assignments and tests assigned by professional teachers							
		7	I am sure I can master the knowledge taught in this course							

		8	Considering the difficulty of this course, the teacher, and my own ability, I think I can do well in this professional course							
		9	For me, it is very important to learn what the teacher taught in the professional class							
		10	I am very interested in what I have learned in my professional class							
	task value	11	I think what I have learned in professional classes will help me increase my knowledge							
		12	I like what I have learned in this specialized course							
		13	It is important for me to understand the content of this professional course							
		14	During the professional exam, I thought that I would do worse than other students							
		15	During professional exams, I kept thinking about questions that I couldn't answer							
	test anxie-ty	16	During the professional exam, I was worried that I would fail							
		17	During professional exams, I feel nervous and uncomfortable							
		18	During the professional exam, I felt my heart beat faster.							
		19	Getting good grades in this professional course is the most satisfying thing for me so far							
	Extri-nsic Moti vatio-n	20	If possible, compared to other students in the class, I would like my professional academic performance to be higher than theirs							
		21	I expect myself to do well in this professional course as it is important to demonstrate my abilities to others (eg: family, friends, employers)							
	Posit-ive self-c onfid ence	22	If there is a suitable study method, I think I can understand all the professional study content							
		23	If I try hard enough, I think I can understand the study material of this specialized course							
	Nega-tive	24	It is my own fault that I did not study this professional course well							

	self-c -onfi -den ce	25	If I don't understand the study material for this specialized course, it's because I didn't try hard enough							
Learn -ing strate gy	**retell -ing strat egy**	26	When preparing for exams, I reread my lecture notes and course materials							
		27	I listed and recited the main points of this specialized course							
	Finis -hing Strat -egy	28	I try to combine the content of this professional course with other courses as much as possible							
		29	When reading, I try to combine the professional content I am reading with my existing professional knowledge							
		30	I try to apply what I have learned in this specialized course to other course activities, such as presentations and discussions							
	Orga -niza -tion -al strat egy	31	When I was studying the reading material for this professional course, I made an outline of the material to help me organize my thoughts							
		32	I make simple tables and diagrams to help me organize my course material							
		33	I outline the chapters in professional textbooks to help me remember							
	Criti -cal Thin -king	34	I find myself often asking questions about what I hear or read professionally, and using that to determine whether it is true							
		35	When new theories, explanations, or conclusions emerge from readings or in class, I try to find out whether there is enough evidence to support them							
		36	I use the study material as a baseline on which to base my understanding							
		37	Whenever I hear a conclusion or assertion in this professional class, I wonder if there are other possibilities							
	Cogn -itive strat egy	38	Before starting to learn new professional content, I will briefly read it							
		39	To make sure I understand what I'm learning, I ask myself questions							
		40	I try to change my learning style to adapt to the professional course requirements and the							

			teacher's teaching style							
		41	When studying this professional course, I will set goals for myself to determine the learning method at each stage							
		42	When I get confused when taking notes in a professional class, I will definitely figure it out after class							
	self-regulation	43	I always felt lazy or bored while studying this professional course, so I gave up before completing my study plan							
		44	When encountering difficult professional learning tasks, I either give up or only do the easy parts							
	Mutual learning	45	I am trying to complete course assignments with my classmates in this specialized course							
		46	When preparing for the exam, I always take the time to discuss the study material with other students in this specialized course							
		47	When I can't understand the study material of this professional course, I will ask my classmates who take this professional course together to help me							
		48	I'm trying to get acquainted with my fellow students in this subject so I can ask for help if needed							
	time man-agem-ent	49	I promise to complete the weekly assignments for this specialized course							
		50	I always go to professional class							
	Lear-ning environment	51	I always study in a place where I can concentrate							
		52	I have a fixed place to study							

Appendix 3

Work Evaluation Form

Structural indicators (first-level indicators)	Single indicator (secondary indicator)	Self-evaluation	group evaluation	teacher evaluation
3D model (50 points)	Information integrity: whether the parts, standard parts, and attributes are complete (10 points)			
	Information accuracy: Whether there are reconstruction errors such as coordination and reference (10 points)			
	Product innovation: practicability, novel appearance, solving existing problems, forward-looking technology (10 points)			
	Software application skills: total number of parts, feature complexity of parts, modeling techniques used (10 points)			
	Design intent: including assembly level, coordination, features and dimensions, and whether maintenance and modification are convenient and error-prone (10 points)			
Engineering Drawings (10 points)	Standardization: Whether the picture frame, title bar, and label meet the standard (5 points)			
	Integrity: Whether the content of the title bar and BOM is complete, whether the views, labels, and notes are accurate and complete (5 points)			
Description of the work (10 points)	Whether the expression of the work description document is clear and			

	accurate, and whether it can highlight the characteristics of the work (10 points)			
Rendering (10 points)	Rendered with Photoview360. Evaluation from aspects of work angle, color, light and shadow, depth of field, background, etc. (10 points)			
Product animation (10 points)	Use SOLIDWORKS animation or Composer to make animations, and evaluate the content expression, coherence, rhythm, angle, color, annotation or sound of the animation (10 points)			
Analysis report (10 points)	Analyze simulations with SOLIDWORKS Simulation. Evaluate from the aspects of analysis objectives, simplification of ideas, unit division, boundary conditions, result interpretation, and reference value for guiding design.			
Subject evaluation				

Appendix 4

Classroom Observation Record Form

Class:__________________________________ Observation Time:____________

Observation Location:_____________________ Observer:____________________

Observation items	**Score**		
Observing students' mastery of knowledge content (The situation of answering the question, the expression state of the students)	1	2	3
Observing students' mastery of operational skills (Able to judge the correctness of the operation, operate independently, accurately and methodically)	1	2	3
Observing student attention (focus throughout class, focus most of the time, focus when it is time to focus, focus sometimes, distraction)	1	2	3
Observing student engagement in learning (The initiative to answer questions in class, and the enthusiasm to participate in class discussions)	1	2	3
Observe students' cooperation (Listen to other people's opinions and actively express your own opinions)	1	2	3
Observe the student's thinking state (Able to express opinions in an orderly manner, use different methods to solve problems, have a clear process of solving problems, think independently, and do things in a planned way)	1	2	3

Experimental class observation record raw data table

	NO.	knowledge content	skill operation	attention	Participation	cooperative	state of mind	total score
Experimental class	1	3	3	3	3	2	2	16
	2	2	3	3	3	2	3	16
	3	2	3	3	2	2	2	14
	4	2	3	2	3	2	2	14
	5	3	3	3	3	3	3	18
	6	3	3	3	3	2	3	17
	7	3	3	3	3	2	3	17
average		2. 57	3	2. 86	2. 86	2. 14	2.57	16

Control class observation record raw data table

	NO.	knowledge content	skill operation	attention	Participation	cooperative	state of mind	total score
Experimental class	1	2	2	2	2	2	2	12
	2	2	3	2	2	2	3	14
	3	2	3	2	1	2	2	12
	4	2	3	2	2	2	2	13
	5	3	3	2	3	2	3	16
	6	3	3	2	2	2	2	14
	7	2	3	3	2	2	2	14
average		2. 29	2. 86	2. 14	2. 00	2. 00	2.29	13. 57