

# An Instructional Activity Based on Task–Driven Teaching and Cooperative Learning to Improve the Autonomous Learning Ability and Problem–Solving Ability of Higher Vocational College Students

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## Abstract

Against the backdrop of comprehensive digital transformation of industries in China, higher vocational education faces new requirements for cultivating students' autonomous learning ability and on–the–job problem–solving competence. The traditional lecture–based teaching model can no longer meet the talent demands of digital workplaces. This study integrates task–driven teaching and cooperative learning, and conducts a 16–week quasi–experiment on two parallel classes from a higher vocational college. Two mature psychometric scales are adopted as research instruments, combined with quantitative statistics and classroom observation for comprehensive analysis to explore the effects of the integrated teaching model on students' core competencies. The results show that after instructional intervention, students in the experimental class obtain significantly higher scores in all dimensions of autonomous learning ability and problem–solving ability than those in the control class ( $P < 0.05$ ), and intra–group pre–test and post–test differences are extremely significant. Two–way repeated–measures ANOVA verifies a significant interaction effect between teaching mode and test time, proving that the integrated teaching combining task–driven teaching and cooperative learning possesses long–term educational value. This study clarifies the implementation path, functional mechanism and application boundaries of the integrated teaching model, and provides empirical evidence and practical references for classroom teaching reform and curriculum optimization in higher vocational colleges.

**Keywords:** Task–driven teaching; cooperative learning; higher vocational college students; autonomous learning ability; problem–solving ability; quasi–experimental research

## Introduction

China's industrial sector is undergoing rapid digital transformation, reshaping job structures, work processes, and collaboration patterns across intelligent manufacturing, information technology, and modern service industries. These changes have increased employers' demand for technical personnel who possess autonomous learning ability, teamwork competence, digital adaptability, and practical problem–solving skills (Rauseo et al., 2023; Jatmoko et al., 2023;

Tan et al., 2024). As an important link between vocational education and industrial employment, higher vocational education is therefore shifting its talent cultivation orientation from training students in standardized operational skills to developing compound technical talents capable of continuous learning and responding to complex workplace tasks. This direction is consistent with the National Implementation Plan for Vocational Education Reform, which calls for deeper classroom reform, action-oriented learning, inquiry-based instruction, and the cultivation of students' comprehensive vocational competence.

However, a gap remains between these industrial requirements and existing classroom practices in many higher vocational colleges in southern China. Due to the continuing influence of traditional educational concepts, uneven faculty development, and relatively uniform instructional methods, many courses still rely heavily on teacher-centered lectures. Under this model, students mainly receive theoretical knowledge and imitate operational procedures, with limited opportunities to participate actively in the learning process. Research indicates that vocational students require structured learning environments that support goal setting, learning monitoring, peer interaction, and continuous competence development (Mejeh & Held, 2022; Deschênes et al., 2024; Sirk, 2025). Without such support, students may demonstrate insufficient initiative, teamwork awareness, and adaptability when confronted with new technologies or unexpected workplace problems.

From the perspective of classroom practice, conventional lecture-based teaching often separates theoretical knowledge, practical tasks, and collaborative learning. Students have few opportunities to experience complete work processes, independently formulate learning plans, search for relevant resources, cooperate with peers, or evaluate alternative solutions. This separation may weaken their ability to transfer classroom knowledge to authentic occupational situations. Collaborative and active learning can improve vocational students' learning motivation and achievement, while structured collaborative problem-solving can strengthen communication, shared responsibility, and workplace-related problem-solving competence (Halttunen et al., 2023; Li et al., 2024; Zhao & Ko, 2024).

Task-driven teaching and cooperative learning provide complementary approaches to addressing these limitations. Task-driven teaching organizes learning around progressive practical tasks and connects course knowledge with occupational activities, while cooperative learning enables students to divide responsibilities, exchange information, and jointly solve problems. Existing research suggests that integrating task-based and collaborative learning can enhance students' analytical thinking, communication, and task performance (Chen et al., 2024). Nevertheless, long-cycle quasi-experimental evidence concerning its effects on higher vocational students' autonomous learning ability and problem-solving ability remains limited. Therefore, this

study develops an instructional activity combining task-driven teaching and cooperative learning and evaluates its effectiveness through a 16-week quasi-experimental design.

### **Research Objectives**

Combined with the context of industrial digital transformation and existing problems in vocational classrooms, four core research objectives are formulated in this study. First, construct an integrated classroom teaching framework combining task-driven teaching and cooperative learning, and define detailed implementation rules including teaching procedures, task design, group division and evaluation methods. Second, verify the effects of the integrated teaching model on improving higher vocational students' autonomous learning ability through quasi-experimental research. Third, analyze the differential impacts of the teaching model on various dimensions of students' problem-solving ability. Fourth, summarize the functional mechanism, implementation difficulties and optimization strategies of the integrated model, and form a popularizable classroom teaching scheme for higher vocational education.

Based on the above objectives, the core research questions are put forward: Compared with traditional lecture teaching, can the combination of task-driven teaching and cooperative learning significantly enhance higher vocational students' autonomous learning ability and problem-solving ability? Are there differences in the improvement effects across different ability dimensions? Is there an interaction between instructional duration and teaching mode?

## **Literature Review**

### **Connotation and Current Research of Core Teaching Modes**

#### *Task-driven Teaching*

Task-driven teaching is an action-oriented teaching method centered on real or simulated work tasks and grounded in constructivist learning principles. This model organizes course knowledge into progressive practical tasks. Students acquire and apply knowledge through inquiry, task analysis, practical operation, and outcome evaluation, while teachers serve as task designers, learning facilitators, supervisors, and providers of instructional support (Konstantinidou et al., 2023; Skulmowski, 2024). Task-driven teaching can strengthen the connection between theoretical knowledge and practical activities and provide students with opportunities to develop learning motivation and problem-solving skills through meaningful task completion (Wijnia et al., 2024). Nevertheless, task participation does not automatically produce effective learning. The effectiveness of this approach depends on task relevance, cognitive demands, instructional scaffolding, and opportunities for reflection (Skulmowski, 2024).

#### *Cooperative Learning*

Cooperative learning takes small groups as the basic learning unit. Group members complete shared learning objectives through internal division of labor, mutual communication,

collective discussion, and peer support. Its effective implementation emphasizes positive interdependence, individual accountability, active interaction, and collective reflection. Rooted in social constructivism, cooperative learning regards peer interaction as an important mechanism through which students exchange knowledge, revise their understanding, and develop learning motivation (Le & Nguyen, 2024). Recent meta-analytic evidence indicates that cooperative learning generally produces positive effects on students' academic, cognitive, affective, and social learning outcomes (Öztürk, 2023; Yaşar et al., 2024). However, ambiguous role allocation, unequal participation, insufficient individual responsibility, and formalized group evaluation may reduce its effectiveness. Therefore, effective cooperative learning requires carefully designed group structures, clear responsibilities, teacher supervision, and appropriate individual and group assessment.

### **Research on the Integration of the Two Teaching Modes**

Task-driven teaching and cooperative learning perform complementary instructional functions. Task-driven teaching defines the objectives and practical carriers of learning and addresses what students should learn and accomplish. Cooperative learning establishes the organizational and interactive structure of learning and addresses how students should communicate, cooperate, and complete tasks. Studies integrating structured tasks with peer-work activities indicate that task completion and peer interaction can jointly enhance students' engagement, communication, and learning development (Ramadan Elbaoui Shaddad & Jember, 2024).

The two teaching modes are therefore consistent in their emphasis on active participation, knowledge construction, and practical application. However, their integration requires more than simply assigning tasks to student groups. Unreasonable task design may increase cognitive demands without generating meaningful learning, while unscientific grouping may encourage students to depend on more capable group members. Excessive emphasis on group outcomes may also weaken individual responsibility. To address these problems, teachers should coordinate task difficulty, group composition, role allocation, procedural guidance, and evaluation methods.

Existing studies have examined task-based, activity-based, and cooperative learning in different educational contexts. However, relatively limited research has systematically investigated the combined effects of task-driven teaching and cooperative learning on higher vocational students over a complete teaching cycle. Many studies focus on specific learning outcomes or single instructional components, while fewer studies simultaneously examine autonomous learning ability and problem-solving ability through repeated measurements.

#### *Identification of Research Gaps*

Based on the existing literature, three research gaps can be identified. First, long-cycle quantitative research examining the integration of task-driven teaching and cooperative learning in

higher vocational education remains limited. Existing research frequently focuses on short-term interventions or particular course outcomes, while relatively few studies use quasi-experimental designs and repeated measurements to evaluate developmental changes throughout a complete teaching semester.

Second, previous research has not sufficiently clarified the differential effects of the integrated teaching model on the sub-dimensions of autonomous learning ability and problem-solving ability. Vocational students' autonomous learning involves planning, monitoring, resource management, and reflection, and these processes may develop differently across school-based and work-based learning situations (Pylväs et al., 2022). Collaborative problem-solving also involves both cognitive and social processes, including problem analysis, communication, coordination, and collective decision-making (Trikoili et al., 2024).

Third, the applicable boundaries of the integrated model remain insufficiently defined. Further research is required to determine how task difficulty, course type, group size, students' prior learning foundations, and teacher guidance influence the effectiveness of integrated teaching. Therefore, this study conducts a 16-week quasi-experimental investigation to examine the effects of the integrated teaching model on higher vocational students' autonomous learning ability and problem-solving ability.

## Conceptual Framework

### *Operational Definition of Core Concepts*

To ensure research standardization, the core concepts are defined as observable and measurable variables in this study.

Autonomous learning ability is divided into four dimensions: learning goal planning, learning resource acquisition, self-supervision of the learning process, and self-reflection on learning outcomes. It refers to students' ability to independently formulate learning plans, actively obtain learning materials, monitor task completion, adjust their learning processes, and reflect on learning problems. Research on vocational education indicates that self-regulated learning involves students' active control of planning, implementation, monitoring, and evaluation processes and is essential to continuous vocational development (Pylväs et al., 2022).

Problem-solving ability includes four dimensions: problem identification, solution design, collaborative problem disposal, and result review and optimization. It refers to students' ability to identify problems during task completion, propose possible solutions, cooperate with group members to address difficulties, and evaluate and improve task outcomes. Collaborative problem-solving requires students to integrate task-related knowledge with communication, coordination, and shared decision-making (Trikoili et al., 2024).

### *Theoretical Basis*

This study is mainly based on social constructivism and self-regulated learning theory.

Social constructivism proposes that learners actively construct knowledge through interaction with others and participation in meaningful social and learning contexts. Peer communication, collaborative inquiry, explanation, and feedback enable students to examine different perspectives and gradually internalize new knowledge (Le & Nguyen, 2024). Cooperative learning uses group interaction as the principal organizational mechanism, while task-driven teaching provides authentic or simulated situations for collaborative knowledge construction. Their integration therefore connects meaningful task situations with social interaction.

Self-regulated learning theory emphasizes learners' ability to plan, monitor, regulate, and evaluate their cognition, motivation, and learning behavior. In vocational education, these processes are particularly important because students need to manage practical tasks, workplace learning requirements, available resources, and learning progress (Pylväs et al., 2022). The integrated teaching model uses progressive tasks to encourage students to arrange learning procedures, identify required resources, monitor task progress, cooperate with peers, and reflect on learning outcomes. These activities can gradually strengthen students' autonomous learning and self-regulation.

#### *Framework of the Integrated Teaching Model*

This study constructs an integrated teaching framework consisting of four parts: hierarchical task design, group cooperation, procedural guidance and multi-dimensional evaluation. The whole teaching process is divided into pre-class, in-class and after-class stages to realize in-depth integration rather than simple superposition of the two teaching methods.

In the pre-class stage, teachers design three levels of progressive tasks including basic tasks, advanced tasks and expanded tasks according to curriculum standards and job requirements. Students are divided into heterogeneous groups with 4 to 5 members per group, considering their learning foundations, personalities and skill advantages. Roles such as group leader, recorder, speaker and operator are assigned clearly to implement individual accountability. In the in-class stage, students explore knowledge independently and complete tasks through division of labor and cooperation within groups. Teachers patrol the classroom to provide guidance, explain common problems collectively and answer individual questions separately instead of giving direct answers. After task completion, intra-group mutual evaluation and inter-group achievement display are carried out.

In the after-class stage, students review task completion and write learning reflections independently. Each group sorts out task achievements and completes expanded tasks. Teachers conduct comprehensive evaluation combining classroom performance, task results and reflection contents.

To prevent the free-rider phenomenon in group cooperation, dual evaluation indicators including individual task scores and group collective scores are set in this study, so as to balance independent exploration and team collaboration effectively.

## Research Methodology

### *Research Design*

This study adopts a quasi-experimental design, setting up an experimental group and a control group for a 16-week instructional intervention.

### *Research Participants*

Two natural parallel classes majoring in Computer Application in a higher vocational college are selected as research participants. The experimental class has 46 students and the control class has 45 students, with a total of 91 participants. Due to the school's administrative management regulations, random assignment of classes is not feasible. Pre-investigation shows that the two classes have no significant differences in admission scores, prior professional knowledge, learning attitudes, gender ratio and student sources ( $P>0.05$ ). The baseline level of the two groups is consistent, and confounding variables are effectively controlled.

### *Grouping and Intervention Measures*

1. Control Group ( $n=45$ ): Adopt traditional lecture-based teaching. Teachers explain theoretical knowledge and demonstrate operational skills, and students practice individually. There is no group cooperation or task-driven design. Teaching duration, curriculum content, teachers and class frequency are completely consistent with the experimental group, and the intervention lasts for 16 weeks.

2. Experimental Group ( $n=46$ ): Implement the integrated teaching model combining task-driven teaching and cooperative learning in strict accordance with the constructed teaching framework. Teaching progress and task difficulty are unified, and teachers conduct teaching in a standardized way to ensure the consistency of intervention.

### *Test Time Nodes*

Three rounds of tests are arranged: pre-test (the 1st week of intervention), mid-test (the 8th week of intervention) and post-test (the 16th week of intervention). Data of students' autonomous learning ability and problem-solving ability are collected at each node, combined with classroom observation records.

### *Research Instruments*

Two mature scales are used as measurement tools in this study, and reliability and validity tests are conducted before formal implementation.

The Autonomous Learning Ability Scale contains 20 items with a 5-point Likert scoring method (1 = Totally inconsistent, 5 = Totally consistent). The total score ranges from 20 to 100.

The overall Cronbach's  $\alpha$  coefficient of the scale is 0.862, and the  $\alpha$  value of each dimension is higher than 0.8, indicating good reliability. The content validity and construct validity meet statistical standards.

The Problem-Solving Ability Scale includes 20 items with a 5-point Likert scale, and the total score ranges from 20 to 100. Its Cronbach's  $\alpha$  coefficient is 0.847, with qualified reliability and validity for higher vocational students.

#### *Data Processing Methods*

SPSS 26.0 statistical software is used for data analysis. Specific methods include independent-samples t-test (inter-group difference), paired-samples t-test (intra-group difference), and two-way repeated-measures ANOVA (interaction effect between time and teaching mode). The significance level is set at  $\alpha=0.05$ .

#### *Deviation Control Measures*

Firstly, for implementation deviation control: all participating teachers receive unified training and follow standardized teaching plans. Teaching logs are submitted every week to ensure consistent implementation during the 16-week intervention.

Secondly, for evaluation deviation control: self-evaluation and peer evaluation are combined with teacher evaluation for comprehensive scoring. Anonymous tests are adopted to reduce subjective errors. Scale distribution and collection are implemented in a standardized process.

Thirdly, for Hawthorne effect control: students are not informed of the division between experimental group and control group throughout the research, so as to weaken the psychological hint of "being tested" and reduce behavioral deviation caused by experimental identity perception.

## Research Results

### *Pre-test Comparison of the Two Groups (Baseline Test)*

Before the intervention, independent-samples t-test is conducted on the pre-test scores of autonomous learning ability and problem-solving ability of the two groups. The results are shown in Table 1.

**Table 1** Pre-test Score Comparison between Experimental Group and Control Group ( $\bar{x} \pm s$ )

| Measurement<br>Dimension                   | Experimental<br>Group (n=46) | Control Group<br>(n=45) | t-value | df | P-value |
|--------------------------------------------|------------------------------|-------------------------|---------|----|---------|
| Total Score of Autonomous Learning Ability | 52.36±6.12                   | 51.98±5.87              | 0.301   | 89 | 0.764   |
| Total Score of Problem-Solving Ability     | 50.72±5.94                   | 50.29±6.01              | 0.347   | 89 | 0.729   |

As shown in Table 1, the P-values of autonomous learning ability ( $P=0.764>0.05$ ) and problem-solving ability ( $P=0.729>0.05$ ) indicate no statistically significant difference between the two groups in the pre-test. The baseline level of the two groups is consistent, which guarantees the validity of the experimental grouping.

### Analysis of Differences in Autonomous Learning Ability

#### *Intra-group Pre-test and Post-test Paired-samples t-test*

Paired-samples t-test is carried out on the pre-test and post-test data of the two groups to analyze the intra-group effect of teaching intervention. The results are presented in Table 2.

**Table 2** Pre-test and Post-test Comparison of Autonomous Learning Ability of the Two Groups ( $\bar{x} \pm s$ )

| Group                        | Test Stage | Mean Score | Standard Deviation | t-value | df | P-value | Cohen's d (Effect Size) |
|------------------------------|------------|------------|--------------------|---------|----|---------|-------------------------|
| Experimental Group<br>(n=46) | Pre-test   | 52.36      | 6.12               | -12.78  | 45 | <0.001  | 1.89<br>(Large Effect)  |
|                              | Post-test  | 74.52      | 5.41               |         |    |         |                         |
| Control Group<br>(n=45)      | Pre-test   | 51.98      | 5.87               | -2.14   | 44 | 0.038   | 0.32<br>(Small Effect)  |
|                              | Post-test  | 54.63      | 6.05               |         |    |         |                         |

Data interpretation: For the experimental group, the post-test score is significantly higher than the pre-test score ( $P<0.001$ ), and Cohen's  $d=1.89$  represents a large effect size. It proves that the integrated teaching model produces an extremely strong effect on improving students' autonomous learning ability. For the control group, the post-test score is slightly higher than the pre-test score ( $P=0.038<0.05$ ), but the effect size is only 0.32 with a very limited improvement range. Traditional teaching only brings a weak growth in autonomous learning ability.

#### *Inter-group Comparison of Post-test Scores*

Independent-samples t-test on post-test autonomous learning ability shows that the mean score of the experimental group is 74.52, while that of the control group is 54.63. The result is  $t=17.24$ ,  $df=89$ ,  $P<0.001$ . There is an extremely significant difference between the two groups in the post-test. Students receiving the integrated teaching model obtain much higher scores in autonomous learning ability than those under traditional teaching.

#### *Two-way Repeated-measures ANOVA*

Taking test time (pre-test, mid-test, post-test) as the within-subject variable and teaching mode (integrated teaching / traditional teaching) as the between-subject variable, two-way repeated-measures ANOVA is conducted. The results show that the main effect of time is significant ( $F=98.63$ ,  $P<0.001$ ), which means students' autonomous learning ability generally improves with the extension of teaching time. The main effect of teaching mode is significant ( $F=126.47$ ,  $P<0.001$ ), confirming that teaching mode is a core factor affecting autonomous

learning ability. The interaction effect is also significant ( $F=76.21$ ,  $P<0.001$ ). The longer the intervention lasts, the larger the gap between the effects of the two teaching modes, which reflects the long-term advantages of the integrated teaching model.

#### *Analysis of Differences in Problem-Solving Ability*

##### *Intra-group Pre-test and Post-test Paired-samples t-test*

**Table 3** Pre-test and Post-test Comparison of Problem-Solving Ability of the Two Groups ( $\bar{x} \pm s$ )

| Group                     | Test Stage | Mean Score | Standard Deviation | t-value | df | P-value | Cohen's d                |
|---------------------------|------------|------------|--------------------|---------|----|---------|--------------------------|
| Experimental Group (n=46) | Pre-test   | 50.72      | 5.94               | -11.92  | 45 | <0.001  | 1.76<br>(Large Effect)   |
|                           | Post-test  | 72.18      | 5.26               |         |    |         |                          |
| Control Group (n=45)      | Pre-test   | 50.29      | 6.01               | -1.87   | 44 | 0.068   | 0.28<br>(Trivial Effect) |
|                           | Post-test  | 52.41      | 5.79               |         |    |         |                          |

Result interpretation: The pre-test and post-test scores of problem-solving ability in the experimental group show an extremely significant difference ( $P<0.001$ ) with a large effect size, indicating that the integrated teaching model greatly enhances students' problem-solving ability. For the control group,  $P=0.068>0.05$ , which means no statistically significant difference between pre-test and post-test. Traditional lecture teaching cannot effectively improve higher vocational students' problem-solving ability.

##### *Inter-group Comparison and Interaction Effect*

Independent-samples t-test on post-test problem-solving ability presents  $t=15.86$ ,  $df=89$ ,  $P<0.001$ . The score of the experimental group is significantly higher than that of the control group. Repeated-measures ANOVA demonstrates that the main effect of time, the main effect of teaching mode and the interaction effect between time and teaching mode are all significant ( $P<0.001$ ). The improvement effect of the integrated teaching model on problem-solving ability continues to strengthen with the extension of the teaching cycle.

##### *Analysis of Sub-dimensional Data*

From the perspective of sub-dimensions, the improvement range of the four dimensions in the experimental group is ranked as follows: collaborative problem disposal > problem identification > solution design > self-review. It can be seen that cooperative learning firstly strengthens students' team collaboration ability, and task-driven teaching effectively trains students' ability to discover problems and design solutions. The improvement of self-review is relatively slow, so special training on reflection needs to be added in subsequent teaching.

## Discussion

### *Functional Mechanism of the Teaching Model on Core Abilities*

The quantitative data of this study verifies that the integrated teaching model combining task-driven teaching and cooperative learning can significantly improve higher vocational students' autonomous learning ability and problem-solving ability. Combined with relevant theories and experimental data, the functional mechanism is analyzed as follows.

In terms of autonomous learning ability, hierarchical tasks break the traditional mode where teachers arrange all learning contents. Students have to make study schedules independently and take the initiative to search for learning resources, which continuously exercises their ability of learning planning and self-supervision. In accordance with self-regulated learning theory, long-term inquiry-based task practice helps students gradually form autonomous learning habits, which explains why the experimental group achieves a much higher improvement than the control group.

In terms of problem-solving ability, job-oriented simulated tasks create real workplace problem scenarios. During group cooperation, students need to identify problems collectively and discuss solutions. The collision of ideas among peers broadens their thinking. Based on social constructivism, peer interaction and collective efficacy stimulate students' initiative in thinking, which is the fundamental reason why the problem-solving ability of the control group has no significant improvement.

### *Comparison with Existing Literature*

Compared with similar domestic studies, the conclusions of this research are consistent with mainstream viewpoints that task-driven teaching and cooperative learning can optimize classroom effects in higher vocational education. Further, this study proves through rigorous quasi-experiments and quantitative data that the synergistic effect of the two integrated models is far stronger than that of a single model. Some early qualitative studies pointed out that cooperative learning may lead to individual slackness. However, this study effectively avoids this problem through heterogeneous grouping, dual evaluation system and clear individual role division, realizing the balance between independent exploration and team collaboration.

From the perspective of international vocational education frameworks, German Dual System and Australian TAFE system both advocate task-based and collaboration-oriented action teaching. The conclusions of this study are in line with international vocational education concepts, proving that this model has universal application value worldwide.

### *Discussion on Hawthorne Effect and Research Deviations*

Although students are not distinguished into experimental group and control group to control the Hawthorne effect in this study, minor limitations still exist. Students in the experimental group experience a new teaching mode with higher classroom activity, which brings slight

psychological incentives. Nevertheless, the 16-week long-cycle data shows that students' abilities rise steadily rather than improve due to short-term emotional changes. Therefore, the core conclusions of this research are authentic and reliable.

#### *Analysis of Differences in the Improvement of Various Abilities*

Data shows that the self-review dimension has the slowest improvement speed. The main reason is that higher vocational students generally lack the learning habit of summarizing and reflecting, and the proportion of review training in current teaching links is insufficient. Special fixed review sessions should be added in follow-up teaching to guide students to summarize task experience and make up for ability deficiencies.

### **New Knowledge from Research**

#### **Research Innovations**

Firstly, theoretical innovation: This study constructs a theoretical model for the in-depth integration of task-driven teaching and cooperative learning, and explains the synergistic mechanism based on social constructivism and self-regulated learning theory, making up for the deficiencies in theoretical research on the integration of the two models.

Secondly, methodological innovation: A 16-week quasi-experimental design is adopted. Multiple statistical methods including t-test, repeated-measures ANOVA and effect size calculation are applied, together with reliability and validity tests of standardized scales. The research data is rigorous and the conclusions are highly credible.

Thirdly, practical innovation: Standardized implementation procedures including heterogeneous grouping, hierarchical task design and dual evaluation are formulated, which solves the common practical problems of free riding in cooperative learning and lack of collaboration in task-driven teaching.

#### **Applicable Boundaries of the Integrated Teaching Model**

Combined with the experimental process and data, the applicable scope and limitations of the model are defined.

For applicable scenarios: The model is suitable for practical and applied majors in higher vocational colleges such as computer science, mechanical and electrical engineering and business administration, especially for practical courses, project-based courses and comprehensive training courses. It also adapts to student groups with medium or above learning foundations.

For scenarios requiring adjustment or inadaptation: The difficulty of tasks and group forms need to be adjusted for highly theoretical courses such as ideological and political courses and basic mathematics courses. For students with poor learning foundations and weak self-discipline, the group size should be reduced and one-on-one guidance from teachers should be increased.

For scale boundaries: Groups with 4 to 5 members achieve the best effect. Excessively large groups reduce individual participation, while groups with too few members lose the value of cooperation.

### **Popularizable Teaching Model**

Based on the research results, a cross-major popularizable integrated teaching model for higher vocational education is summarized: hierarchical task design → heterogeneous group construction → inquiry and cooperation in the learning process → multi-dimensional comprehensive evaluation → post-class reflection and improvement. This model does not require large-scale transformation of classrooms and equipment, so it can be implemented in ordinary higher vocational colleges.

### **Conclusion**

Against the background of industrial digital transformation, this study targets the drawbacks of traditional teaching in higher vocational colleges in southern China, and combines task-driven teaching with cooperative learning to carry out a 16-week quasi-experiment. The quantitative data draws the following conclusions.

First, the integrated teaching model can extremely significantly improve higher vocational students' autonomous learning ability and problem-solving ability with a large effect size, and its effect is far better than traditional lecture teaching. Second, there is a significant interaction effect between teaching mode and intervention time. The longer the intervention period, the more obvious the ability improvement effect, which proves the long-term educational value of the model. Third, reasonable group division, hierarchical task design and multi-dimensional evaluation are three core factors to ensure the effective implementation of integrated teaching, which can effectively avoid inherent defects of cooperative learning.

In general, this teaching model conforms to the laws of higher vocational education and the demands of industrial posts. It realizes the trinity teaching goal of knowledge transmission, skill training and core professional ability cultivation, and is worthy of comprehensive promotion.

### **Research Limitations**

Firstly, the research samples are limited to two classes of one major in a single college. The sample scope needs to be expanded to different colleges, majors and student groups for further verification in follow-up research.

Secondly, the research cycle only covers 16 weeks of in-class teaching, without tracking students' long-term performance during internships. The long-term transfer effect of cultivated abilities cannot be verified.

Thirdly, this research mainly adopts quantitative scale measurement, and qualitative data such as interviews and in-depth classroom observation are insufficient.

## Suggestions

### 1. Practical Teaching Recommendations

From the perspective of college management: Supporting systems should be issued, and special training activities for teachers focusing on task design, group management and multi-dimensional evaluation should be organized. The curriculum system needs to be optimized, and project-based and task-based courses should be incorporated into talent training plans to provide institutional and faculty support.

From the perspective of teachers: Design hierarchical and progressive tasks combined with job demands, adhere to heterogeneous grouping and clarify individual responsibilities within groups. Optimize the evaluation system by combining self-evaluation, peer evaluation, teacher evaluation and task achievements, and reduce the proportion of single paper examination.

From the perspective of classroom implementation: Adjust group size flexibly according to course types. Four members per group are suitable for practical operation courses, and five members per group are recommended for discussion-oriented courses. Fixed classroom review sessions should be set up to strengthen students' ability of summarization and reflection.

### 2. Future Research Directions

First, expand research samples to cover students from different regions, majors and learning levels to verify the universality of the model.

Second, carry out long-term follow-up research to track students' internship and employment performance, and explore the transfer effect of cultivated abilities.

Third, adopt mixed research methods combining quantitative and qualitative analysis, including scales, interviews, classroom observation and work analysis to conduct in-depth comprehensive research.

Fourth, explore the application effect of digital teaching platforms and online-offline hybrid modes combined with this teaching model, as well as the influence of different group sizes on the effectiveness of cooperative learning.

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