Journal of Education, Teaching and Social Studies
ISSN 2642-2336 (Print) ISSN 2642-2328 (Online)
Vol. 8, No. 3, 2026
www.scholink.org/ojs/index.php/jetss

Original Paper

Innovation in the "148" Split-Classroom Model for Social Science Courses in Engineering Majors —Taking "Urban Economics" as an Example

Shiya Qin
School of Architecture, Changsha University of Science & Technology, Changsha 410076, China

Received: July 23, 2026 Accepted: August 12, 2026 Online Published: August 19, 2026
doi:10.22158/jetss.v8n3p50 URL: http://dx.doi.org/10.22158/jetss.v8n3p50

Abstract
This study applies the split-classroom teaching model to social science courses in engineering disciplines, innovating the instructional practice of Urban Economics for urban and rural planning programs. It implements the 148 split-classroom framework—defined by one core concept (dividing classroom time and content between instructors and students), four stages (Lecture, Self-study, Discussion, Summary, i.e., "PADS"), and eight operational steps (problem introduction, focused lecture with intentional, independent internalization, "Bright-Exam-Help" formulation, group discussion, class-wide presentation, chapter synthesis, and application assessment). Through multi-dimensional data analysis of teaching outcomes, this paper points out the problems existing in the teaching reform of split-classroom and puts forward the corresponding strategies, so as to provide a solid practical basis and landing path for the teaching reform of social science courses in other engineering majors.

Keywords
148 split-classroom, engineering majors, social science courses, urban economics

1. Introduction

Against the backdrop of the deep integration of a new round of technological revolution and industrial transformation, the construction of new engineering disciplines in China has entered a critical period of implementation and deep cultivation from conceptual advocacy. Unlike traditional engineering model that focuses on cultivating a single technical skill, the new engineering requires talents to possess solid engineering practical skills, interdisciplinary systematic thinking, complex problem analysis ability, as well as a sense of patriotism and social responsibility based on local needs. As a typical pilot major of new engineering, urban and rural planning has shifted its talent cultivation beyond the single dimension of traditional architectural space design to comprehensively address complex issues such as urban economic operation, public resource allocation, and response to people's livelihood needs. The traditional training model of "emphasizing technology and neglecting humanities and social sciences" is no longer suitable for the core requirements of composite planning talents in urban and rural construction in the new era.

However, the current teaching of social science courses in most engineering majors still faces the dilemma of being misaligned with the goals of the new engineering disciplines: these courses often adopt a theoretical indoctrination model, which does not conform to the learning characteristics of engineering students' concrete thinking and emphasis on practical operation, nor does it deeply integrate social science theory with subsequent engineering practice scenarios, resulting in students seeing it as a "water course" and relying solely on pre exam cramming to cope, unable to establish an interdisciplinary analysis perspective; At the same time, traditional classrooms focus on one-way output from teachers and do not provide students with space for independent thinking and collaborative exploration. This makes it difficult to stimulate students' interest in exploring social science issues and to develop their ability to use social science theories to solve real engineering problems. As a result, there is a problem of "learning with two skins": students are familiar with theoretical provisions but cannot use them to solve practical problems such as land supply and demand, transportation management, and housing security design in urban planning projects.

Driven by the need for educational reform, Professor Zhang Xuexin of Fudan University proposed the split-classroom teaching model in 2014, which provides a highly adaptable new approach to solving pain points in engineering and social science courses. This model scientifically allocates classroom responsibilities, with half of the teacher lecturing on core theories and the other half being handed over to students for group discussions, supplemented by an after class internalization process between two classes. Through a closed loop of "focused lecture with intentional→ independent internalization→ collaborative inquiry→ Q&A sublimation", it reconstructs a student-centered classroom ecology. It not only retains the clear theoretical guidance required by engineering students, but also provides ample space for students to independently digest and combine practical thinking, naturally meeting the talent cultivation requirements of "comprehensiveness, innovation, and practicality" in the new engineering field. After implementation, it can directly improve the quality of single course teaching and provide a replicable and promotable practical paradigm for the reform of similar interdisciplinary courses.

Driven by the need for educational reform, the split-classroom teaching mode proposed by Professor Zhang Xuexin of Fudan University in 2014 [1] provides a new idea with strong adaptability for solving the pain points of engineering and social science courses. This model scientifically allocates classroom rights and responsibilities, with half of the teachers' intensive lectures on core theories and half of the students' group discussions, supplemented by the after-school internalization link between the two classes, and reconstructs the student-centered classroom ecology through the closed loop of "focused lecture with intentional→ independent internalization→ collaborative inquiry→ Q&A sublimation ". It not only retains the clear theoretical guidance required by engineering students, but also gives enough space for students to digest independently and think in combination with practice. It naturally meets the talent training requirements of the new engineering "comprehensive, innovative and practical". After the implementation, it can not only directly improve the quality of single course teaching, but also provide a replicable practice paradigm for the teaching reform of similar cross courses.

International scholars have laid a theoretical foundation for the proposal of the related concepts and teaching modes of the divided classroom [2-3]. Since the concept of split classroom was formally put forward in 2014, relevant research has rapidly covered the whole discipline of higher education, and a large number of practical cases have been accumulated in the professional courses of science and engineering and the core courses of Humanities and Social Sciences [4-6], which has verified the significant effect of this model in improving classroom participation and reducing academic burnout [7-10]. However, there are still obvious gaps in the existing research: first, most of the practice is concentrated in the field of pure engineering or pure social science single curriculum, and there are few studies on the adaptability of cross cutting social science courses for engineering majors, without forming an exclusive design scheme based on the characteristics of Engineering Students' strong concrete thinking and high acceptance threshold of social science theory; Second, most of the existing studies focus on the application of general teaching process, and lack of typical samples represented by urban economics, which is a strong practical engineering discipline such as urban and rural planning, and fail to open up the connection channel between social science theory and engineering practice; Third, most educational reform studies only use achievement as the effect measurement index, and have not established an interdisciplinary ability evaluation system suitable for engineering and social science courses, which is difficult to accurately quantify the improvement effect of students' comprehensive quality, which is also the core innovation breakthrough point of this study.

This study selects *Urban Economics*, a major in urban and rural planning, as the practice carrier. This course has both the theoretical basis of Applied Economics and the practical attribute of urban and rural planning. It is a typical intersection between planning and design and the law of urban economic operation. This research will deeply integrate the concept of split classroom with the characteristics of the course, and through a semester of comparative teaching practice, explore a new teaching path for social science courses that suits the learning habits of engineering students, help students break through the limitations of only knowing drawing and not knowing the logic of urban operation, and grow into compound planning talents who can respond to the real development needs of the city based on economic laws, and also provide practical basis for the social science curriculum reform of similar engineering majors under the background of new engineering.

2. Diagnosis of Teaching Problems in *Urban Economics* Under Traditional Models

As a core interdisciplinary course linking theory and practice in urban planning, traditional *Urban Economics* teaching models have gradually revealed multi-dimensional misalignment with New

Engineering talent cultivation goals, directly constraining the quality of versatile planning professional training.

2.1 Course Content Issues

The most prominent issues are the disconnection between theory and urban planning practice, and insufficient local case coverage. Current textbooks and teaching content mostly follow the general theoretical framework of classical economics, with extensive focus on abstract principle derivation (e.g., land rent theory, supply-demand models) but minimal connection to high-frequency practical scenarios for urban planning students (e.g., regulatory detailed planning index formulation, old community renovation, district industrial planning). Meanwhile, the course case database is outdated: most cases still use Western urban samples from decades ago, with insufficient coverage of recent domestic hot topics in new first-tier cities like Changsha and Wuhan (e.g., rail transit TOD development, land value increment distribution in urban renewal, affordable housing layout). This leaves students unable to apply theoretical knowledge to practical planning project evaluations, resulting in a "theory-practice gap."

2.2 Teaching Method Issues

At the level of teaching methods, the pain points of high proportion of one-way indoctrination, low students' active participation and insufficient cultivation of interdisciplinary thinking exist for a long time. In traditional classrooms, over 90% of time is dedicated to instructor lectures, with almost no space for independent reflection or collaborative inquiry. The interaction between teachers and students is limited to sporadic classroom questions, and most engineering students are always in a passive state of taking notes. Under this mode, the course completely abandoned the guidance of interdisciplinary thinking, neither guided students to understand the laws of economics from the concrete perspective of planning drawings, nor inspired students to reflect on the feasibility of planning schemes with economic logic, which eventually led to students' wrong cognition that "economics is irrelevant", only mechanically recited formula provisions, and completely failed to establish an interdisciplinary analysis perspective of "economic logic behind spatial layout".

2.3 Student Adaptation Issues

Engineering students have strong logical thinking but face high barriers to social science theory absorption, and traditional models struggle to stimulate learning interest. Urban planning students receive long-term training in concrete, practical skills (e.g., drawing, spatial modeling) and excel at visual problem-solving. However, traditional teaching skips the cognitive adaptation phase, directly presenting abstract economic assumptions and mathematical model derivations without building a bridge to engineering students' thinking characteristics. Many students develop a fear of difficulty at the start, viewing the course as "unfamiliar content beyond their capabilities," and ultimately rely on last-minute cramming—lacking active exploration motivation throughout the learning process.

At the level of learning situation adaptation, engineering students have strong logical thinking but face high barriers to social science theory absorption, and traditional models struggle to stimulate learning interest. Students majoring in urban and rural planning have long received representational and practical training such as drawing and spatial modeling, and are good at understanding problems through visualization. However, the traditional teaching directly skips the cognitive adaptation link and directly outputs a large number of abstract economic assumptions and mathematical model derivation to students, without building a cognitive bridge in combination with the thinking characteristics of engineering students. Many students were afraid of difficulties when they first came into contact with the course. They classified the course as "unfamiliar content out of their ability". Finally, they could only cope with the examination by cramming before the exam, and did not have the interest of active exploration in the whole process.

2.4 Assessment Issues

At the assessment level, final exams account for an excessively high proportion, and the process ability can not be effectively measured. Under the traditional mode, final closed-book exams typically account for 70%–80% of the total grade, with assessment content focused on memory-based tasks (e.g., term explanation, short answer questions), and there is almost no open-ended question to investigate students' application of economic principles to analyze local planning problems. This evaluation orientation excludes process-based indicators (e.g., classroom discussion participation, field research outcomes, group scheme discussion quality) that reflect interdisciplinary practical ability—failing to accurately measure students' real competency growth and reinforcing the misconception that "memorizing knowledge point guarantees passing," which deviates from New Engineering's goal of cultivating versatile talent.

3. Design of the "148" Split-Classroom Model for *Urban Economics*

To address the New Engineering goal of cultivating interdisciplinary innovative talent, this study proposes the 148 teaching method ("One Concept, Four Stages, Eight Steps").

One Concept: Dividing classroom time and content between instructors and students. Time allocation is flexible (5:5, 6:4, or 7:3) based on actual needs, 5:5 is half the time for teachers to explain and half the time for students to discuss; In terms of content, teachers mainly explain the knowledge frameworks, key points and difficulties, while students independently study detailed knowledge outside class.

Four Stages: Instructor Lecture (P), Student Self-study (A), Classroom Discussion (D), and Chapter Summary (S) (collectively "PADS").

Eight Steps: Problem Introduction, Focused Lecture with Intentional, Independent Internalization, "Bright-Exam-Help" Formulation, Group Discussion, Class-Wide Presentation, Chapter Synthesis, and Application Assessment.

3.1 Instructor Lecture (P)

This stage is divided into two steps: Problem Introduction and Focused Lecture with Intentional.

(1) **Problem Introduction**: Before specific content delivery, instructors use diverse methods (goal-based, audiovisual, case-based, question-based) to anchor learning objectives. For example, in the section of "Urban Transportation Economics", a video of 300 meter long vehicle queues at the entrance of the

Yingpan road tunnel on Changsha’s Xiaoxiang Avenue (waiting 2–3 traffic light cycles) is screened to let students feel the serious situation of urban traffic congestion and stimulate students to think about the causes and mitigation measures of urban traffic congestion. Or directly throw out the topic "after the opening of the extension line of Changsha Metro Line 3, the housing prices of surrounding buildings have increased by 12% in half a year, but some suburban stations have long-term insufficient passenger flow". Use the local traffic phenomenon that students can perceive in daily life to quickly catch their attention, directly point out the core contradiction to be solved in this section, and quickly anchor the learning objectives. Through question introduction, students can understand what learning objectives are to be achieved in this chapter, or attract students' interest, or let students perceive the close relationship between book knowledge and the real world, or stimulate students' thinking.

(2) **Focused Lecture with Intentional**: Teachers focus on the core logic of the course, the key and difficult points of the chapters, and the path of knowledge practice in the split classroom. It takes 30-40 minutes to build a clear cognitive guidance, clarify the core definition, value, and exploration direction of knowledge, and leave the details, extensibility, and local scene related content for students to explore independently. For example, when explaining the traffic economy, the teacher only focused on the basic framework (transportation supply-demand model, congestion pricing theory, rail transit premium core rules), clarifying the core logic and applicable boundary of the theory, did not expand the derivation details, and did not directly give the standard answers to the traffic congestion at the entrance of the Yingpan road tunnel in Changsha Instead, they intentionally leave blanks to explore (e.g., "causes of tunnel entrance congestion," "how to match land use around stations with passenger demand") to guide students to independently complete in-depth thinking in combination with subsequent research. This mode fits the learning characteristics of engineering students: it not only avoids students' confusion in autonomous learning by clear system guidance, but also returns the learning initiative by "leaving blank", so as to eliminate the direct infusion of all standard answers and stimulate students' desire to explore from the source.

3.2 Student Self-study (A)

This stage includes two steps: Independent Internalization and "Bright-Exam-Help" Formulation.

(3) **Independent Internalization**: After listening to the teacher's lecture, students use detailed split-class textbooks and Xuexitong platform materials to consolidate and internalize the key contents, repeat and review the difficult points, and independently explore Intentional areas—grasping the knowledge context system and master all the knowledge points of the chapters. For example, in transportation economics, students complete the reading of the designated chapters (transportation supply-demand model, congestion pricing theory, rail transit premium theory), conduct local field research (e.g., recording vehicle flow at the Yingpan Road Tunnel entrance during peak hours, documenting land development and commercial layout along Metro Line 3 stations), and independently organize the practical manifestations of theories. In this link, students' independent learning is emphasized, and they do not discuss with classmates or ask the teacher to help explain doubts.

(4) **"Bright-Exam-Help" Formulation**: After the internalization of independent learning, students extract three components:

"Bright Points": The most insightful or important content, giving the reasons to share with the group members during the group discussion, such as the justifications (e.g., "optimal traffic volume determination," "metro station impact on housing prices").

"Exam You": Interest-based questions in the form of problems (e.g., an application question on Changsha Metro Line 3 TOD development).

"Help Me": Difficult knowledge point or practical engineering challenges (e.g., "economic causes of traffic congestion," "low ridership at suburban Metro Line 3 stations").

These components are shared during group discussions to facilitate collaborative learning.

3.3 Classroom Discussion (D)

This stage is divided into two steps: Group Discussion and Class-Wide Presentation.

(5) **Group Discussion**: After students' self-study, they will analyze and discuss in groups in class. Usually, 4-5 people form a group, and each group elects a team leader to organize the analysis and discussion activities of the group. A student is responsible for recording, communicating one by one around the "bright test group" in the group, answering questions with their own site cases. Teachers patrol among groups, master the progress of group discussion, guide and focus on the real planning issues such as congestion control costs and site passenger flow, avoid the empty discussion that is divorced from practice, or guide and encourage some introverted students who are not good at communicating to express their views.

(6) **Class-Wide Presentation**: After the discussion, each group elected a representative to share the group's most valuable research findings and common problems in the class. Other groups answered questions across groups. The teacher only made key points to guide students to demonstrate the landing logic of traffic economic laws from the perspective of planning practice.

3.4 Chapter Summary (S)

This stage includes two steps: Chapter Synthesis and Application Assessment.

(7) **Chapter Synthesis**: After presentations, the teacher will summarize the contents of the knowledge points in this chapter, the links between the knowledge points, as well as the group discussion and the class report. Guide the students from which perspective to analyze and obtain reasonable answers to the questions that still have doubts and no clear answer in the group discussion or the class report. Or teachers and students work together to sort out the theoretical context of this section, such as adding the investigation cases of Changsha tunnel entrance or subway in each group to the knowledge system, clarifying the specific application scenarios of traffic economic analysis in the follow-up regulatory traffic special planning, and opening up the link between theory and planning practice.

(8) **Application Assessment**: After the chapter summary is completed, the teacher puts forward several practical questions for students to use the knowledge of this chapter for analysis, so as to test students' mastery of the corresponding knowledge points and their ability to analyze and solve practical problems

with relevant knowledge. Usually, open application questions are used to give the real scene of land use planning around a new subway station in Changsha. Students are required to use the traffic premium theory to complete the economic feasibility analysis of the scheme, and accurately measure students' interdisciplinary practical application ability.

4. Teaching Practice Implementation and Effect Analysis

4.1 Teaching Practice Implementation

In this teaching practice, two parallel undergraduate classes of grade 2022 and 2023 of urban and rural planning specialty in our school were selected as the experimental objects, conducted over two academic years. The admission scores and average grades in prior professional courses between the two classes in each year showed no significant statistical differences. The class sizes were 23 students (2022 cohort) and 27 students (2023 cohort), respectively. The semester of the course was the first semester of the third year of the University, which completely covered the whole teaching cycle of 24 class hours of urban economics. The control class follows the traditional teaching mode of "teachers' whole teaching+final closed book assessment", and the experimental class is fully adapted to the optimized bisection class scheme of engineering and social sciences courses. In addition to the different teaching modes, the teaching teachers, curriculum outline and assessment knowledge points of the two classes are completely consistent, excluding the interference of unrelated variables on the experimental results.

4.2 Multi-dimensional Data Collection

A comprehensive, multi-dimensional data collection system was established during the implementation to realize the quantifiable traceability of teaching effect.

(1) Classroom Participation Dimension: Classroom participation is mainly measured from three aspects: the rate of class attendance (through the automatic statistics of learning sign in backstage), the response rate of classroom interaction (through the automatic statistics of rain class backstage), and the average speaking time of group discussion (through the statistics recorded by the recorder during group discussion).

(2) Quality of Assignment Completion: The quality of assignment completion is measured from three aspects: on-time submission rate (automatically calculated by the Learning Express assignment backend), case analysis based on local examples (calculated from submitted "Urban Research Task" assignments), and job excellence rate (above 90 points are excellent).

(3) Final Exam Performance: This dimension is evaluated through three aspects: average score (average score of the whole class participating in the examination), excellent rate (proportion of more than 90 points), and open-ended question score rate (proportion of open questions to investigate interdisciplinary application ability).

Table 1. Multidimensional Data Table for the Practice of the "Split-Classroom" Teaching Model

First-Level Assessment Indicator	Second-Level Assessment Indicator	2022 Cohort		2023 Cohort	
		Control Class, 23 students	Experimental Class, 23 students	Control Class, 27 students	Experimental Class, 27 students
Classroom Participation	Course Attendance Rate	95.7%	100%	96.3%	100%
	Classroom Interaction Response Rate	42%	86%	52%	98%
	Average Speaking Duration per Student in Group Discussion	1.5 minutes	3.5 minutes	2 minutes	5 minutes
Homework Completion Quality	Homework on Time Completion Rate	91.3%	100%	92.6%	100%
	Integration of Local Cases Case Analysis Rate	30.4%	87.0%	51.9%	88.9%
	Excellent Homework Rate	34.8%	52.2%	40.7%	66.7%
Final Exam Scores	Average Score	74.8	80.7	76.9	83.8
	≥90 Excellent Rate	8.7	14.8	11.1	18.5
	Open-Ended Question Score Rate	44.1%	67.7%	51.2%	79.8%

4.3 Analysis of the Practical Effects of the "Dui Fen" Classroom Teaching Model

From the data in Table 1, the following conclusions can be drawn:

(1) Compared with grade 2022, among the nine secondary assessment indicators of grade 2023, both the control and the experimental class, except for the two indicators of 100% of the course attendance rate and the on-time completion rate of homework in the experimental class, the data of other indicators have improved to varying degrees. This indicates that with the growth of teachers' teaching age, the summary and application of teaching experience, the teaching and learning effect has been improved to some extent.

(2) Compared with the control class, the data of 9 secondary assessment indicators in the experimental class of both grade 2022 and 2023 have improved to a certain extent. Notably, five key indicators—the response rate of classroom interaction, the per capita speaking time of group discussion, the rate of combining local case analysis, the average score of final examination and the scoring rate of open questions have been significantly improved.

From the practice results of the two grades, the bisection classroom has completely promoted the fundamental change of students' learning state from "being forced to study "to " wanting to learn ". The common practice of cramming before exams has been greatly reduced. Many students have taken the initiative to use their spare time to visit the urban planning exhibition hall, visit the old local community to collect research materials, and even some groups have taken the initiative to extend the outcomes of the course discussion to the topic selection of the college students' urban and rural planning competition. The more core effect is that the students have completely jumped out of the limitations of the traditional engineering students' ability of "only being able to draw plans without understanding urban operational logic.", and really learned to use the theoretical tools of urban economics to study and judge the feasibility of planning schemes. Their ability to solve practical urban problems across disciplines has been practically improved, which fully meets the training requirements of the new engineering construction for compound planning talents.

5.1 Teaching Reflection

In the practice of two grades and two semesters of split-classroom, two core practical challenges gradually emerged, which became the bottleneck restricting the further improvement of teaching effect.

(1) Difficulty in matching the "Dui Fen" rhythm of different basic classes: Although there is no significant difference between the two parallel control classes in the entrance grades and the average scores of the pre courses, the students' autonomous learning ability is obviously differentiated. Nearly one third of the students in the experimental class who have long relied on traditional indoctrination teaching cannot quickly adapt to the mode of "after class internalization +in class discussion". The completion of internalization tasks is delayed, and the discussion link is always in a passive follow-up state. The unified teaching rhythm is difficult to adapt to the needs of different students at the same time.

(2) Challenges in controlling discussion depth: In some groups, discussions tended to stay at the shallow level of "sharing urban knowledge", or talk about the phenomenon in general terms, unable to relate to the core knowledge points such as transportation pricing theory and supply and demand model, or fall into boundless divergent chatting. The limited patrol time of teachers is difficult to take into account the depth of discussion guidance of all groups at the same time, resulting in the discussion in part of the time becoming a mere formality.

5.2 Optimization Strategies

To address these issues, this study proposes two feasible optimization strategies:

(1) Dynamically adjust the proportion of daily performance, reconstruct the original "homework +attendance" binary daily structure into a three-dimensional evaluation system of "30% of internalized tasks completed, 40% of group discussion participation, and 30% of chapter expansion and exploration results". For classes with weak foundation, appropriately reduce the weight of expansion tasks, force students to complete basic internalization with rigid evaluation, and gradually cultivate autonomous learning habits.

(2) Establish a hierarchical discussion guidance mechanism to match the differentiated discussion outline for groups with different foundations in advance: provide a list of "theoretical points - case scenarios"

for groups with weak foundations to help them quickly build the discussion logic; The group with good foundation will directly throw out open and real planning issues, guide them to independently complete interdisciplinary argumentation, and select students with high acceptance of the course as group discussion assistants to help teachers follow up the discussion progress of multiple groups synchronously and solve the problem of insufficient control over the depth of discussion.

5.3 Promotion Pathways

The two-semester, cross-grade reform practice of the "Split-Classroom" model in Urban Economics demonstrates strong potential for cross-course transfer and wider application. It has jumped out of the misunderstanding of directly applying the general process to the divided classroom in the past, and formed a complete set of exclusive paradigms suitable for the social science courses of Engineering Majors: from the content design of "elaborately speaking the blank space suitable for the concrete thinking characteristics of engineering students", to the internalization setting of "local city research task", and then to the discussion system of "real engineering topic orientation", the whole scheme has completely avoided the pain point of the disconnection between the traditional social science courses and engineering students. This model can be directly applied to similar courses such as Urban Sociology and Urban Geography in urban and rural planning programs, and also offers replicable references for interdisciplinary social science courses in civil engineering, hydraulic engineering, and other engineering fields. It provides solid practical evidence and actionable pathways for institutions nationwide to address the widespread challenge of engineering students disengaging from social science courses under the New Engineering Education initiative.

Funding

This paper was supported by the Changsha University of Science & Technology Teaching Reform Project (Project No. XJG25-063) "Innovative Research and Practice of the Split-Classroom Model in Social Science Courses for Engineering Majors—Taking 'Urban Economics' as an Example"

References

[1] Zhang Xuexin. (2014). Split-Classroom: A New Exploration in University Classroom Teaching Reform. *Fudan Educational Forum*, *12*(5), 5-10.

[2] Chen Jun, & Qiu Miaoqin. (2010). A Review of Internalization of Learning Motivation: From the Perspective of Self-Determination Theory. *Modern Educational Review*, *2010*(12), 37-40.

[3] Lage, M. J., Platt, G. J., & Treglia, M. (2000). Inverting the Classroom: A Gateway to Creating an Inclusive Learning Environment. *The Journal of Economic Education*, *31*(5), 120-125. https://doi.org/10.1080/00220480009596759

[4] Zheng Huiyuan, Su Junlong, Wang Xiaolong, et al. (2023). Exploration and Practice of "Course Ideological and Political Education + Classroom Innovation" in Embryology Teaching. *Chinese Journal of Histochemistry and Cytochemistry*, *32*(02), 223-228.

[5] Zhao Zhen'ao, Guo Yaxiong, Gao Siqi, et al. (2023). Practice and Evaluation of the Split-Classroom Teaching Model for Medical Graduate Experimental Animal Science. *Medical Education Management*, *9*(01), 72-76+99.

[6] Cui Zhenhua, & Yang Yanping. (2019). A Survey on the Impact of the Split-Classroom Teaching Model on English Learners' Autonomous Learning Concepts. *China Educational Journal*, *2019*(S1), 72-74.

[7] Hua Rui, & Yuan Qingdan. (2021). Design and Practice of the Split-Classroom Model under the Background of "Student-Centered" Teaching Reform—Taking the Course "Theoretical Mechanics" as an Example. *Vocational and Technical Education*, *42*(02), 29-32.

[8] Yuan Yayi. (2020). Research on Teaching Strategies for Split-Classroom Instruction in Higher Vocational Education Based on "Guided Learning by Lesson Plans". *Vocational Education Forum*, *36*(09), 71-77.

[9] Jin Xin, Li Liangjun, Du Jing, et al. (2022). Teaching Innovation Design Based on the BOPPPS Model—Taking the "Mechanical Design" Course as an Example. *Research in Higher Engineering Education*, *2022*(06), 19-24.

[10] Zhang Xia, Han Yide, Wang Jinxia, et al. (2022). Offline Split-Classroom Teaching Design and Practice in Inorganic Chemistry Combined with PBL Case Studies. *Chemical Education* (Chinese & English), *43*(02), 40-44.