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SPOC Hybrid Teaching Based on SDT and Learning Involvement Model: A Case Study of the Course "Cross-border E-commerce Data Analysis"

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Abstract: With the vigorous development of China's digital economy and the rapid rise of the cross-border e-commerce industry, the market's demand for high-quality digital trade talents is growing rapidly. Vocational education must accelerate digital transformation to cultivate high-skilled talents that meet market demands. This article analyzes the current situation and challenges of SPOC hybrid teaching in higher vocational colleges, and explores the application of the Self-Determination Theory (SDT) and the learning involvement model in optimizing SPOC teaching and solving teaching dilemmas. Taking the course "Cross-border E-commerce Data Analysis" as an example, this article delves into meeting students' needs for competence, autonomy, and relatedness through optimizing class design in the SPOC hybrid teaching model. This approach aims to stimulate students' intrinsic learning motivation, enhance their learning involvement and knowledge retention rate, and ultimately improve their professional capabilities and competitiveness. By reporting the teaching reform, this article aims to provide a solid theoretical basis and practical paths for the teaching of related courses in higher vocational colleges.

1. Introduction

The current mainstream online education platforms include MOOC (Massive Open Online Courses) and SPOC (Small Private Online Course). MOOC is characterized by its "massive scale" "openness" and "online" nature. Internationally, platforms like Coursera, Udacity, and edX are the most renowned, while in China, platforms such as China University MOOC, Smart Vocational Education, and XueTang Online are prominent examples. MOOC has successfully disseminated high-quality courses from top universities worldwide, but it also has drawbacks such as excessive scale, high registration rates but low success rates [1]. In contrast, SPOC has emerged to address these shortcomings with its low barriers, small scale, ease of management and high flexibility [2], thus known as "post-MOOC" application.

With the increasing popularity of blended online and offline education modes, many higher

education teachers have integrated physical classrooms with SPOC platforms to conduct small-scale, restricted hybrid teaching, making it the current mainstream hybrid teaching platform. The combination of SPOC and traditional classrooms can offer richer teaching resources and more diversified teaching methods. This mode not only leverages the flexibility and comprehensive data advantages of online education but also enhances face-to-face interactions between teachers and students [3], shifting the traditional teacher-centered approach to a student-centered personalized teaching model. The SPOC hybrid teaching process typically consists of three stages: pre-class, in-class, and post-class. Before class, SPOC is used for sharing learning resources and conducting pre-class quizzes. During class, SPOC facilitates activities like attendance, teacher-student Q&A and group discussions. After class, SPOC is utilized for homework, tests, and student reflections [4].

Although SPOC blended teaching mode has been widely adopted in vocational colleges, its effectiveness often falls short of expectations. The history of SPOC blended teaching mode is relatively short, therefore it lacks a mature theoretical framework to guide its implementation. As a result, teachers tend to adopt simplistic and arbitrary teaching designs when applying SPOC. Research indicates that the teaching activities most commonly used by teachers are concentrated on classroom attendance, sharing learning resources, and assigning homework, while more interactive activities such as group discussions, interactive Q&A sessions, and project presentations are less frequently incorporated [4]. This phenomenon stems from the fact that many teachers still adhere to the traditional "knowledge-centered" teaching philosophy, viewing SPOC merely as a tool for maintaining classroom discipline and delivering knowledge, while neglecting students' psychological needs and personalized development.

Compared to traditional offline teaching, the SPOC blended teaching mode offers students more flexibility in terms of learning time and space. However, its weaker monitoring mechanisms, limited feedback, and susceptibility to network quality issues make it difficult to ensure effective teaching outcomes. Vocational college students often lack motivation due to poor academic performance in middle and high school and have a relaxed mindset upon entering university [5]. In the SPOC blended teaching environment, the uncertainty of the learning environment and the numerous distractions from the internet further exacerbate the issue of insufficient motivation, leading to low levels of engagement and difficulty keeping up with the teacher's pace. This not only affects students' learning efficiency but also diminishes their ability to deeply understand and apply knowledge.

The problem of students lacking active thinking is equally concerning. In the SPOC blended teaching model, students often become overly reliant on the direct provision of teaching resources and the assistance of artificial intelligence (AI) tools, lacking the drive for self-exploration and active thinking. This passive learning attitude limits students' ability to analyze and solve problems. In this regard, teachers should be particularly cautious in designing SPOC teaching activities, especially in how to use project-based teaching to guide students in analyzing and solving problems based on real-world tasks, thereby stimulating their motivation and active thinking abilities.

2. Theoretical Background

2.1. Self-Determination Theory

Learning motivation, as a key factor in stimulating and sustaining students' learning behaviors, directly determines the level of engagement and learning outcomes [6]. Therefore, a deep understanding of the mechanisms behind learning motivation is crucial for improving the effectiveness of SPOC teaching. SDT (Self-Determination Theory), an important motivational theory in positive psychology, was proposed by psychologists Edward Deci and Richard Ryan in the 1980s [7]. This theory categorizes human motivation into intrinsic motivation and extrinsic

motivation. Intrinsic motivation arises from an individual's spontaneous interest in the activity itself, while extrinsic motivation stems from the desire to obtain external rewards, avoid punishment, or gain recognition from others. SDT particularly emphasizes the importance of intrinsic motivation because it is closely tied to an individual's long-term interests and goals, making it more enduring and effective. Additionally, intrinsic motivation fosters positive emotional experiences and a state of flow, promoting psychological well-being and growth.

According to SDT, the activation of intrinsic motivation depends on the fulfillment of three basic psychological needs: competence, autonomy, and relatedness [7]. The need for competence refers to an individual's sense of achievement when completing tasks. The need for autonomy refers to the experience of self-choice in decision-making. The need for relatedness refers to an individual's need for care, support and sense of belonging from their social group. When these needs are met, individuals perceive their behaviors as self-determined rather than externally controlled, thereby fostering stronger intrinsic motivation. Intrinsic motivation drives individuals to participate in activities with positive attitude, leading to persistence and creativity.

Within the SDT framework, learning motivation can also be divided into intrinsic learning motivation and extrinsic learning motivation. Intrinsic learning motivation refers to the spontaneous drive to learn that arises from a student's interest in the learning content, while extrinsic learning motivation is driven by the desire to obtain external rewards such as scholarships or gifts, avoid punishments like failing a course. Research shows that intrinsic learning motivation is more enduring and effective than extrinsic motivation and leads to better learning outcomes [8], making it the primary focus of this study.

2.2. Levels of Learning Based on Involvement

The goal of vocational education is the cultivation of students' professional capabilities. A crucial element in this process is students' active engagement. Therefore, the role of teachers extends beyond teaching knowledge. They are also creators of positive learning environments. Teachers need to construct thinking-oriented classrooms to foster students' motivation for active learning and enhance their level of engagement [9].

The Levels of Learning Based on Involvement Model posits that learners are not just passive recipients of knowledge but must actively engage to achieve efficient learning [10]. This model illustrates different levels of learning activities, ranging from passive reception to actively involvement. As students' level of involvement increases, so does their knowledge retention rate (as shown in Figure 1). In traditional teaching modes, such as mere reading and listening, students' knowledge retention rates are relatively low because these activities lack deep cognitive engagement. However, when students engage in discussions, practice, and hands-on activities, their knowledge retention significantly improves, as these activities require deeper thinking and participation. The highest level of knowledge retention occurs when students not only need to learn the material themselves but also teach it to others. This process demands extensive active learning to ensure they understand and can accurately convey the knowledge. In the process of teaching others, students must not only grasp "what to do" and "how to do it" but also deeply understand "why so", therefore fully exercise their active thinking and problem-solving abilities. This approach requires both students and teachers to maintain high levels of participation throughout the learning process, including pre-class preparation and in-class interaction, which is difficult to achieve in traditional offline classrooms.

The existence of SPOC platforms provides excellent support for such teaching activities. Teachers can use the platform to offer rich pre-class materials, enabling a flipped classroom mode. Additionally, they can initiate and record teacher-student and student-student interactions during

class, providing students with full-process assessments and immediate feedback. This effectively enhances students' learning engagement and knowledge retention.

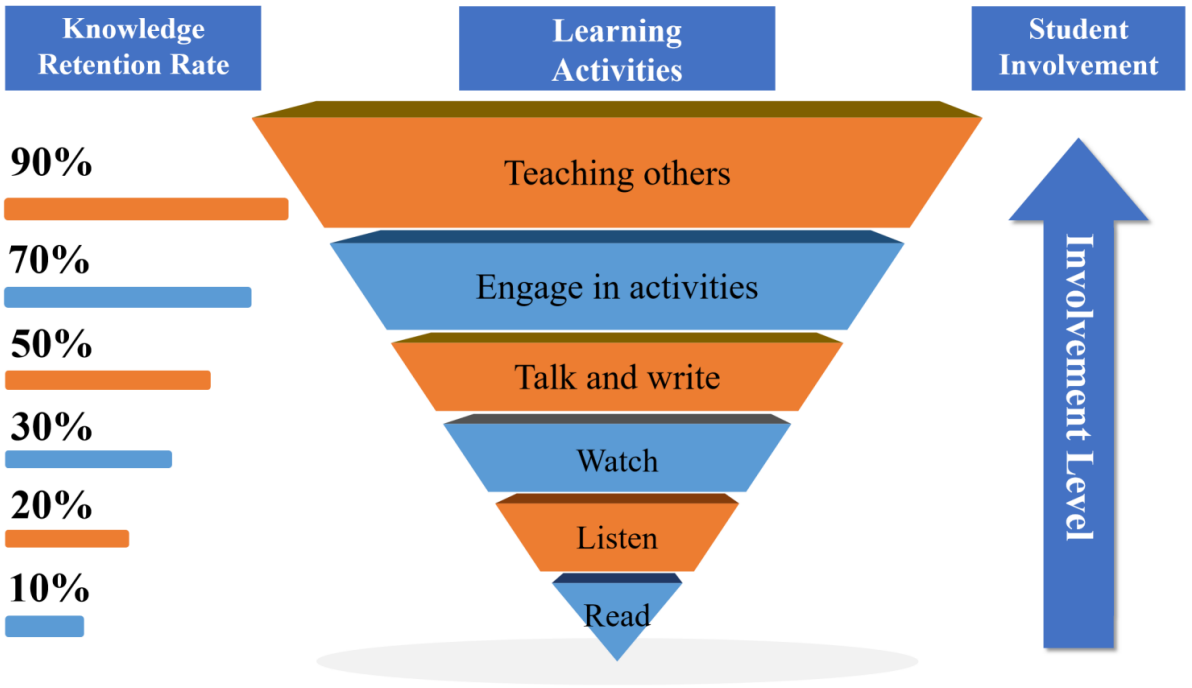

Figure 1: Levels of Learning Based on Involvement

2.3. Integrating SDT and Learning Involvement Model into SPOC Blended Teaching

As SPOC blended teaching is still in its early stage, it urgently requires the guidance of educational theories. Based on SDT, the formation of intrinsic learning motivation relies on the effective fulfillment of three psychological needs: competence, autonomy, and relatedness. Among these, the enhancement of competence undoubtedly takes precedence. Therefore, in designing courses, teachers need to carefully analyze the key professional competencies required by the corresponding job positions and restructure the course accordingly. Simultaneously, teachers should fully leverage the technical capabilities of the SPOC platforms to track and evaluate students' development throughout the entire learning process, and provide personalized improvement suggestions. This creates a virtuous cycle of continuous improvement, meeting students' needs for competency development.

To address the need for autonomy, teachers can utilize SPOC to construct personalized learning paths for students. In terms of course content presentation, teachers can offer various formats of learning materials, such as texts, video demonstrations, and animated simulations, to cater to different students' preferences. Meanwhile, flexible learning modules can be designed, allowing students to choose different content and depth of learning based on their individual ability and preference. Besides imparting professional knowledge, teachers also need to actively respond to students' need for relatedness by strengthening emotional interactions with students. This includes building close bonds through timely Q&A and feedback during class, as well as deeply engaging in student discussions and closely monitoring their learning difficulties before and after class through the SPOC platform. Peer interaction is another way to fulfill the need for relatedness. Teachers should actively encourage students to collaborate and support each other in their learning, gaining genuine recognition from peers, thereby fostering a strong sense of belonging in a caring learning

environment.

Based on the Levels of Learning Based on Involvement Model, the degree of learning involvement determines knowledge retention rate. Therefore, teachers should promote active thinking and deep engagement. The model suggests that when students teach others, they achieves the highest level of knowledge retention. It can be realized through a flipped classroom approach with the assistance of SPOC platforms. Before class, teachers can create tasks, assign them to students or let students choose on their own, while providing abundant supporting materials. In setting these pre-class tasks, teachers should establish clear goals and requirements and raise a series of task-related questions to guide students' active thinking and prepare them for in-class demonstrations. During class, project demonstrations by leading students can replace traditional teacher demonstrations, with teachers reinforcing key points based on students' demonstration. Teachers can also design various high-engagement classroom activities, such as group discussions, role-playing, and case analyses to deepen knowledge understanding and promote skill mastery. After class, reflective assignments can be assigned to consolidate newly acquired knowledge, while students are encouraged to continue sharing their learning outcomes in the SPOC community.

In summary, guided by advanced educational theories, teachers should leverage the SPOC platform to enhance students' learning motivation and engagement, rather than merely treating it as a traditional tool for maintaining classroom discipline and delivering knowledge.

3. Teaching Practice of the Course "Cross-border E-commerce Data Analysis"

3.1. Reconstructing the Course with a Focus on Competency Development

"Cross-border E-commerce Data Analysis" is a core course outlined in the "Higher Vocational Education Cross-border E-commerce Major Teaching Standards" published by Chinese Ministry of Education. In 2022, teachers in Shenzhen Polytechnic University (SZPU) began using the "Vocational Education Cloud SPOC" platform to implement on-campus blended online and offline teaching. In 2023, it was launched on the "Smart Vocational Education MOOC" platform for off-campus teaching, attracting over 6,000 students. The course centers on the role of cross-border e-commerce operation specialist, which is in high demand by enterprises. The team focus on data analysis workflow of this role and collaborate with industry experts to systematically analyze the competency requirements, which are distilled into the 4P framework: Professionalism, Process, Principle, and Precision.

Professionalism. This core course of cross-border e-commerce major serves as an important platform for cultivating students' values and professional ethics. The course team developed the "Professional Ethics Education" section. Through animations and business case studies, students are guided to reflect on social responsibilities, business ethics, and professional conduct related to data in the cross-border e-commerce industry. Particular emphasis is placed on fostering a meticulous and compliant work style, as well as strengthening students' awareness of protecting user data privacy and ensuring fair transactions.

Process. The design of this course follows two main lines, taking the operation process of cross-border e-commerce as the core framework, while integrating the general process of business data analysis. In cross-border e-commerce, data analysis is crucial in four key processes: product selection, promotion, sales, and supply chain management, forming the core projects of the course. These four projects are then organized according to the scientific process of business data analysis, from data collection and pre-processing to analysis, visualization, and report writing. This clear and logical course structure not only builds a systematic theoretical framework for students but also systematically enhance their data analysis capabilities across the entire operation process.

Principle. Data analysis capabilities is closely related to the foundational knowledge in statistics

and business analysis. Therefore, the course incorporates core statistical concepts such as correlation analysis, cluster analysis, and regression analysis. Through intensive practices, students learn to transform abstract statistical principles into practical tools for solving real-world business problems. The course also emphasizes the application of business analysis principles, such as market segmentation and consumer behavior analysis. By learning these principles, students can understand the business logic behind data and scientifically formulate strategies based on data analysis results.

Precision. The course adheres to the teaching philosophy of project-driven and theory-practice integration. Teachers collaborate with industry experts to design a series of projects based on real cross-border e-commerce data analysis scenarios. These projects enable students to apply their knowledge to actual work situations. The practical projects emphasizes the analysis and calculation of key data indicators with high precision.

3.2. Integrating Advanced Teaching Theories to Optimize the Flipped Classroom Mode

The course implementation adopts a project-based flipped classroom approach, incorporating the core concepts of Self-Determination Theory (SDT) and Learning Involvement Model. The teaching is conducted through a hybrid teaching mode using SPOC + classroom, with the whole process illustrated in Figure 2.

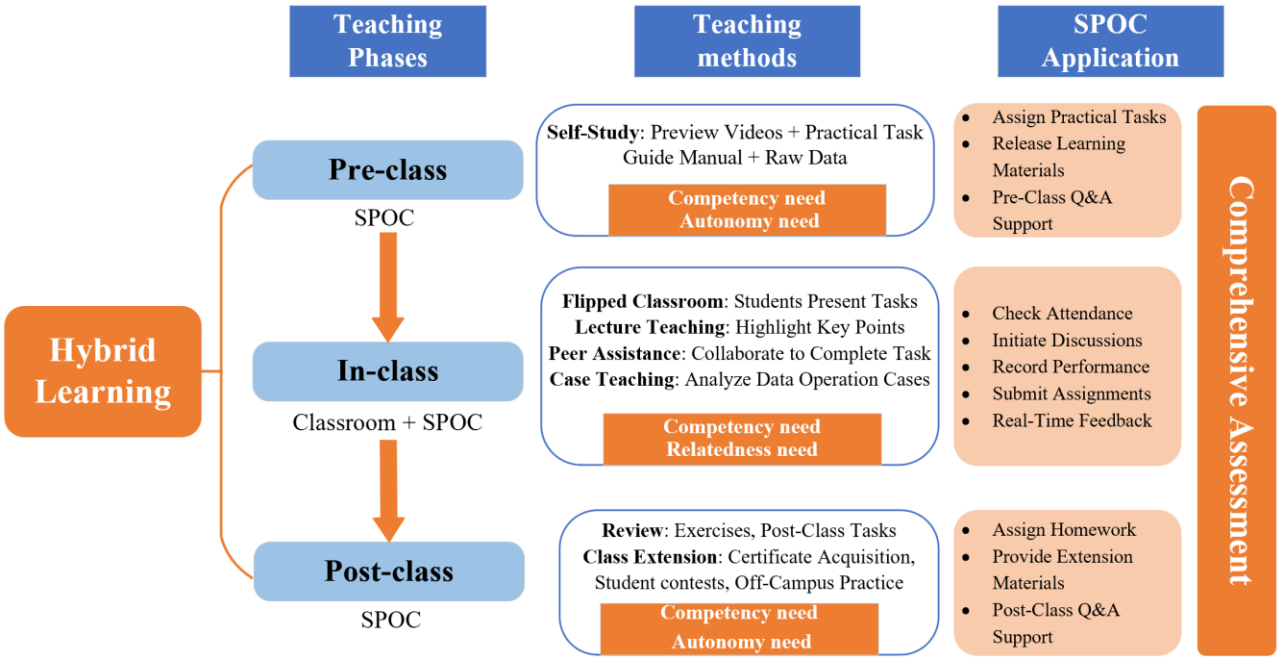

Figure 2: Hybrid Teaching Design

3.2.1. Pre-class SPOC study: meet the need of competency and autonomy

The course is designed around the cross-border e-commerce business logic of "product selection - promotion - sales - after-sales," comprising 6 projects and 14 tasks, supported by 36 practical sub-tasks. These tasks cover the entire process of cross-border e-commerce data analysis, including the collection, analysis, presentation, and optimization of key data indicators. Before class, the teacher assigns the 36 practical tasks to individual students via the SPOC platform and uploads a full set of pre-class resources, including instructional videos, task manuals, and raw data tables. Students use these resources to preview the theoretical and operational aspects of the tasks, complete the tasks independently, and can contact the teacher through the SPOC platform for help. Compared to the

traditional flipped classroom, this course adopts a project-based flipped classroom approach, requiring each student to lead the self-learning and peer-teaching of 1-2 practical tasks over the semester. This reduces the time and effort required for pre-class preparation, making the tasks more specific and the learning process more efficient, better suited to the learning characteristics of vocational college students.

The tasks are closely aligned with real-world work scenarios, with appropriate difficulty levels and rich supporting resources. Most students can complete the tasks through self-study and research, mastering key data analysis skills such as data collection, pivot table usage, Excel function application, and visual chart creation. Students experience the joy of skill improvement during the task completion process and can flexibly arrange their learning activities according to their own time and space. For students with extra learning capacity, teachers provide additional resources for deeper learning, fully meeting their needs for competence and autonomy.

3.2.2. In-Class Face-to-Face study: meet the need of competency and relatedness

During class, the teacher deeply integrates the SPOC platform with offline face-to-face classroom activities. SPOC is not only used for checking attendance but also for recording and showcasing students' pre-class tasks. Based on student presentations, the teacher explains key theoretical points and highlights practical challenges, thereby delivering new knowledge. After student presentations and teacher feedback, the entire class completes practical exercises together and uploads them to SPOC for grading. To further stimulate students' self-motivation and meet their needs for belonging and competence, the teacher initiates "peer assistance activities," where students help each other and record the content, feedback of their mutual help. After teacher approval, these records can be exchanged for classroom performance scores. Additionally, the teacher creates related data operation teaching resources, including cases, videos, animations, and interactive games, as supplementary materials to reinforce new knowledge. The teacher organizes various interactive activities such as quizzes, role plays, and discussions to stimulate thinking and questioning. SPOC records student participation in real-time, generating personalized learning trajectory maps.

The classroom teaching design emphasizes "learning by doing and doing by learning." Through the setup of work-related tasks, the teacher trains students' ability to calculate and analyze data indicators, uncovering the business logic and principles behind the data. By integrating SPOC platform activities such as practical exercises, lectures, case studies, and interactions, the course promotes the achievement of knowledge, skill, and competency goals, meeting students' needs for competence. During task presentations, peer assistance, and teacher-student discussions, students build connections with teachers and peers, particularly gaining gratitude and praise through helping others, thus fulfilling their need for belonging.

3.2.3. Post-class SPOC study : meet the need of competency and autonomy

After class, students continue to refine their tasks, write reflections, and complete exercises. They can freely choose the timing and pace of completion and contact the teacher via the platform for help. The teacher provides feedback and adjusts subsequent course content based on students' task completion. Additionally, the teacher uploads the latest trends in cross-border e-commerce data operations and industry developments as post-class extension materials to the SPOC platform for students' self-study. To meet students' needs for obtaining professional certificates in e-commerce data analysis and cross-border B2C data operations, as well as participating in various e-commerce data operation contests, the teacher creates exclusive learning packages for extended study. Students can independently plan the depth and breadth of their post-class learning according to their own

schedules, fully meeting their needs for competence and autonomy.

4. Conclusion

The course "Cross-Border E-commerce Data Analysis" explores innovative teaching methods and builds students' data analysis capabilities amid the digital economy. In response to the current status and challenges of SPOC blended teaching, teachers have integrated Self-Determination Theory and Learning Involvement Model into the class design to optimize teaching methods. The course has been restructured to cultivate digital trade professionals who "adhere to standards, understand processes, grasp principles, and master precision". By leveraging a "SPOC + Classroom" hybrid teaching approach and incorporating advanced educational theories to refine the flipped classroom mode, the course carefully designs pre-class, in-class, and post-class activities. This not only meets students' psychological needs for competence, autonomy, and belonging but also enhances their learning engagement and knowledge retention. These teaching practices and explorations provide a valuable model for addressing existing issues in higher vocational education, offering insights for related courses.

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