

**CONSTRUCTION OF SPOC BLENDED TEACHING MODE IN RAILWAY INDUSTRY
ENGLISH COURSE IN HIGHER VOCATIONAL COLLEGES BASED ON DEEP
LEARNING**

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Abstract

CONSTRUCTION OF SPOC BLENDED TEACHING MODE IN RAILWAY INDUSTRY ENGLISH COURSE IN HIGHER VOCATIONLA COLLEGES BASED ON DEEP LEARNING

Wei Wang

Under the Supervision of Laura E Roberts, Professor

The demand for international talents on high-speed rail is increasing and good English language skills have become a basic skill for railway workers and technicians. In addition, with the advancement of educational informatization, blended learning has become the norm in education and an important direction for teaching mode reform. This paper aims to explore how to promote deep learning of Railway Industry English through SPOC blended teaching mode. It first reviews research of blended learning and deep learning in China and U.S. The paper then applies a new blended teaching mode with deep learning: SPOC online and offline blended teaching mode through two English intelligent learning platforms, Xue Xi Tong and ISmart. Taking the Railway Industry English course offered by Hunan Technical College of Railway High-speed as an example, I developed a new teaching model for cultivating international railway professionals, promoting in-depth learning of railway industry English courses. This paper references the reform and innovation of blended learning

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Chapter I Introduction

Chinese vocational colleges are actively implementing teaching reforms, introducing various advanced educational resources and methods, such as multimedia courseware, high-impact courses and resource libraries (Ran, 2020). Blended learning has rapidly expanded and extended in the field of education. However, new problems arise: online learning often leaves students' learning process at a shallow level, unable to achieve the goal of deep learning.

Professor Li (2005) claims that deep learning emphasizes the deep understanding and construction of knowledge, which is a high-level learning method for students to connect with existing knowledge and apply new knowledge to solve problems. Guo's (2018) study found that blended learning models can promote deep learning from three aspects: target positioning, construction of learning tasks, and design of learner centered teaching activities. Qin (2021) proposed that the SPOC model is beneficial for promoting deep learning, as it effectively ensures students' learning effectiveness in course knowledge and professional skills. SPOC (Small Private Online Course) refers to “small-scale restricted online courses” (Fox,2013). The works of American scholar Curtis J. Bonk (2006) showed that blended teaching consists of “online learning + face-to-face learning,” which emphasizes student-centered development and learning. Therefore, the combination of SPOC mode and blended learning can promote autonomous, deep, and personalized learning, and promote learners to shift from shallow learning to deep learning.

With the deepening development of China's high-speed railway going global strategy, railway vocational colleges have an unshrinkable responsibility in cultivating international railway professionals with certain English expression skills. Exploring the construction of a railway industry English deep learning teaching model under the SPOC model can effectively support the cultivation of applied innovative railway talents

This paper aims to analyze the current situation and problems of railway industry English teaching from the perspective of deep learning. Taking the Railway Industry English course offered by Hunan Technical College of Railway High-speed as an example, the SPOC online and offline blended teaching mode is applied. This paper proposes implementation strategies to verify the effectiveness of the new blended teaching reform under the SPOC model.

Statement of the Problem

At present, the learning of students in railway vocational colleges remains at a shallow level, and teachers also neglect deep interaction with students, leading to a lack of deep learning ability among students. Teachers lack the design and application of blended teaching models based on deep learning.

The research question is: How to promote deep learning of railway industrial English through SPOC blended teaching mode?

Definition of Terms

Railway Industry English

Industry English, also known as ESP (English for Specific Purposes), refers to English related to a certain profession or discipline, which is learned according to the specific purpose and needs of learners.

Railway Industry English is English for specific purposes related to the railway, such as Railway Transportation English, Railway Engineering English, Railway Signal English and Railway Locomotives English.

Blended learning and Teaching

Harvi Singh and Chris Reed (2004) proposed that blended learning is a learning method that achieves optimal learning outcomes by applying “appropriate” learning techniques at the “appropriate” time. Donald Clark (2005) divided blended learning into two parts: the offline learning part and the online learning part. Professor He (2003) identified that integrating the advantages of traditional learning and e-learning is the definition of blended learning. High level learning ability and strategies can be combined with online and offline teaching methods of blended learning.

Deep learning

American scholars Marton and Saljo (1976) first proposed the concept of deep learning. They believe that deep learning refers to the ability of learners to critically learn new ideas and facts based on understanding, and “integrate them into existing cognitive structures,” establish connections between numerous knowledge, and “transfer existing knowledge to new situations,” making decisions and solving problems.

SPOC

SPOC (Small Private Online Course), also known as Small Restricted Online Course, was proposed by Professor Amand Fox of the University of California, Berkeley in 2013. Small and private refer to the number of students generally ranging from tens to hundreds. Private refers to setting restrictive admission conditions for students, and only eligible applicants can participate in SPOC courses

Xue Xi Tong

Xue Xi Tong (see Figure 1) is a mobile learning professional platform for mobile devices such as smartphones and computers. Teachers can create their own courses or create classrooms on Xue Xitong. This platform has activity functions such as check-in, voting, candidate

selection, answering questions, thematic discussions, quizzes, questionnaire surveys, grading, group tasks, live streaming, notifications, etc., achieving various forms of interactive communication between teachers and students.

Figure 1. Xue Xi Tong App



ISmart

ISmart (see Figure 2) is an English online intelligent learning application. It combines language learning resource libraries and utilizes techniques such as oral pronunciation diagnosis to achieve autonomous learning. ISmart stimulates learners' motivation and engagement in English learning.

Figure 2. Ismart APP



Purpose of the Study

This study aims to explore the SPOC blended teaching model for railway English courses based on deep learning. The aim is to provide teaching strategies for railway English teaching in vocational colleges, improve teaching effectiveness, and promote students' deep learning. In addition, it also serves international educational cooperation. On the other hand, it provides reference for the reform of English teaching in the railway industry.

Significance of the Study

This article explores and applies the SPOC blended online and offline teaching mode based on deep learning, providing reference for the reform of English teaching mode in the railway industry. This teaching model effectively promotes the development and utilization of high-quality teaching resources and students' deep learning, while also improving teachers' information technology teaching ability and classroom teaching quality.

This article provides a teaching design: using a learning platform to create SPOC courses. For example, using Xue Xitong and iSmart intelligent learning platforms to create *Railway Industry English* and *Rail Transit Professional English*. Adopting knowledge construction: online autonomous learning; Knowledge transfer: classroom language application (situational teaching) and knowledge reflection: extracurricular practical activities to expand students' learning space, improve their learning efficiency and practical ability. These teaching design and implement can achieve deep learning and the goal of cultivating vocational English abilities. The conclusion drawn in this article is that the SPOC teaching model promotes deep learning abilities such as knowledge construction, transfer and application, analysis and reflection.

Methodology

This seminar paper is based on literature research. Academic sources include published journal articles and books related to in-depth learning and SPOC blended learning. Using the literature research method, this paper comprehensively interprets and classifies the definition, connotation, characteristics, research status, existing teaching methods and evaluation methods of deep learning, SPOC mode and blended learning. Combining existing knowledge and experience, this study provides strong theoretical support for this paper.

Chapter II Review of Literature

With regard to deep learning and blended learning, Chinese and American scholars have conducted various studies on the blended learning model to promote deep learning (Guan, 2017). The main focus is on the theoretical framework, design and implementation, as well as the evaluation of the effectiveness of blended learning (Hu & Zhang, 2016).

SPOC was proposed by Professor Fox of the University of California in 2013, providing students with a small-scale, personalized online learning environment. This is a course that provides targeted management and control for students (Li, et al., 2020). Searching for relevant literature in online libraries of American university is limited in quantity. China's research on SPOC began in 2014, and in recent years, SPOC courses have been quite popular. Xing, et al., (2020) believed application of SPOC in universities has been strengthened and widely recognized by college students.

This chapter first reviews the concept and research overview of blended learning, in-depth learning, SPOC model in China and the United States, as well as the relationship between them. It also reviews the application of SPOC online and offline hybrid model in Chinese railway industry English courses, and railway industry English teaching strategies to promote in-depth learning.

Blended Teaching

Definition

Since the emergence of blended learning, scholars at in China and the U.S have attempted to define it. American scholars Margret Driscoll (2002) proposed that blended learning includes four levels: audio, video, virtual classroom, and other networked technologies. It combines multiple teaching theories, such as constructivism, cognitivism, behaviorism, to produce the best

learning outcomes. Procter's (2003) viewpoint is that blended learning is an effective combination of different knowledge transfer methods, teaching modes, and learning methods. Graham (2006) defines blended learning as a mixture of face-to-face learning and online learning. Chinese scholar He (2008) stated that “Blending Learning refers to combining the advantages of traditional learning methods with the advantages of e-Learning, which means that teachers should not only play a leading role in guiding, inspiring, and supervising the teaching process, but also fully reflect students' initiative, enthusiasm, and creativity as the main body of the learning process” (P.3). Li (2004) pointed out that “the key to blended learning is to properly select and combine media to achieve the minimum possible cost and the highest learning effect” (P.15).

Based on the above, blended learning not only emphasizes the mixing of multiple learning methods, resources, and media, but also emphasizes the efficiency of mixing to achieve the minimum time investment and maximum learning output. In addition, blended learning is a mode of deeper comprehension in which teachers serve as the director and students serve as the primary subject. It also emphasizes the main role of students, and the leading role of teachers should not be ignored. Only combining the two can ensure the smooth implementation of blended learning.

Research on Blended Teaching

In the new era of information technology, knowledge is rapidly updating. In order to master practical knowledge, college students must achieve autonomous learning (Kai, 2006). The blended teaching model achieves deep integration of intelligent information technology and course teaching and stimulates students' autonomous learning through the organic combination

of “online+offline.” This includes guiding students to deepen their learning and achieving their deep learning abilities (Jin et al., 2022).

In the term of blended teaching methods, it mainly includes PBL project-based teaching, ESP flipped classroom, scenario introduction method, visit teaching method, etc. Integrating mature educational and teaching concepts and methods into blended teaching mode to form a fixed teaching mode is a research hotspot in China's blended teaching mode. For example, Jin (2021) has constructed a seven-part teaching model of “guidance, observation, learning, doing, evaluation, practice, and examination,” and proposed a mixed teaching model of simulated tour guide courses for tourism majors. Zhang (2021) constructs a teaching model that emphasizes both learning and teaching, with teachers as the leader and students actively building a knowledge system. Zhai et al. (2021) constructed a “CBI+FOP” blended teaching approach.

According to Liu (2021), students can establish a railway engineering professional research English interest group under the guidance of teachers and set up some English dialogue scenes related to the railway specialty to investigate the students' ability to adapt to the situation and express themselves in English. Carrying out blended teaching reform based on the “Smart Vocational Education” platform strengthens the guidance, organization, and evaluation of students' learning process through three-stage interactive teaching before, during, and after class. This effectively improves students' participation and initiative, improves teaching effectiveness, and helps cultivate composite high-speed rail crew talents with English communication skills (Li & Liang, 2020).

In terms of teaching evaluation, teaching evaluation adopts mixed evaluation, with online and offline learning separated. The evaluation of online learning is conducted by the classroom based on students' level of cooperation and their academic adaptation. The mutual evaluation

among students, groups, and teachers is the foundation for evaluating offline learning. Therefore, teachers can comprehensively evaluate students' learning situation (Grønlien et al., 2021). Wu et al. (2018) conducted a special experiment on listening and speaking courses within one academic year. The experimental results indicate that the teaching mode of listening and speaking courses, which integrates formative assessment and blended teaching, has a positive promoting effect on the cultivation of students' autonomy and group cooperation abilities, and effectively enhances students' interest in speaking English.

In terms of advantage and disadvantage, Liao & Liu (2020) thinks the advantage of blended teaching is that it can save time and money. Online training is more convenient because learners have lower costs of using professional platforms and their resources, especially if the platform is provided by individual employers. Mirjam Westerlaken, et al. (2019) adds that blended learning may stimulate effective learning and promote high-quality education. Blended learning not only provides online lectures and reading, but also provides interactive homework and collaborative learning. The additional goal is to save time for teachers, thereby saving potential costs.

According to Yang (2014), through the exploration and practice of this kind of blended teaching, the students' abilities of independent learning, cooperative learning and inquiry learning have been cultivated, the students' spirit of diligent learning, self-discipline and overcoming difficulties has been strengthened, and the students' transformation from shallow learning to deep learning has been realized. The traditional teaching process, electronic teaching resources, single assessment, and the limitations of online platforms in the blended teaching process.

Complication ultimately leads to low interest in learning among students, poor teaching effectiveness, and failure to achieve the goal of blended learning (Pan, 2020).

In all the studies reviewed here, I can summarize that the blended teaching model is mainly guided by constructivist theory, comprehensively utilizing modern educational technology and various teaching methods to promote the combination of learning and application, and achieve knowledge construction and application. The blended teaching model is undoubtedly a way to improve the effectiveness of English teaching in the railway industry. Of course, there are still many aspects that need to be explored and solved.

Deep Learning

Definition

American scholars Ference Marton and Roger Saljo (1976) first proposed the concept of deep learning. They made clear that learning can be divided into two levels from a cognitive perspective: deep learning and shallow learning. In 2005, deep learning research officially entered China. Professor Li (2005) pointed that deep learning is a form of critical learning that involves understanding new ideas and knowledge and integrating them into existing cognitive structures. This learning method allows for establishing connections between numerous ideas and transferring existing knowledge to a new learning environment, leading to decision-making and problem-solving.

Research on deep learning

American educator Benjamin Bloom (1956) classified educational goals into three categories: cognitive, emotional, and skill. His student Anderson Lorin W. Anderson (2001) revised on this basis, pointing out that human cognitive processes develop layer by layer through six processes: memory, understanding, application, analysis, evaluation, and creation. Ference Marton and Roger Saljo (1976) first formally proposed the concepts of deep learning and

shallow learning. In 2004, the American Association for Educational Communication and Technology (AECT) made deep learning an important goal of educational technology.

Research in China mainly focuses on the connotation, theoretical basis, teaching models, and empirical research of deep learning. Professor Li (2005) began to focus on deep learning research. Professor Li (2018) first proposed the issue of depth in online learning, which has attracted widespread attention in the academic community. Duan and Yu (2013) summarized the characteristics of deep learning: 1. Learner centered 2. Emphasis on higher-order thinking 3. Emphasis on critical understanding 4. Solving practical problems 5. Emphasizing reflective ability 6. Emphasizing the construction and transfer of knowledge (Wang, 2022). Zeng (2015) discussed the construction of deep learning models, while Zhang (2014) used methods such as observation, reflection, investigation, and testing to collect objective data on the learning process and results, attempting to construct a theoretical system for evaluating deep learning.

All of the studies reviewed here support that deep learning effectively guides students to understand the connotation of knowledge, constructs a knowledge system, and flexibly applies knowledge to solve specific problems. It emphasizes students' deep participation and high-order thinking in the learning process, and ultimately internalizes knowledge by changing their thinking and learning behavior, thereby obtaining comprehensive problem-solving and relearning abilities in real situations.

Studies between Blended Teaching and Deep Learning

In blended teaching and learning designs, deep learning is used to improve curriculum quality and becomes a teaching practice trend in higher education. In the learning process for students, deep learning places an emphasis on the development of higher-order thinking awareness and the capacity for lifelong learning. Mystakidis (2021) showed that deep learning, also known as

meaningful learning, can teach students about difficult topics and improve their ability to analyze what they learn.

Deep learning emphasizes meaningful learning. Teachers organize teaching content, change the knowledge-based teaching content arrangement mode, set teaching content as project tasks, and further subdivide it into learning subtasks. Enable students to critically construct a knowledge system (Shi, et al.,2021). Under the guidance of teachers, through task-driven and problem-based teaching content setting, students' learning initiative is mobilized. Knowledge is deepened layer by layer, a knowledge framework is established, and newly acquired knowledge is critically integrated into the existing knowledge system (Zhang, 2018).

SPOC Mode

Definition

SPOC is a form of classroom teaching aimed at promoting students' autonomous learning and personalized teaching. SPOC has the characteristics of small scale, strong openness, unlimited learning space, extensive content, sufficient learning, free discussion, and dynamic learning evaluation (Singh, 2003).

Comb é et al (2014) studied the spatiotemporal learning formal structure of SPOC. In their studies, the learning forms of SPOC include autonomous learning, cooperative learning and inquiry learning. The teaching process is divided into three stages: preliminary learning, in-depth learning, and applied innovation. In the initial learning stage, learners are required to watch micro videos (such as knowledge explanations) and try to learn core knowledge. In the deep learning stage, highlight the task context and firmly build a knowledge network by studying problems, projects, and cases in real situations. In the application innovation stage, revise and improve the core knowledge network. Kesim & Altinpulluk (2015) further proposed that SPOC

teaching and research should pay attention to: 1. designing three types of problems: “framework problems,” “reflective problems,” and “memory practice problems”; 2. providing a collaborative learning element 3. integrating self-cognition and extending cognition into SPOC.

Research on SPOC mode

SPOC is a teaching medium and resource adopted by many universities in U.S and China. The relatively successful SPOC courses abroad mainly include: Harvard University's “Copyright Law,” “Architecture Hypothesis” and other SPOC courses, the SPOC experiment of the “Software Engineering” course at the University of California, Berkeley, and the micro SPOC experiment of the “Colorado State University Global Campus” practice. MIT has adapted MOOC course resources to use the SPOC model for campus courses (Zhang, 2020). The earliest university in China to offer SPOC courses was Tsinghua University, which opened multiple SPOC courses on the “XueTangOnline” platform, breaking through the conservative teaching model. Afterwards, SPOC developed rapidly in universities, and many universities began to establish campus SPOC platforms. 45 medical colleges launch SPOC in China in 2017. At present, many Chinese medicine universities in China have implemented SPOC teaching practices for different courses.

Create learning task scenarios using SPOC, obtain tasks, play short videos, and allow students to discuss and learn online. Finally, through SPOC process recording and problem analysis, students use classroom notes to record their evaluation and reflection on self-learning (Li. et al., 2020). Shanghai University of Traditional Chinese Medicine has utilized the SPOC teaching model to reform the mixed teaching mode of traditional Chinese medicine courses. Through the use of flipped classrooms, learning groups, and TA (teaching assistant) assisted teaching, the learning content in textbooks is used as a case study for speculation, allowing

students to form traditional Chinese medicine diagnosis and treatment thinking through continuous “questioning and reflection” exercises (Zhang, 2020).

There are some advantages and disadvantages of SPOC model. Xue (2016) thinks that SPOC emphasizes the construction of knowledge. SPOC is supported by advanced educational information technology, providing students with rich learning materials anytime and anywhere, and enabling communication and collaboration anytime and anywhere, achieving an open education environment. Wei et al. (2020) demonstrated that the SPCO model has three advantages: students quickly integrate into the classroom, targeted teaching, and making up for the lack of teacher experience. I agree with that, vocational teachers who are graduates or above, they are lack practical work experience, the in-depth guidance on difficult professional job operations can't be offered. In SPOC mode, we can rely on modern information technology, inviting frontline technical personnel to analyze, explain, and demonstrate professional operational knowledge, bringing students a more in-depth course experience. Yang (2020) proves teachers can dynamically adjust teaching methods and content based on SPOC platform data, and students can engage in personalized learning to improve learning efficiency and effectiveness.

Wang, et al. (2022) argues that the online and offline blended teaching mode based on SPOC can effectively improve students' subjective initiative in learning. However, there are still some problems in the implementation of this teaching mode, such as the inability of teachers and students to communicate in a timely manner, excessive reliance on students' autonomy, and further improvement is needed. Gu (2015) pointed out that the phenomenon of fragmentation, multitasking and shallow map reading accompanied by digital learning is likely to lead to the lack of depth of learning.

Application of SPOC Blended Teaching in Railway Industry Course in China

Currently, many teachers in railway vocational colleges use the SPOC platform for teaching. It is demonstrated in Xiao's (2023) work that in the English teaching of railway vocational colleges, actively adopting diversified methods for innovation and using intelligent vocational education platforms for blended mobile teaching can achieve student-centered teaching goals. In a recent study, Yang (2022) concluded that the effectiveness of this SPOC teaching mode in practice by took the teaching of the *Railway Passenger Transport Organization* course as an example from three aspects of teaching mode design, implementation, and learning situation analysis. Wei, et al. (2020) discussed the teaching mode of rail transit major in vocational colleges based on SPOC by taking the course of *Maintenance of Urban Rail Transit Vehicles* as an example. It was proposed to combine SPOC with college enterprise joint training. Yang (2020) constructed a SPOC teaching model based on smart vocational education cloud, and used the course *High Speed Rail Train Attendant Practice* as an example to carry out SPOC teaching, which improved teaching effectiveness. According to Wen (2022), SPOC values the use of professional learning. Its target audience is registered students, supplemented by online videos, exercises, and Q&A, reflecting the orderly combination of online and offline functions. SPOC enhances interaction and communication through online assisted teaching, such as discussions, task collaboration, and face-to-face communication.

In terms of student evaluation, Zhou (2021) conducted research on the evaluation model under the SPOC teaching mode, and propose four diversified evaluation methods: classroom performance, online evaluation, paper testing, and practical grading. Zhao, et al. (2010) adopted a diversified intelligent evaluation method for students' learning effectiveness based on the SPOC model.

Summary

In the teaching system, educators play a role of guidance, enlightenment, supervision, and control. In the environment created by teachers, students can demonstrate initiative, enthusiasm, and creativity, fully utilizing their education (Grønlund et al., 2021). Long & Tuo (2023) describes that the construction of a blended teaching process is a continuum centered around learning objectives. One end of the continuum is for students to independently learn online course resources, while the other end is for students to reflect on the learning process and results. In the middle, teachers and students participate in deep classroom learning, supporting students' learning to continuously develop from low and shallow levels to high and deep levels. According to my point, Railway Industry English teaching can also be combined with SPOC. The latest blended teaching reform under SPOC mode strengthens the cultivation of students' professional skills and fully mobilizes their learning enthusiasm and initiative, and it has achieved certain results in practical application (Xing et al., 2020).

According to the literature review, it is believed that the innovation of SPOC blended learning model based on the deep learning theory can promote students' effective learning of railway industry English. Teachers can use the learning platform to construct SPOC courses in the railway industry. Through a SPOC blended method, students' enthusiasm for independent learning is stimulated, knowledge construction is guided, knowledge transfer is deepened, and practical problems are solved. Multiple evaluation methods are designed to help students deeply reflect on their learning achievements, promote deep learning, and cultivate composite railway talents with English communication skills.

Chapter III Conclusions and Recommendations

Railway Industry English Course

Introduction

The internationalization of China's railways is rapidly developing, and the requirements for English proficiency of work and technical personnel in various fields of railway construction and operation services are also constantly improving.

At present, there are 26 railway vocational colleges in China, and most of them adopt the curriculum systems of *Basic English + Railway Industrial English*. The learning objectives and content of the course are based on the actual and professional development needs of the college, cultivating professional abilities. Students learn and master common English vocabulary, sentence structure, reading, writing and translation skills in railway industry English, and focus on training basic language skills in English communication and service, so as to better engage in railway related fields and provide high-quality services for Chinese and foreign railways. The development of English courses for vocational railway majors has a relatively complete system.

1. Vocational college students' basic English knowledge is not solid.

Railway English course involves many professional and difficult sentence structures, vocabulary and articles. For students with weak foundations, there are certain difficulties.

2. The integration of information technology teaching and classroom teaching is shallow.

This leads to low classroom efficiency, neglecting the cultivation of high-level thinking abilities, and failing to achieve deep learning

3. The teaching evaluation is also relatively single.

Teaching Evaluation is mainly based on exam scores and lacks evaluation of the learning process.

SPOC Course Construction

The Railway Industry English course offered by Hunan Technical College of Railway High-speed provides an example of how SPOCs can be constructed. It is a professional English course specially designed by this college for students majoring in railway. It integrates railway industry knowledge and English knowledge, helps students master railway industry English expression skills, lays a solid foundation for future workplace English communication.

SPOC, as a form of online courses, requires the support of the course online platform for its operation. The basic functions of XueXiTong and iSmart foreign language learning platform provide mobile online learning mode for our students. Teachers create the courses on the SPOC platform: *Professional English for Rail Transportation* (see Figure 3) and *Oral English for Rail Transit* (see Figure 4). Students install Xue Xi Tong APP on their mobile phones or computers. They enter the class number and then join the class for learning.

Figure 3. SPOC Course –
Professional English for Rail Transportation



Figure 4. SPOC Course -
Oral English for Rail Transit

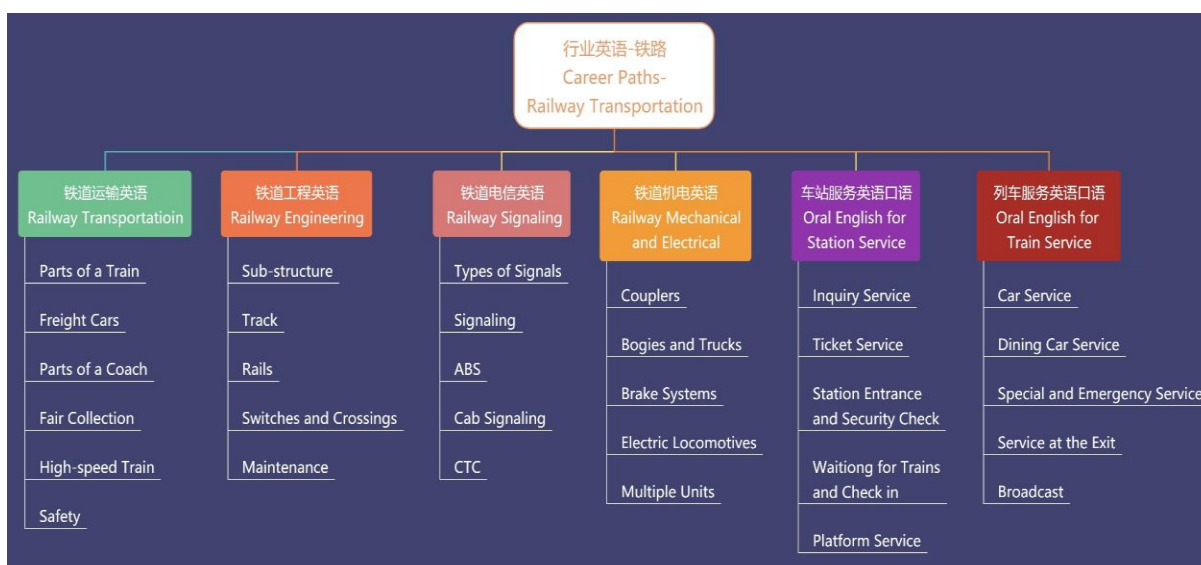


SPOC is a teaching medium and resource adopted by many universities. Due to the small range of students, teachers are easier to control the curriculum, and management is also easier. Many universities both domestically and internationally have started to try and received positive feedback (Kaplan, et al., 2016). The railway industry English course adopts a small class

teaching model, with 40-50 students in each class. In a small number of student classes, teachers have the energy to provide differentiated teaching and targeted guidance to students, and provide timely feedback to students' questions. The high participation of teachers and hierarchical teaching are powerful guarantees for students to enter deep learning (Lin,2020).

The course covers 30 thematic learning topics such as train components, tracks, signals and maintenance. Divided into four modules: Railway Transportation, Railway Engineering, Railway Signaling and Railway Mechanical and Electrical, as well as 2 oral modules for Rail Transit Passenger Service, including Station Service and Train service (see Figure 5).

Figure 5. SPOC Railway Industry English Courses Content



Based on the English communication context of various dimensions in the railway industry, the railway industry English SPOC course is the combination of listening, speaking, reading, writing and E-discussion has stimulated students' self-learning ability. The Module includes 6 parts (see Figure 6): Pre-class Warm-up, Vocabulary Study, Passage Study, Vocational Situation Experience, Role Models & Career Ideals and Section Test. The teaching resources of this SPOC course are rich and diverse, with prominent industry characteristics.

Course resources includes auxiliary audio and videos, high-quality micro courses, real industry case studies, documents, and images. This course has five practice libraries (see Figure7), including single choice, multiple choice, filling in the blank, judgment, and listening ... creating “exclusive” teaching content for students. Since its establishment in 2020, it has been running for 6 rounds.

Figure 6. the Parts of Module 1 Railway Transport

Figure 7. Practice libraries



Application SPOC Blended Teaching in Railway Industry English Courses

The SPOC blended online and offline teaching mode integrates modern teaching technology, reorganizes the teaching process, and considers the acquisition of students' theoretical knowledge and the development of practical abilities (Jian, et al., 2022).

Based on Bloom's-Taxonomy (Lin, 2020) (see Figure 8) and *Blended Teaching Mode Oriented by “Deep Learning”* (Zhao, et al., 2022) (see Figure 9).

Figure 8 Bloom's-Taxonomy (Lin, 2020)

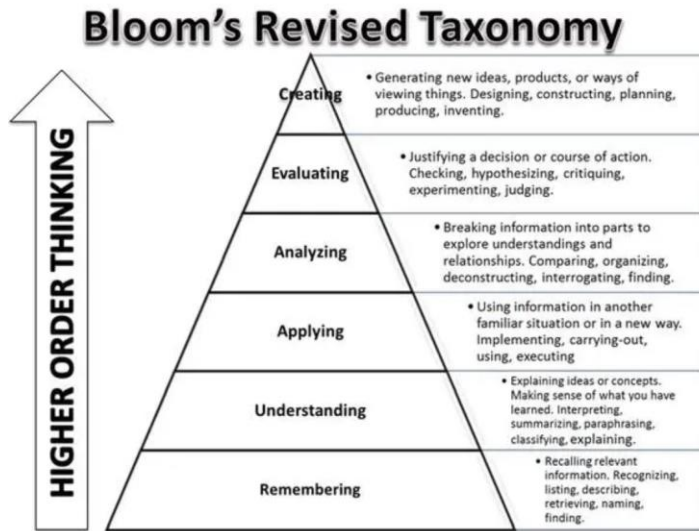
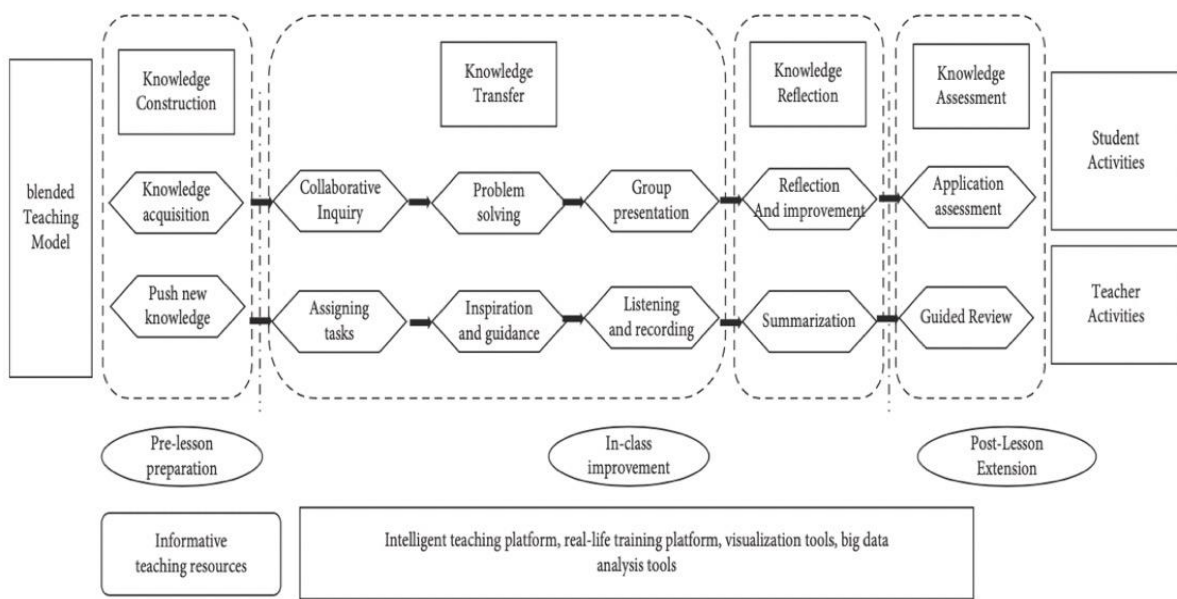


Figure 9. Blended Teaching Mode Oriented by “Deep Learning (Zhao, et al.,2022)



I designed a SPOC Blended Teaching Model (see Table 1) and combined it with SPOC teaching platforms such as XueXiTong and Ismart to apply it to *Railway Industry English* courses. I am utilizing my experience in railway English teaching to demonstrate how to successfully implement SPOC. I applied this teaching mode in Class 2202 of Railway Signal for one semester. The purpose is to promote students' deep learning in the railway industry and cultivate their high-level thinking and abilities in railway industry English learning.

Table 1. Design of SPOC Blended Teaching Mode Based on Bloom's-Taxonomy

Process	Teacher	Students	Goal Hierarchy
Knowledge Construction (Pre-class) <i>SPOC Platform</i>	1.Publish the task list	1. Understand the tasks of this topic	Remembering, understanding
	2.Refine the knowledge points and create a publishing mind map	2.Watch mind maps, understand content of the topic	Remembering, understanding
	3.Publish relevant learning materials (audio, video, articles)	3. Watch audio and video, read relevant articles, and complete personal tasks	Understanding and creating
	4.Produce and publish SPOC micro videos, online testing and discuss topics eg: Precise practice of pronunciation Information gathering	4. Complete SPOC learning online	Understanding and creating
	5.Q&A , tutoring group task	5. Ask questions and complete group tasks	Applying, analyzing and creating
Knowledge Transfer (In-class) <i>SPOC Platform + Classroom</i>	1. Check the pre- class learning situation and conduct pre-evaluation of students	1.Complet the pre-evaluation	Applying
	2.Further explain the key and difficult points eg: Intensive learning of knowledge points	2. Listen to the teacher's explanation. Consolidate and deepen understanding of the content of this topic	Remembering, understanding
	3.Cultivate students' knowledge transfer ability. Explore topic through activities and interactions. eg: Discussion and debate-based learning Collaborative learning Professional situational Experiential learning Tutoring in class	3. Actively participate in activities and interactions, think deeply, Complete knowledge transfer and internalization Accept Teacher's guide	Applying, analyzing and creating
	4.Evaluate student tasks or evaluate each other among students	4. Accept evaluations, reflect, and learn excellent works	Evaluating

Knowledge Reflection (After-class) <i>SPOC Platform</i>	1. Use SPOC teaching platform to push Section Test and practical projects.	1. Complete assignments or projects on SPOC platform and upload them to the SPOC platform.	Applying, analyzing and creating
	2. View the quantity and quality of student assignments completed through the SPOC platform.	2. Accept online tutoring and testing from teachers. Summarize and reflect on learning outcomes, and exchange learning experiences.	Understanding analyzing, evaluating
	3. Answering or tutoring students' questions online.	3. Ask questions and expand your resource pack and further apply knowledge.	Applying, analyzing and creating

In order to achieve the goal of deep learning, in the SPOC blended classroom, the teaching process is structured, and the overall cognitive load is distributed among the tasks in the pre-class, in class, and after class stages, so that the pre-class, in class, and after class stages are no longer isolated. Each stage is interconnected, guiding and assisting students to develop higher-level thinking abilities from shallow to deep, thereby promoting participation in deep learning in the classroom (Le, 2020).

Based on Bloom's cognitive stratification theory, the SPOC blended teaching model consists of three stages in three periods: knowledge construction, knowledge transfer, and knowledge reflection. The various tasks in the table enable students to participate in many high-level thinking activities, such as analysis, evaluation, and creation. The activities in these three stages can promote effective learning for learners and achieve the goal of deep learning.

1. Knowledge Construction

This stage is Pre-Class Warm-up, it aims to build a primary knowledge system. The pre-class knowledge teaching session prepares for SPOC deep learning and lays the foundation. High

quality pre- class instructional design can stimulate students' interest in deep learning. For example, the mind maps, discussion and Precise practice of pronunciation on SPOC course.

The mind maps (see Figure 10, Figure 11) skillfully introduce the knowledge points learned in the course, introduce the key and difficult points of teaching, quickly attract students' attention, stimulate their interest, guide them to find clues related to the teaching content, and gradually sort out and summarize the knowledge points into a complete knowledge unit.

Figure 10. Mind Map on SPOC Course

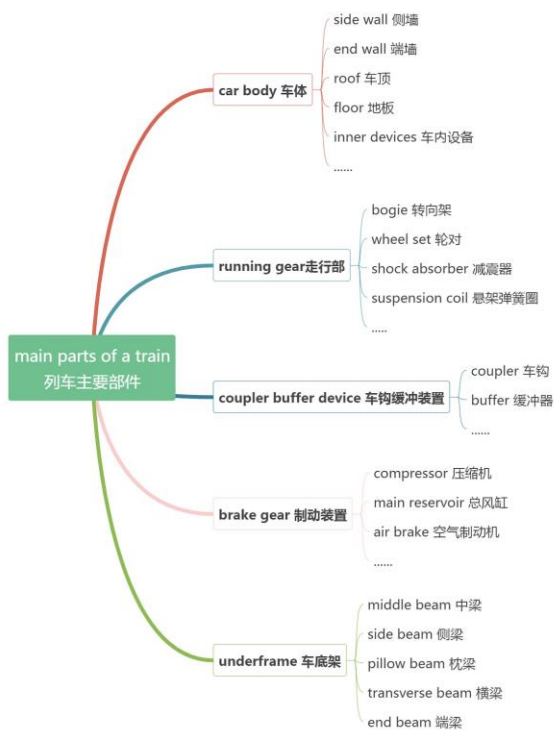


Figure 11. Discussion on SPOC Course

热身讨论 Warm-up Discussion

Search for relevant information to list out main parts of a train, and complete the discussion of the topic below.
查找相关信息，列举列车的部件名称，并完成下面的主题讨论。

列车的主要部件

What are the main parts of a train?
Can you list some of them?
PS. Both Chinese and English versions should be presented.
请列举列车的主要部件。(同时提供中英文)

Precise practice of pronunciation (see Figure 12, Figure13), students can practice repeatedly and efficiently complete learning tasks within the specified time frame. ISmart rates students' pronunciation. I can know students' real-time learning situation through big data statistical analysis, and can also provide targeted guidance students.

Figure 12, Words Oral Test On Ismart

Figure 13, Sentences Oral Test On Ismart



In Knowledge Construction, I provide learning materials on SPOC conducted pre- class discussions using task learning methods, collaborative exploration methods, etc., Students learn and discuss on their own, and have a preliminary memory and understanding of the basic knowledge points of this topic.

2. Knowledge Transfer

This stage is In -class Teaching, which through deep learning guides collaborative learning and realizes knowledge transfer and internalization. In classroom teaching, students actively participate in discussions, demonstrations, and other activities under the guidance and assistance of teachers, and students' advanced cognitive abilities such as analysis, application, judgement and creation are developed accordingly. Classroom teaching can use Manual selection, Shaking, and Preemptive Responses on the SOPC platform to stimulate students' participation and interest in the classroom.

The first step is to further strengthen the difficult basic knowledge trough Intensive learning of Knowledge Points, which will help to internalize classroom teaching and deepen communication in the next step. The knowledge points were taught with pictures and videos (see

Figure14, Figure15). I created the PPT for explaining Railway Signal English words and passage study, recorded teaching videos of the explanation, and uploaded it to the SPOC platform.

Figure14, Further Explain the Terms

4.1.3 词汇学习 Vocabulary Study

编辑 删除

① 词汇跟读 ② 语言点 ③ 解析视频

术语解析视频 Videos for terms and definitions



● 任务点



Figure15, Further Explain the Passage Study

4.1.4 课文案例学习 Passage Study

编辑 删除

① 文章教学视频 ② 教学视频 ③ 难句解析

文章教学视频 Teaching Videos for the Passage



● 任务点



I publish E- discussions (see Figure 16, Figure 17) on the SPOC platform guide students to discuss to cultivate their ability to critical thinking and express themselves fluently.

Figure 16 Discussion Board SOCP Platform

浏览 第8章 模块7-车站服务口语的 8.1.1 Teaching Objectives

Think about the following question.

How to provide excellent inquiry service in a railway station, if you want to be a qualified station clerk ?



Figure 17 Discussion Board SOCP Platform

观看下面的视频片段，并回答视频中的问题。
Watch the following video clip and answer questions during watching.



● 任务点



The classroom also adopts group collaboration and situational simulation and to solve higher-level thinking and deep learning problems such as transfer application and critical innovation. For example, in Topic 39 Automatic Block Systems, the entire class is divided into eight groups to read the Passage Case and collaborate to complete the functional tables of each component of the automatic block system. After completion, while the teacher explains, each team leader evaluates each other. In the Inquire Service unit. Each group will discuss and write down 5 questions that passengers may raise at the information desk, and exchange them with other groups. Ask other groups to answer the 'Passenger Question List'. Guide students to think deeply and solve problems based on their own life experiences. Another example: Group work. I showed the English micro lesson produced by me and my team *How to deal with public health emergencies on the high-speed train?* (See Figure 18, Figure 19). Students collect information, summarize the process, write dialogues, and present the work, which helps them implement knowledge internalization.

Figure 18 Micro Lessons on SPOC Platform



Figure 19 Micro Lessons on SPOC Platform



I assign situational dialogue tasks (See Figure20), and use various railway professional training bases (See Figure21) on campus to practice language, enabling students to internalize

the language knowledge in textbooks into their own language abilities through personal experience. SPOC platform are also used to establish connections with frontline experts.

Figure 20. Situational Dialogue Design Task

Figure 21. Railway Training Bases



In the process of classroom inspection and guidance, further guidance is provided on difficult problems and tasks, such as problem-solving skills and the combination with practical problems, to inspire students to form logical and comprehensive thinking in the problem-solving process, and promote deep processing of knowledge.

3. Knowledge Reflection

This is after -class Teaching, it is also a reflective learning in the advanced stage. The aim is to build a final knowledge system and apply it.

For example, I design and implement the *Railway Vocational English Live Performance Training Project*. Divide each class into 8 small groups, paying attention to the complementarity of group members in knowledge, personality, and skills. Group collaboration to complete railway professional role scenario simulation. Each group select one of the 8 situational dialogue

themes (see Figure22), and fill out a division chart (see Figure23). After completing the shooting of professional scene videos, upload them to the SPOC platform.

Figure22. Situational Dialogues



Figure 23. Situation Performance Division Table

Situational Dialogue Scenes for Railway Passenger Transportation

Class _____	Group _____
主题 Topic	Making Departing Announcement and Showing Passenger to the Compartment
组长 Team Leader	
组员 Team Members	
分工 Division	PPT Maker: Krystal Microsoft Word Maker: <u>Announcement</u> ; Conversation 1: (_____ in conversation1) (_____ in conversation1) Conversation 2: (_____ in conversation2) (_____ in conversation2)
大致内容 Main content	1. Departing Announcement 2. Change the ticket check 3. Lead passenger to the washing-room 4. Showing passenger to his compartment and helping him to change berth

Students can also play the role of railway technicians, inspect safety equipment inside carriages, and discuss CTC systems. Students upload the captured videos to the SPOC course assignment area. I have chosen the best work and placed it in the SPOC course display area.

Through discussions and work presentations, students can reflect and revise their understanding of existing knowledge, resulting in a deeper understanding of new knowledge.

4. Knowledge Assessment

SPOC blended teaching based on deep learning can adopt a multidimensional evaluation system that combines self-evaluation, group evaluation, and teacher evaluation. This not only enhances students' teamwork, communication abilities, but also enhances their logical thinking.

For example, the writing assessment of railway industry English can be completed using corrected online writing (see Figure 24). It automatically evaluates compositions in terms of spelling, grammatical accuracy, vocabulary and sentence structure, and puts forward suggestions for revision. Students can modify their writing according to suggestions. They can also use this website to rate each other. Teachers can make further modifications online. This evaluation process of student self-evaluation, peer evaluation, and teacher evaluation stimulates students' deep thinking and improves learning efficiency.

Figure 24 Correcting Online Writing



The overall evaluation of the course can adopt a dual evaluation method of Process evaluation and Summary evaluation.

Based on big data information (see *Figure 25*) such as video viewing rate, chapter quizzes, and homework completion statistics from the SPOC platform, process evaluations are conducted in conjunction with classroom performance, self-evaluation, and mutual evaluation. The SPOC platform will automatically calculate the online grades for each task (see Table 2), and the teacher will proportionally calculate the total online grades, which will be included in the Daily Performance Grades.

The summary evaluation is mainly conducted in the form of online and offline final testing, practical evaluation, and result reports.

Combining process evaluation and summary evaluation to objectively and comprehensively demonstrate students' true learning level. Course overall evaluation score: Daily Performance Grades (Process evaluation) 50% +Final Exam Grades (Summary evaluation) 50% .

Figure 25. Big Data Information on SPOC platform



Table 2. Online Grades

Number	Assessment Points	Content and requirements	percentage	Assessment Time
1	Assignment	Full score of 100 points, taking the average score of all assignments	15%	The entire process
2	Classroom interaction	Participating in course activities such as voting, questionnaires, quizzes, selecting candidates, discussions, quizzes, and group tasks can earn corresponding scores, with a score of 100 being the maximum score	20%	
3	Sign in	Accumulated by number of times+1 point for each sign in, with a maximum score of 100 signs	5%	
4	Course audio and video	Full score for completing all course videos/audio, average distribution of individual video/audio scores, full score of 100	10%	
5	Chapter Quiz	For chapter tests that are only calculated as task points, the average score of the student's chapter test is taken, and for tests that are not taken, a score of "0" is calculated	10%	
6	Discuss	2 points for posting or replying to a discussion, with a maximum of 100 points	10%	
7	Online Exam	Average score of all exams	30%	
Total			100%	End of period

Conclusion

The SPOC blended teaching mode emphasizes completing learning tasks through self-directed learning, exploration, discussion, and practice, emphasizes the application of knowledge. This enables students to shift their learning of railway industry English from knowledge construction to knowledge transfer, and then to knowledge feedback, achieving a transition from shallow learning to deep learning.

After a semester of study, the students of Railway Signal Class 2022 have significantly improved in listening, speaking, reading, and writing. In the course feedback, this railway industry English course based on SPOC blended teaching mode received positive feedback from both teachers and students. Teaching practice has shown that the online and offline SPOC blended teaching mode has achieved good teaching results. At the same time, it also places high demands on teachers. It takes a lot of time and effort to design and build a high-quality SPOC courses and fully utilize the SPOC platform.

This paper explores the SPOC mode and blended teaching mode, applying the SPOC blended teaching mode to English teaching in the vocational railway industry, and combining examples to prove that this mode can utilize digital resources and practical activities to effectively improve teaching quality and promote students from shallow to deep learning. This paper also provides reference for English teaching in the railway industry

After reflection, there are still some issues that need to be further explored and studied. Such as how to create different levels of inquiry questions on the SPOC platform based on students' learning situations. In addition, further research is needed on what course design is suitable for students in other majors.

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