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Research on Project-based Teaching Design of Scientific and Technological Interpretation in Smart Classroom Environment

Ying Tan[1], Shuying Wu[2,*]

[1]*College of Foreign Studies, Guilin University of Technology, Guilin, China*
[2]*College of Foreign Studies, Guilin University of Technology, Guilin, China*
[*]*Corresponding author*

Abstract: *Economic globalization and science and technology advancement have brought about great changes in social demands for interpreters who are capable of tackling scientific and technological content. However, in conventional science and technology (ST) interpreting teaching, there is a disconnection between classroom learning and career practice. This article explores a project-based output-oriented teaching design of the science and technology (ST) interpretation in a hybrid teaching model, aiming to build an authentic ST interpretation project tasks in smart classroom environment. By scaffolding students' project leaning, we make out better solutions to ST interpreting learning and problem solving, providing a new perspective for the integration and innovation of smart classroom interpreting teaching.*

Keywords: *smart classroom, science and technology interpretation, instruction design*

1. Introduction

In the context of economic globalization, there is an urgent need of professional interpreters who combine foreign language competence with other subject knowledge such as science and technology, diplomacy, economics and trade, laws and other specific professional fields. As China's economy gradually becomes knowledge-intensive, scientific and technological (ST) interpretation is of particular importance in international science and technology exchanges and cooperation. However, some drawbacks in conventional interpreting teaching, such as single training methods and separation between learning and practice, are drawing substantial attention from both universities and industries.

The PBL (problem-based learning) teaching model is widely adopted in university-level interpretation teaching. It is usually learner-centered, allowing learners to actively research, connect theories to practice, apply technology to solve specific problems, and seek solutions to problems through independent exploration and cooperative learning. Driven by authentic and complex interpreting projects, PBL in ST interpreting course can be regarded as a practical and efficient talent training model. However, the iteration of information technology continues to promote the networked, digital, and intelligent transformation of education.(Zhong Fuqiang,2021)The integration of information technology and education has brought new opportunities and challenges to interpreting classroom. Under the new situation, information technologies such as AI, 5G, and virtual simulation (VR) are being widely used in higher education, especially in various practical and skill-based courses, including English.(Li Ying,2020)How to organize and conduct the interdisciplinary ST interpreting more efficiently in a smart classroom environment has become an urgence. Therefore, it is the time to reconsider the physical and virtual learning space, which implies classrooms' transformation towards learner engagement, formative assessments and active methodologies.

Smart classroom is a digital classroom, equipped with a set of computers, projectors, electronic whiteboards, physical booths and instant feedback systems etc., endowed with technology in different senses, from the incorporation of digital devices and learning software to the inclusion of sensor networks that help with tracking classroom processes, gathering data and offering insights to help decision making for better and faster learning, to provide more convenient teaching and learning conditions for educators and students. Technology is adapted to pedagogical aspects, giving response to educational needs rather than being included as a merely innovative but unconnected solution.

Through the smart classroom control system, the teaching process can fulfil a three-stage process,

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covering targeted study from before, during and to after class. The classroom teaching process data can be uploaded to the intelligent cloud platform, which can be accessed by students through the school's smart cloud platform, making the class simpler, smarter, interactive and more effective. The smart classroom can not only promote the organic integration of online and offline teaching, but also fully integrate and utilize teaching resources and time, promoting students' independent thinking and learning abilities cultivation.

This paper responds to the need to rethink and reform learning environments in smart classroom environment at university level, exploring how to improve project-based interpreting learning, attempts to design new smart teaching tasks and models for ST interpretation. By creating an immersive learning environment with high simulation, perception, and interactivity, the teaching design can effectively improve learners' ST interpretation competence and promote the integration and innovation of information technology in interpretation teaching[1-3].

2. Theoretical frame work for teaching design

2.1 Literature review

Learning analytics has been a hot topic in research hotspot in recent years. We searched the IEEE database (Institute of Electrical and Electronics Engineers) for documents from 2013 to 2023 using "Smart classroom" as the keyword, and obtained 884 foreign documents. Research on the practice and application of smart classrooms outside China has a long history. Khan proposed a face detection and recognition algorithm based on convolutional neural network (CNN), whose performance is better than traditional technology. (Khan et. al., 2019) Lee et al. explored implementing a Rotating Synchronous Teaching (RST) model for teaching large student audiences simultaneously while maintaining a smaller interactive classroom atmosphere.(Lee,2019)Songkram proposes an Education 3.0 system called Mutual Learning Community (MLCOM) by combining subsystems of virtual-based learning classroom (VLC), mobile-based learning classroom (MLC) and flipped learning classroom (FLC).(Songkram et. al., 2021)

From 2013 to 2018, relative research in China tend to diversify, and research key words include smart classroom application models, e-schoolbags, flipped classrooms, and personalized learning grew rapidly etc. Yu Shanshan used the China National Knowledge Infrastructure (CNKI) database to conduct a research on documents published from 2011 to 2021 with the theme keywords of "smart foreign language teaching", "smart foreign language learning", "smart foreign language classroom" and "smart foreign language education". After searching, a total of 599 documents were retrieved, mainly focusing on research on smart foreign language teaching, smart foreign language learning, the integration of information technology, smart foreign language education, and other research.(Yu Shanshan,2022) Wang Huashu conducted a quantitative analysis of the research literature on interpretation technology from 1988 to 2019, focusing on "interpretation technology", "information technology + interpretation", "language technology + interpretation", and "Computer-Assisted Interpreter Training or Computer-Aided Interpreter(CAIT)", "Computer-Assisted Interpreting or Computer-Aided Interpreting (CAI)", "Remote Interpreting (RI) + interpretation", "Telephone interpretation + interpretation", "Machine interpretation + interpretation", "Sign language + Interpretation" . A total of 186 core journal papers, conference papers, authoritative database papers, 19 interpretation technical books, 4 doctoral theses, 14 related industry reports and industry standards, and 24 interpretation resource libraries were obtained.(Wang Huashu,2020)

2.2 Methodologies

In this paper, we focus on four student-centered methodologies that have been widely used and recognized: (1) project or problem-based learning, (2) case study, (3) simulation and (4) cooperative inquiry.

Interpreting practice is the most critical and substantive part of classroom interpretation simulation exercises, which faithfully evaluates students' competence to use interpretating skills and language knowledge. The interpreter has a knowledge structure consisting of three blocks: KI=KL+EK+S (P+AP). KI is the knowledge required for an Interpreter; KL refers to knowledge of language; EK means encyclopedic knowledge,including the subject knowledge for specific interpreting mission; S(P+AP) is professional interpreting skills and artistic presentation skills. (Zhong Weihe,2003:64)In this context, Smart Education gains force as a means to put in practice ESD processes as it enables the creation of intelligent, personalized and adaptive learning environments. (Zhu, Z.T, 2016)

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By offering realistic and context-based learning situations, we use student-centered approaches such as project- or problem-based learning and experiential learning to mobilize critical thinking and reflection, autonomous learning, active engagement with the community and research skills. Project- or problem-based learning is a didactic methodology that creates the capacity to apply information to genuine world issues and circumstances, and to look for and evaluate diverse sources of data to solve the problem being studied[4-6].

Case studies have been widely used in a variety of areas of study. This methodology boosts understanding of the topic and the system as a whole. Students can acquire new knowledge and cultivate critical thinking abilities, while getting familiar with the dilemmas faced when applying or producing innovative solutions for interdisciplinary interpreting. Problem-based learning may likewise converge with case studies as a type of inquiry-based learning. Deep descriptions and analysis of real-world scenarios, problems and debates in sustainability can help students to acquire the skills that allow them to handle intricacy and incertitude at the community, regional and global levels. Case studies allow students to engage in research, to examine real-world examples contemplating the perspectives of diverse partners and to encounter the complexity of socio-environmental systems.

Simulations or role-playing games are a conventional classroom strategy that foster experiential learning. Students do different roles and produce a context or situation close to real life. It includes acting and dramatization, the sharing of views and feelings with others and reflection on the subject or subjects involved, being greatly valuable for the analysis of social, economic and environmental problems.

Cooperative inquiry comprises learning through research activities shared by peers, in which student groups engage in a research process, where all of the research decisions are shared, and the group members become co-researchers. Cooperative inquiry can establish an effective communication inside group, and have positive influence on team cooperation.

3. ST interpretation instructional design based on PBL model

Since John Dewey proposed the concept of project-based learning, project-based teaching has become an important field in pedagogy research. PBL enables students to gain first-hand real practical experience in the process, by learning how to deal with real-life problems and how to work as a team. (Dewey, 1966: 2) Dahlboom believes that this kind of project-based collaboration is possible when the project participants are in different places and all work on network-related work. (Dahlbom, 1998:36) Wenger holds that learning and practice are closely connected and inseparable. This concept is the basis of project-based design. (Wenger, 1998: 24)

3.1 Overall teaching design

Table 1: ST interpreting mission

Number	Major task	Contents of teaching
Mission 1	Client reception	1. Receiving guests at the airport 2. City transportation, hotel check-in and services
Mission 2	Business activity	3. Business dinner and receptions 4. Welcoming speech and toast
Mission 3	Visiting company	5. Company profile 6. Local investment environment 7. Local investment policies
Mission 4	Product presentation	8. New product presentation, brand strategy 9. Market research result
Mission 5	Product demonstration	10.Product features 11.Prodcut assembly, operation and maintenance 12. business negotiation
Mission 6	Corporate cooperation	13.Corporate cooperation, technological exchanges 14.visiting high-tech trade fair

The design is based on a case of foreign visitors visiting Chinese enterprises and participating in high-tech trade fairs. It is designed as a comprehensive scientific and technological interpretation service project for receiving foreign businessmen. The project involves welcoming foreign guests, visiting enterprises, product promotion, business and technical cooperation negotiations, etc. The interpretation content involves company profile, product presentation, purchase and sales negotiation, technical

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cooperation and exchanges, etc. This module has three levels of knowledge and ability objectives: 1) Understand the process of corporate visits and customer reception; 2) Understand international trade negotiations involving science and technology exchanges; 3) Be able to do interpretation involving technological product assembly, operation and maintenance etc[7-9].

The design starts with a foreign business representative's visit to a Chinese technology company that specializes in mobile phone stabilizers. Table 1 indicates the relative teaching contents:

3.2 Implementation of the teaching design

Based on the knowledge and ability goals, the teaching process is divided into three steps. First, the "presentation" of knowledge points (pre-class theoretical learning); second, the "unpacking" of knowledge points (connecting the corpus with real things); third, the "repackaging" of knowledge points (the combination of theory and practice); finally, high-quality scientific and technological interpretation. The teaching implementation is divided into three stages: pre-class self-study, in-class cooperative study and after-class extended study.

3.2.1 Pre-class self-study

Activity 1: Pre-class literature reading: building agenda and vocabulary

The teacher provides technical documents, in both Chinese and English, about a technological model for pre-class reading. In reading, students complete exercises such as the term matching, word guessing, and fill-in-the-blanks issued by the teacher through online platform. This pre-class reading introduce students not only to the basic knowledge about the target product but also the vocabulary, technical terms and expressions in the literature. As the project involves business activities and technology, the students need to make out an agenda before they build their glossary.

Activity 2: Research and Q&A: understand the agenda and work environment

The teacher shares the operation video of the product online. Students watch the video, and combine their knowledge obtained in reading the literature with the video information, to gain an intuitive understanding of the product.

Some t questions are issued through online platforms to guide students into critical research and thinking. These questions involve the company's introduction and market share, the company's development strategy, product competitiveness, local preferential policies for investment promotion and relevant laws and regulations, etc. Students complete subject knowledge learning by doing Internet searches, group discussions and collaborative collaboration. They form groups to analyze upcoming interpreting tasks and fill out a question set sheet. The question set includes:

•The needs and expectations of foreign business representatives

•The needs and expectations of Chinese business representatives

•The work requirements and environment of interpreters

Activity 3: team management

Teacher releases the task card on the online teaching platform, and students are divided into groups to claim the task card. Each student will play the role as the foreign visiting client, the representative of the Chinese company, and interpreter respectively. Team members prepare their parts in advance the task of airport pick-up, company visits, business dinners, toasts and welcome speeches based on their roles.

3.2.2 In-class cooperative study: a case of receiving foreign clients in a high-tech company

The classroom teaching process needs to be completed in a language laboratory or smart classroom equipped with interpretation teaching system. The classroom is accessed to WIFI and equipped with cameras, speakers and other equipment. Teachers can use the Chaoxing Smart Classroom System (classroom system), which is connected to the Fanya platform (online teaching platform), Xuexitong (mobile app), and big data analysis system (management app), to flexibly organize various resources, activate classroom activities, project screens for interaction, collect academic statistics, do recording and live broadcasting, etc. Teachers and students can use real-time chat apps on mobile devices such as QQ and WeChat groups to form a classroom response system and use digital intelligence technology to carry out scientific interpretation practice and thinking training more efficiently.

Teacher first conducts memory training in class, then reflects on the difficulties of feedback memory

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training, guides students to think about the importance and challenges of interpretation note-taking training, and then uses new training to scaffold students in note-taking skills. Teachers prepare audio and video materials of different difficulties in visual memory, outline memory and comprehensive memory, and play these audio or video resources through the classroom teaching system. Students individually perform retelling or interpretation tasks and their response will be recorded. The playback and listening guide students to reflect on their memory process and compare it with relevant interpretation skills and knowledge, to identify difficult points in scientific and technological interpretation. Teachers can also take or randomly select student recordings, organize discussions, provide evaluation and feedback, and jointly analyze problems that arise, such as logical problems, missing key words, incomplete information, etc., analyze the causes behind and explore improvement methods. Examples are as follows:

Activity 1: sight interpreting: **product introduction**

The teacher prepares sight interpreting materials and allows students to do interpretating warm-up exercises.

In the comments, teachers guide students to reflect on the interpreting process, discover the internal logic of ST interpreting materials, explore and optimize memory methods, and introduce the skills of Chinese-English ST interpreting, such as sentence restructuring, meaning group segmentation, part-of-speech conversion and terminology translation, etc.

In the second step, the teacher prepares audio exercises in English-Chinese ST interpretation (see table 2).

Table 2: English-Chinese interpreting: product features

Source text: We have solved the issue of frequently having to change positions and angles whilst filming with a T-shaped handle and integrated suspension handle. The T-shaped handle is ergonomically designed to fit your palm for precise control and enhanced comfort whilst the integrated suspension handle makes low-angle shooting easier than ever.

Through memory, retelling and trial translation, teachers guide students to compare the different manifestations of Chinese and Western thinking differences in English and Chinese, optimize memory methods, and explore issues related to thinking differences that should be paid attention to when translating between English and Chinese, such as word order within sentences and modifiers, location etc.

Activity 2: video interpreting

Each student group claims the task card and carries out simulated technology talk interpretation according to the project content on the task card. The smart classroom can play audio or video in segments on multiple screens. Each group communicates with teachers and students through real-time chat tools such as QQ groups. The teacher monitors the progress of each group's tasks and the participation of group members through the monitor, and answers the questions of each group in a timely manner through the chat tool.

The video covers the introduction of the industrial park, local investment environment and policies, local laws and regulations concerning import & export, transportation and logistics and so on, preparing for students to proceed to scientific and technological interpreting in a high-tech company[10-11].

Activity 3: simulation interpreting

Teachers use the smart teaching system to uniformly play the audio or video of ST interpretation, including product unboxing evaluation, product installation and operation, product disassembly and repair, etc. Each group is responsible for the interpretation practice of different task cards, and the other groups evaluate and give feedback to the group responsible for the interpretation by taking notes and watching the interpretation scene. Each group can ensure on-time communication between the teacher and students through the chat app, for questions, terminology or more optimized translations, and achieve positive interactions between the audience, interpreters, and Chinese and foreign businessmen in the simulated ST interpretation multi-party talks. Each group can also conduct simulated ST interpreting training by randomly exchanging interpreters and randomly exchanging roles (see table 3).

Table 3: English-Chinese interpreting: high-tech product presentation

Source text: The product has a tiny built-in extension rod, so you can easily capture what you love from any perspective, even in low and super-wide angles. With its intelligent scene recognition function and smart object tracking, filming your next Blockbuster becomes more convenient than ever!

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Teachers guide students to use interpretation skills rationally, reducing the technical difficulty of scientific and technological content, and help students to obtain a language style that is understandable to the general public and consistent with the language habits of the target audience, so as to achieve good communication effects.

3.2.3 After-class extended study: reflection and interpreting video sharing

After class, teachers can further cultivate students' thinking independently and innovatively by publishing extended learning tasks, for example:

•Reflect group interpretation process and make a report;

•Discuss about how to effectively use interpretation technology to improve the efficiency of long-term memory and short-term memory;

•Discuss about how to utilize the Internet;

•Think about how to use memory assisting technologies and tools such as speech recognition, mind mapping, interpretation terminology database, parallel corpus, machine translation, etc. in interpreting practice;

•Completes an interpretation research report, shares the research results of the group, and improves memory accuracy and expansion means of self-study.

Teachers can also use the smart teaching system to release more extra ST interpretation resources, such as audio, video, text, etc., to provide students with rich materials for independent learning and interpretation practice. At the same time, teachers can provide self-evaluation forms for monitoring the quality of interpretation, and guide students to reflect on the interpretation process through peer evaluation or self-evaluation after independent learning, discover problems, and improve their practical ability in scientific and technological interpretation.

4. Conclusion

"Smart classroom" is a new form of education and modern teaching method. Based on the Internet of Things technology, a new modern smart classroom system integrating smart teaching, personnel attendance, asset management, environmental smart adjustment, video monitoring and remote control is gradually being promoted. Application will inevitably become an effective part in promoting future school construction. In the smart classroom environment, project-based teaching of scientific and technological interpretation can realize the teaching process from teacher-centered to student-centered, from textbook-centered to project-centered, from classroom-centered to practice-centered and Operation-centered transformation. With the support of smart approaches, ST interpretation teaching can realize functions such as multi-screen interaction, energy efficiency management, intelligent roll call, automatic data collection, etc., which effectively supports the project-based teaching needs of scientific and technological interpretation, and not only provides learners with immersive foreign language The learning environment also provides application scenarios for learning interpretation theory, and continuously improves the effectiveness of interdisciplinary interpretation talent training. Although project-based learning has been on the rise for some time, in my country, the practice of applying project-based design to ST interpretation teaching is still relatively lacking. It is also restricted by many factors and requires a lot of investment in hardware and software.

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