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Original Paper

Research on the Construction and Application of a Blended Teaching Model for Undergraduate English Courses Based on Technological Empowerment

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Abstract

As vocational education is transitioning to the undergraduate level, it requires higher English application ability from students. It needs to provide students of vocational education with good, situation-specific language skills necessary for thriving in an open world and cultivate top-tier technical talent with international competitiveness. Currently, there are still some systemic problems in the English teaching of vocational undergraduates at the college level, such as a "data silo" due to the lack of coordination between online and offline teaching and a single assessment system that cannot comprehensively reflect students' learning results or show the development of their professional literacy. To solve the above problems, this paper puts forward an online-offline blended teaching model based on constructivist learning theory and sociocultural theory, and through the combination of various teaching resources and the application of artificial intelligence and learning analysis, it is possible to collect data on students' learning behavior accurately and deeply. Based on practice, it has been found that this model can provide personalised teaching and learning guidance according to the different circumstances of various students. Through a multi-dimensional and data-driven assessment system for their entire learning process, it can improve teaching efficiency and motivate students to learn. Therefore, it can offer practical theoretical support and an implementation path for the reform of English education in vocational undergraduate education.

Keywords

technology empowerment, vocational undergraduate education, English teaching, blended teaching model, learning analysis

1. Introduction

1.1 Research Background

The rapid development of artificial intelligence (AI) and big data technology has brought new opportunities for the paradigm shift of higher education in the era of Education Informatisation 2.0. These technologies have improved the allocation and use of educational resources and changed the way that educational decisions are made and taken. At the same time, vocational undergraduate education is a new type of higher education that aims to cultivate "high-level technical and skilled talents," so it has different requirements for English education compared with traditional academic undergraduate programs and application-oriented vocational colleges.

In November 2025, the Foreign Language Teaching Steering Committee for Vocational Institutions under the Ministry of Education organised the symposium "New Types, New Ecosystems, New Development: Reform and Development of Foreign Language Teaching in Vocational Undergraduate Education in Wuhan." The meeting indicated that the teaching of foreign languages in vocational undergraduate education should be in line with the type-specific positioning requirements for vocational education. It should strengthen practical functions and occupational relevance, then shift from "general English" to "workplace-oriented English." Given the development of technology, exploring a big data-driven online-offline blended teaching model has become an unavoidable response and an indispensable path to address the deep-seated problems in vocational undergraduate English education and promote high-quality development.

1.2 Research Significance

This paper will also offer some theoretical and practical references. At present, at the theoretical level, there has been little research on blended English teaching in vocational undergraduate education, and no systematic theoretical system or operating model has been formed. In order to construct a technology-enabled blended teaching model, this paper hopes to add some new content to the theory of foreign language teaching in vocational education and offer a reference for future studies.

Practically speaking, traditional English teaching in vocational undergraduate programs often lacks an understanding of students' study circumstances, showing that it is slow to give teaching feedback, and the evaluation process is scattered. It fails to motivate students' learning effectively. With the help of big data analysis and artificial intelligence, it will use personalised teaching and study support to address the above issues and improve the quality of teaching. In addition, the research can help to alter the way assessments are carried out in vocational undergraduate English teaching and promote the construction of all-round highly skilled employees with good international awareness, intercultural communication ability, and office English skills.

1.3 Review of Research at Home and Abroad

Recently, many scholars and educators around the world have been studying and using blended teaching. Research abroad has been expanding in recent years to explore how to use learning analytics in language teaching; that is to say, by collecting and analysing data from various sources, instructional

decisions can be made more reasonably, and AI tools will be used to personalise learning path recommendations. According to current research, artificial intelligence can be applied to teaching English better. At the same time, Data-Driven Learning (DDL) has been changing from the old corpus analysis way to use various types of data and live data streams, and now research is also being conducted on students' emotional data and independent learning traits.

Most domestic research has been on how to use information technology in English teaching locally. Within vocational education, a new way has been gradually introduced, which is the combination of "post-course", "competition" and "certificate". Most of the existing studies focus on traditional undergraduate institutions or higher vocational colleges. There has been little systematic research on the particular traits of vocational undergraduate education. In short, there has been little research on how technology supports the entire process of instructional design and all-round assessment systems. Based on domestic and foreign research, a technology-assisted blended teaching model that is suitable for the characteristics of Chinese vocational undergraduate education will be put forward in this paper.

2. Literature Review

2.1 Theoretical Foundations

The first basis for blended teaching is provided by constructivist learning theory. Based on this theory, students will actively construct knowledge and engage in learning by interacting with others in various situations. Constructivist theory can offer some directions for the joint construction of online and offline resources and for the creation of contextualised learning activities in vocational undergraduate English teaching. By self-study on the Internet and close cooperation in class, students can develop and improve all aspects of their language skills in a rich-media learning environment.

Sociocultural theory has shown that people learn to speak through socialisation. People's development of language in life is closely related to how they learn together. Therefore, the above theoretical basis provides a reason for the use of all kinds of technologies, such as collaborative writing platforms, online discussion forums, and artificial intelligence-powered dialogue systems, to encourage students to communicate in blended learning.

Theoretically, Data-Driven Learning (DDL) theory is in line with the direction of technology in this paper. DDL proposes that learners can learn the rules of language through analysis of data from life. With the addition of artificial intelligence technology, it is now possible to extract many kinds of data from various sources in real time. Artificial intelligence will be employed to study students' emotions and any variations in their behaviour or self-study habits in the new learning environment to offer them customised teaching assistance.

2.2 Research Progress at Home and Abroad

Recently, many domestic and foreign scholars have carried out many studies on the combination of vocational English teaching and blended learning models. RoBERTa-NCF and other deep learning models have been applied to the problem of recommendation in online vocational English teaching

platforms at home and abroad to improve the matching accuracy of recommendation systems and test pass rates to some extent. Research has shown that artificial intelligence-based learning analytics technology can help teachers know the level of study and preference for each child better, so teachers can give them suitable study materials. In the environment of AI-assisted data-driven learning, it has been observed that the autonomy and emotions of learners can both positively affect their engagement in learning and their desire to continue studying. The above results can provide some reference for the construction of personalised learning support systems in the blended teaching model.

Some domestic general directions for reform in foreign language teaching at the level of vocational undergraduate education have been reached. First, more weight has been placed on vocational orientation, and language teaching is now in close cooperation with industrial requirements and occupational norms. Second, with the application of artificial intelligence technology, some institutions have started using data analysis and other means to improve management of education. Thirdly, various types of teaching have been organised to meet the various situations of the students' lives and studies. Some institutions have started to use a combination of large-class lectures and small-group tutoring in the new model of education and have also introduced precise instruction through digital learning portfolios and micro-credential certification. In terms of the development of instructional materials, the textbook series of "New Standard Vocational Undergraduate English" has taken a dual-axis design approach to integrate professional scenarios and language skills and has constructed modular and project-based content frameworks that can provide good resource support for blended learning.

2.3 Research Gap

Based on the above review, it can be seen that the present research has certain deficiencies. First of all, there is a gap in research focus. Most studies have focused on traditional colleges of arts and sciences and high-end vocational colleges, but have neglected to consider the specific educational goal of vocational undergraduate programmes, which is to cultivate top-tier technical and skilled talents. Therefore, there has been no theoretical interpretation or practical exploration of the type-specific characteristics of vocational undergraduate English education.

Second, there is an unevenness in the application of technology. Most studies have concentrated on the application of a single tool or platform but have not been able to integrate and coordinate all the other necessary technologies, such as learner profiling, knowledge graphs, AI-assisted assessment, and learning analytics.

Thirdly, the basis for the evaluation is weak. An all-encompassing and data-driven assessment system that can cover all stages of students' learning has not been fully realised yet, and the application of value-added assessment ideas in vocational undergraduate English teaching is still in its infancy.

In light of the above deficiencies, this paper will start from the specific features of vocational undergraduate education. According to the constructionist learning theory and the sociocultural theory, a regular and data-driven online-offline blended teaching model will be developed to address the problems found in this paper.

3. Analysis of the Current State and Challenges of Vocational Undergraduate English Teaching

3.1 Investigation of Current Teaching Practices

In order to gain a general grasp of the actual situation of English teaching in vocational undergraduate education, this paper has chosen the vocational undergraduate college where the including questionnaire distribution, semi-structured interviews, and sampling from platform data. A total of 400 valid answers were collected from students in their first, second, and third years of various specialisations across the university, and the response rate was 92.6%. In addition, to some extent, 20 English teachers were interviewed to learn about their ideas on the present teaching model and what they hoped to see improve. Data from the behaviour log of the online learning platform were also collected, such as the duration of video viewing, the frequency of assignment submission, and the test score distribution. The dual-dimensional dataset combining both subjective perception and objective behaviour was built.

It is found that English teaching in vocational undergraduate programs is still in a lecture mode. Only 43.7% of the students used the online learning resources, and most did not learn online for more than 30 minutes every day. The interest in learning English among the students was very different. Those who were interested had about 2.8 times more enthusiasm for studying than those who were not interested. Most teachers reported that the main reasons for not improving their teaching were a lack of understanding of students' study situations and too long a delay in feedback. The above results are used to conduct a diagnosis of the problems.

3.2 Major Challenges

Although blended online-offline teaching has been introduced in vocational undergraduate English education, the three main structural problems in its application have not been solved.

First, the teaching methods are still old-fashioned and have led to a serious "two-track" problem. Online and offline teaching have not been combined well. Face-to-face classes are still mainly one-way teacher-led lectures, and the function of online platforms has been to store learning materials. The class does not have effective mechanisms to lead students in their online studies or to connect students' online studies with in-class activities. According to the survey, 72 per cent of the students felt that online learning was either not related to or distant from their class teaching.

Second, there are no applications for the educational data. Although an "information goldmine" has been accumulated, it has now become a "data graveyard." Although learning platforms have collected a substantial amount of behaviour data, such as video-viewing interruptions and the frequency and patterns of incorrect answers, this data has seldom been analysed or used. Among the teachers interviewed, 85 percent said that they have never regularly reviewed the learning analytics reports provided by the platform. Therefore, decisions about teaching are still based on a teacher's own experience and intuition, not on data.

Third, the assessment system is still too focused on results and lacks attention to the process of learning. Currently, the assessment of these students mainly takes final exam scores, which account for more

than 60 per cent of the total grade, and there is little attention paid to the dynamic monitoring of their studies and the assessment of professional qualities. Key competencies such as teamwork, self-study, and interdisciplinary communication are not included in the current evaluation system, so they are missing from the goals of vocational undergraduate education.

The combined effect of the above problems restricts the overall quality of English teaching in vocational undergraduate education and is also in contradiction with the overall objective of cultivating high-end technical and skilled talents.

4. Construction of a Technology-Enabled Blended Teaching Model

4.1 Guiding Principles

The three main ideas of the proposed model are the contents of the three dimensions, which are value, method, and objectives.

Student-centeredness holds that the beginning of instructional design should be the actual needs and cognitive starting points of learners, respect individual differences, and motivate learners. In the background of vocational undergraduate education, this principle should focus on fostering students' ability to communicate in English at work rather than just studying abstract language knowledge.

The first purpose of data-driven decision-making is to enhance teaching based on the data of learning behaviour. Teachers should collect, analyse, and present the students' learning paths to obtain some diagnostic data and evidence for adjusting teaching in light of the current situation during the course of teaching.

The aim of this learning is to enable students to use language effectively in their daily work. Thus, the goals of instruction are the development of vocational English ability to enable students to perform tasks reasonably well, communicate professionally, and know the rules of the workplace. This rule is close to the goal of vocational undergraduate education, which is to cultivate high-quality technical and skilled talents. It also aligns with the requirement from the Ministry of Education for enhancing the practical and occupational relevance of foreign language teaching in vocational undergraduate institutions.

4.2 Overall Architectural Design

The three parts of the new model are the resource layer, the platform layer, and the application layer. Data integration and function coordination are carried out at all these levels.

The resource layer is the foundation of the model's content. There are many learning materials available, such as textbooks, industrial case databases, micro-lecture videos, real enterprise projects, and virtual simulation tasks. The multi-level learning system has been established for basic, intermediate, and advanced content. Resource development is in line with the concept of workplace scenario integration, so typical occupational tasks such as business negotiation, technical writing, and customer service have been turned into learning projects.

The platform layer is a new kind of this model. Based on the main instruction platforms, including AI-based speech assessment, intelligent writing evaluation, learner profiling, and knowledge graphs. In addition to distributing educational resources, it will collect various kinds of data from learners' behaviour, performance, and emotions to offer technical support for the use of big data.

The application layer is the teaching plan in the model, and it has three related stages: pre-class preparation, in-class knowledge assimilation, and post-class expansion. Pre-class activities are held to learn about students' study circumstances and resources; during the class, there will be some interaction and timely feedback; and post-class activities are usually customised for learning and improvement. All of the above are to form an instructional feedback loop.

4.3 Key Technological Applications

Technology for learner profiling is to be based on individualised education in the proposed model. By analysing the data of students' learning behaviour, such as their video-viewing paths, quality of homework, patterns of test errors, and frequency of participation in online forums, a multidimensional profile of the learners can be constructed by the system, covering cognitive styles, proficiency levels, and interest preferences. Based on the above profiles, the system will automatically know the students' strong and weak points, give teachers a picture of their studies, and recommend individualised learning materials.

Knowledge graph technology has built a semantic connection between English language knowledge and the working environment. A triad association model has been built to link grammar, word clusters, and job roles. Therefore, students can learn how to use this language knowledge in real work. For instance, the workplace situation of business negotiation can be used to teach students some linguistic characteristics, such as conditional sentences, modal verbs, and polite expressions. Through communicative activities based on this situation, students can learn the rules of English and improve their workplace English.

Speech evaluation and intelligent writing assessment are some types of AI-assisted assessment technologies that can give students immediate feedback on many essays. AI-powered speaking practice systems will generate all kinds of evaluation reports on pronunciation, intonation, and grammar, which can also provide improvement suggestions. Intelligent writing evaluation tools can rapidly find errors in grammar and structure, then suggest more suitable language expressions. The integrated application of these technologies will be able to realize the goal of personalised education for all.

5. A Data-Driven Instructional Implementation Framework

5.1 Pre-Class Phase: Precision Diagnosis and Resource Recommendation

The first purpose of the pre-class stage is to identify learning difficulties and offer customised learning materials so that they can be introduced in class. Teachers publish study packages on the teaching platform before class, which contains short lectures, initial tests, and discussion problems related to the topic. The students must finish the above activities on time.

The platform will collect learning behaviour data automatically, such as how long students watch videos and when they pause. It will also collect test results, mistakes made, and information from discussion forums. Based on the data analysis results, different classes and students' learning status can be displayed. Based on the data above, teachers can adjust teaching priorities, identify significant learning difficulties among students, and optimise their teaching strategies for face-to-face classes to achieve the goal of "teaching according to learning needs." It can finally solve the long-standing problem that teachers are not well-versed in the study situations of students and alter the classroom teaching mode from a standardised one to an individualised and targeted one.

5.2 In-Class Phase: Interactive Inquiry and Immediate Feedback

The in-class stage is the basic part of the teaching mode. Based on the two basic ideas of interactive inquiry and immediate feedback, it intends to help students improve their ability to apply language and professional skills. Teachers have begun to utilise mobile teaching instruments, such as Rain Classroom and Zhijiao Cloud, to conduct all sorts of learning-related operations, including attendance collection, live quizzes, voting, and interactive bullet-screen lectures. The above activities will automatically produce a class participation report to show how much the students are participating and thinking.

Project-based learning is now the main way teachers teach these days. Based on the actual circumstances of various industries, teachers design workplace tasks to have students write business emails in English, participate in simulated cross-cultural negotiations, and present products in English. In groups, students will be given the following tasks and need to work together to complete them, including four steps: task analysis, solution design, cooperative implementation, and final presentation.

AI technologies such as machine translation, writing support, and corpus query tools can help people complete their work more efficiently and reduce the negative impact of the language barrier on their work. Learning by doing can help students improve their practical language skills and also cultivate necessary professional qualities such as teamwork, problem-solving, and self-study.

5.3 Post-Class Phase: Personalized Remediation and Extension

In the post-class period, individualised remediation and ability extension will be organised to consolidate what has been learned and foster the all-round development of the students. According to the data of students' performance in the pre-class and in-class periods, the system will distribute differentiated homework. Students with weak fundamentals will be given knowledge consolidation tasks, such as grammar exercises and vocabulary reinforcement activities. Students who do well will be given advanced tasks, such as simulated workplace communication projects and in-depth analysis of industry-related literature.

There are also many good AI-powered speech practice systems and intelligent writing evaluation tools available now. Students can learn to talk with artificial intelligence speaking systems and get immediate feedback on how they speak and correct mistakes in pronunciation and grammar. Intelligent

writing assessment tools can quickly check a student's written work, point out errors in grammar and organisation, and provide some suggestions for improvement.

It should promptly inform students about mistakes in their writing so they can improve by revising and learning from them repeatedly, thereby cultivating strong language skills in a closed loop of learning and feedback.

6. A Multidimensional Evaluation System Based on Whole-Process Data

6.1 Reconstruction of Evaluation Dimensions

The old way of assessing vocational undergraduate English teaching has the problem of being "dimensionally lacking" and overemphasizing the evaluation of linguistic knowledge at the expense of other necessary links in the development of all-round abilities. With the continuous development of vocational education in the direction of cultivating high-end technical and skilled talents, the construction of an evaluation system has also been required.

A new model for evaluating students' language knowledge has been proposed in this paper, which includes three types: language competence, professional competence, and learning behavior.

The language competence aspect covers the basic skills of listening, speaking, reading, and writing. In addition, it also needs to be used reasonably in different working scenarios, such as business letters, technical documents, and oral communication between cultures.

The professional competence aspect refers to the transferable capabilities of teamwork, independent study, cross-cultural communication, and problem-solving ability. The above qualities can be used in the future of students'work and life.

The three components of the learning behaviour dimension are learning interest, the quality of tasks completed, and the efficiency of resource utilisation. These measures can provide some information about students' study attitudes and metacognition to help teachers better understand the circumstances of their studies and adjust teaching accordingly.

The construction of this three-dimensional evaluation system has changed the traditional focus on the results of study, and now both the process and outcomes will be given importance. It has shifted from knowledge to competence and literacy.

6.2 Data Collection Indicators

To assist the good functioning of the three-dimensional evaluation system, a multi-dimensional data collection system for online and offline studies has been constructed in this paper.

Online indicators include the completion rate of videos and the distribution of interruption points, the quantity and quality of posts in the discussion forum, accuracy rates and time spent on online tests, how often resources are downloaded and accessed, the number of AI-assisted speaking practice sessions, and trends in assessment scores. The above indicators can help us better know how much students' interest in learning and studying can be prolonged.

Offline indicators are based on how often teachers communicate with students and the quality of such communication, such as the performance of group presentations (language expression, teamwork, organisation of content), completion of practical training projects, and structured classroom observation records. The process regularly observes and regularly records offline data by teachers, and then adds it to the online data source.

In this study, a new idea of added assessment is also proposed to determine how much students have improved in their English proficiency by comparing their initial English ability with that after some time of study. Value-added assessment is not a conclusion but rather a way to illustrate what a student has learned and how it has grown over time, which helps better support the development of individual students.

6.3 Evaluation Feedback Mechanisms

According to all the process data, a multi-dimensional evaluation system will be established, and a reasonable feedback mechanism will be set up to help students improve in various aspects. Therefore, this paper will design a visual feedback system based on the generation of a Student English Competency Radar Chart and a personalised learning diagnostic report to provide students with an intuitive and practical way to know their study situation.

The Student English Competency Radar Chart shows the strengths and weaknesses of students in the three main areas of language ability, including professional skills and learning habits, and their related subcategories. It helps students know what to study first and what their goals are.

A Personalised Learning Diagnostic Report will be provided with the assessment results. Based on the analysis of students' learning behaviour data, it can know which parts of knowledge or skills students are lacking and then recommend corresponding learning materials and training.

The openness and interpretability of the evaluation have been enhanced to show students how they are learning and what their potential is. At the same time, teachers can use the feedback they have obtained to modify the teaching plan and, thus, build a good cycle of assessment-feedback-improvement to constantly improve teaching and learning.

7. Empirical Study and Effectiveness Analysis

7.1 Research Design

In order to study the effect of the blended teaching model, two classes at a vocational college were chosen as the subjects of this study, and they were divided into an experimental group ($n = 48$) and a control group ($n = 46$). The two groups were the same in terms of English proficiency (the pretest scores did not differ significantly, $p > 0.05$), disciplinary background, and teaching staff. They meet the basic conditions for a quasi-experimental design.

According to the division rules for the data-driven online-offline blended teaching model in this paper, several groups are set up in the experimental group, and the model is executed all times during the teaching process, including pre-class precise diagnosis, in-class interactive inquiry, and post-class

personalised extension. At the same time, learner profiling, knowledge graphs, and AI-assisted assessment technologies are also used. The control group still employs the old method of teaching, which is based on lectures in the classroom, and although there is distribution of online resources, it lacks systematic data-driven instructional design and a whole-process evaluation system.

The length of the intervention was 16 weeks per school semester. Both groups were in the same vocational undergraduate English curriculum and had been taught by the same teacher, so there were no other reasons for the difference.

7.2 Data Analysis

To fully evaluate the actual effect of the proposed model, both a large amount of quantitative data and some qualitative analyses were used in this paper.

Using SPSS 26.0, independent-samples t-tests were conducted on the final examination scores and some competency indicators (speaking and writing) of the experimental group and the control group to determine whether the new model had an effect on the all-around English proficiency of the students. The analysis of the behaviour data of students on the online learning platform can be used to determine how long they watch videos and how often they post in discussion forums and use other resources to determine whether the model motivates students to study independently. Indicators of students' performance in the area of professional ability also included the frequency of classroom participation, group presentation scores, and completion rates of practical training projects.

At the qualitative level, semi-structured interviews and open-ended questionnaires were employed to collect students' perceptions of the new model, including their levels of satisfaction, acceptance, and suggestions for improvement. The above qualitative data have supported and explained the quantitative results from the students' side.

7.3 Research Findings

Based on the above experiments, it can be seen that the big data-driven blended teaching model has promoted students' learning and life autonomously.

First, students' study results have been better. The mean score in the final test for the experimental group was 82.46 ± 6.73, and that of the control group was 74.28 ± 7.15; the t-value was 5.72, the p-value was less than 0.001, and Cohen's d was 0.83, which is considered a medium-to-large effect. The experimental group also performed better than the control group in both speaking and writing assessments (Speaking: 81.93 ± 7.21 vs. 73.56 ± 8.04, $p < 0.01$; Writing: 83.17 ± 6.58 vs. 75.42 ± 7.33, $p < 0.001$)). Based on the above analysis, it is concluded that the new model can help students integrate language knowledge and apply it practically.

Secondly, the students' desire to learn increased. According to the analysis of platform data, students in the experimental group watched the videos for about 2.3 times as long as students in the control group. The mean number of discussion forum posts was 3.1 times higher, and the frequency of voluntary resource access was 1.9 times higher. Based on the above results, it can be concluded that the

data-driven teaching mode will motivate students to study independently and cultivate good learning habits.

Third, students showed good development in professional competence. Based on comparisons of the frequency of classroom interaction and group presentation scores, it was found that the experimental group performed better than the control group in the areas of teamwork, problem-solving, and intercultural communication. Based on the above interview results, students generally believe that learning tasks are more difficult but also more meaningful. As one student mentioned, “The tasks were more difficult, but I learned a lot from them,” and another student added that in group work, “I was able to cooperate well with classmates who had different working styles.”

In short, the blended teaching model established here is more suitable for teaching and offers personalised learning assistance. Collection and analysis of the whole-process learning data can help students feel the situation of their studies more deeply and provide a practical model for the reform of English teaching in vocational undergraduate education.

8. Conclusion

8.1 Summary of the Study

The construction and application of a technology-enabled blended English teaching model for vocational undergraduate education are the objects of this study. At the same time, the structural problems of “data silos” and overly simple evaluation systems in the current situation of English teaching for vocational students will also be addressed. Big data analysis, artificial intelligence technology, and learning analytics have been used in this paper to put forward a new kind of student-centered and data-driven teaching model.

Resources are provided in the form of textbooks, industry case studies, and actual enterprise projects. Some popular teaching platforms have been added to the platform, and the introduction of AI-assisted assessment tools has started. The whole cycle of teaching and learning activities has been set up to conduct diagnoses before class, experiments in class, and practice after class.

Empirical studies have shown that this model can help students improve in their studies, motivate them to learn on their own, and develop professional qualities. It has achieved effective integration of precision teaching and personalised learning. Based on data from whole-process learning, a multi-dimensional assessment system has been constructed that is no longer just about language knowledge but also covers other areas to form an all-encompassing system of language ability, professional skills, and study behaviour. The above structure addresses the problems of the traditional assessment mode and can better support the development of core competencies in vocational undergraduate English teaching.

8.2 Contributions and Limitations

Theoretically, the construction of a data-driven blended teaching framework for vocational undergraduate education in this paper will provide some reference ideas. Thus, it has added some new

material to the theory of foreign language teaching in vocational education. Operational instructions and a complete process evaluation system have been developed in this paper to provide a model for pedagogical reform in other schools.

Nevertheless, there are some deficiencies as well. First, there will be a limitation in the representativeness of the sample. Therefore, to verify the external validity of the results, more vocational colleges and schools across different areas of China should be involved. Secondly, there was insufficient study on the problems of technological ethics and data protection. As the scope and granularity of learning behavior data collection continue to expand, ensuring the lawful use and secure storage of educational data will become an increasingly important concern. Thirdly, differences in teachers' digital literacy are also reasons why the new model will not spread and last long-term. At present, some teachers are still hesitant to use new technologies, and their sense of ability to use them may vary in different places. There may be both technological determinism and teacher agency in implementation.

8.3 Future Directions

In the future, research on vocational undergraduate English teaching should also keep moving forward in some directions.

First, more effort should be made to explore the in-depth integration of intelligent technology and teaching. For example, to create an immersive language environment for the workplace, various ways can be taken to offer all sorts of tools using virtual reality (VR) and augmented reality (AR) technologies, and blockchain technology can be employed to issue trustworthy certificates and cross-institutional recognition systems for learning records.

Secondly, ideas from various places, such as educational technology and computer science, linguistics, and vocational education, should be combined. Thus, it will be possible to continue improving and optimising the instructional design model in stages.

Thirdly, a systematic framework for the development of digital literacy in vocational undergraduate English teachers should be established. Organised professional development programmes and community learning activities will be used to improve teachers' data literacy and their ability to cooperate with artificial intelligence in teaching.

In short, research on technology-enabled blended English teaching models for vocational undergraduate education is still in the early stages. The improvement of the theoretical foundation and optimisation of the practical path will need continuous discussion and cooperation among scholars, government departments, and educators at the front line.

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