A Study on the Effect Mechanism of Blended Learning Model on the Learning Effect of Diversified Students in Higher Vocational Education Enrollment Expansion

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Abstract

Upon the announcement of the policy to expand enrollment to one million social students of China's higher vocational education in 2019, a fervor to enter colleges and universities swept across Chinese social members, eliciting a tremendous response within the vocational education sector. As the expansion of enrollment progressed steadily throughout 2019, the Chinese Ministry of Education and other related departments further introduced policies to expand enrollment in 2020, continuing to increase enrollment by an additional two million students in 2020 and 2021. The expansion of enrollment measures has facilitated the entry of adult social students into vocational colleges, which were originally oriented towards full-time students, and expanded the existing education and teaching system of vocational colleges. However, this expansion has also led to the emergence of issues surrounding the training of talent for adult education.In order to effectively ensure the quality of education provided to the adult enrollment expansion group, higher vocational colleges must consider deep-level reforms to their talent development models, ranging from enrollment sources to teaching, training, and employment guidance. Therefore, based on the learning characteristics required of adult learners and the application of new digital technologies in education, blended learning has become an important and necessary teaching format for diversified enrollment sources.

In this study, a diversified enrollment blended learning effect model was constructed, which takes into account the joint influence of teachers' teaching behaviors and students' learning engagement on learning outcomes. A questionnaire was used to verify the theoretical model by surveying a portion of the expanded enrollment students.The results indicate that: 1) the teacher's teaching attitude and preparation, as well as the students' learning engagement, all have a significant positive impact on learning outcomes; 2) the teacher's teaching attitude and preparation have

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a significant positive effect on the three dimensions of students' learning engagement; 3) the teaching context only has a positive and significant impact on cognitive engagement; 4) the mediating effect of each dimension of learning engagement between teaching attitude, teaching preparation, and learning outcomes is significant; 5) learning motivation and self-efficacy have significant moderating effects on the relationship between teaching attitude, teaching preparation, and each dimension of learning engagement.

To achieve better learning outcomes in students from diversifiedsources, higher vocational colleges should pay more attention to the teaching behavior of teachers and the learning input of students when implementing a blended learning mode. This includes ensuring that the teaching plans and objectives set by teachers are suitable for blended learning, and that students' sense of self-efficacy and learning motivation are enhanced through the blended learning experience, which will help to promote the reform and development of adult education, vocational education, and continuing education.

Key words: enrollment expansion of higher vocational colleges, blended learning, students from diversified resources, learning effect.

Chapter I Introduction

During the 13th National People's Congress of China, Premier Li Keqiang clearly stated in the government report the imperative to reform and improve the enrollment methods of higher vocational colleges. In addition to the existing student sources, adult groups such as laid-off workers, veterans, and migrant workers are encouraged to apply for higher vocational colleges. Specific expansion of enrollment sources were also identified. In addition to providing general undergraduate education for high school graduates, higher vocational colleges also undertake the task of providing vocational skills training and employment-oriented education for adult social groups during the period of enrollment expansion. This plays a greater role in delivering high-quality professional and technical personnel to the front line of society and advancing China's higher education.

1.Research Background and Motivation

Given that the students from diversified resources have entered vocational colleges while also bearing social roles after the expansion of enrollment,, vocational education seems to imply adult education for such groups. The vocational colleges cannot systematically cultivate diversified students admitted through the expansion of enrollment through off-campus learning. It is necessary to consider the balance between their learning and work, as well as their learning and life. To create favorable conditions for them to achieve full and

effective learning, a flexible training system and an elastic learning approach must be adopted.

To response, the blended learning approach adopted by vocational colleges, which includes mixed online teaching, flipped classrooms, and traditional face-to-face instruction, is highly consistent with the learning needs of the expanded enrollment group of vocational colleges and has become an effective teaching method for this group. The positioning of the expansion of vocational colleges in this instance will pay particular attention to the perspective of social groups, attach greater importance to market-oriented job demands, and focus on transforming educational qualifications into vocational education and social training education that is closer to front-line positions.

Based on the above analysis, the research motivation of this study is twofold.

Firstly, it focuses on the diverse adult population enrolled in vocational colleges to explore the mechanism by which blended learning, as a result of teacher behavior, affects the actual learning outcomes of adult learners in the context of the expanded enrolment policy.

Secondly, the study examines the promotion effect of individual characteristics of adult learners, such as self-efficacy and learning motivation, on the relationship between teaching behavior and learning engagement. The study aims to fill the theoretical gap in blended learning research in adult education by providing a comprehensive understanding of the impact of diversified student population on learning outcomes in vocational colleges.

Thirdly, a scientific and rational inference of factors regarding the educational mode of expanding enrollment is required. It is necessary to develop a set of practicable and valuable rational thinking, which will gradually delve into the solution of the talent cultivation problem brought about by students from diversified resources after the expansion of enrollment.

2.Research Objectives and Questions

The objectives of this study are specifically:

Firstly, considering the characteristics of students from diversified resources and blended learning reality required by the expansion of higher vocational education, a blended learning mode evaluation model of "teaching behavior-learning engagement-learning effect" is constructed based on both external factors such as teachers and internal factors such as individual students. This model aims to explore the multifaceted influencing factors of learning outcomes for expanded student sources utilizing blended learning approaches.

Secondly, this study conducts an analysis of the learning motivation and demonstrated learning performance of adult students from

diversified resources. By incorporating individual factors such as learning motivation, emotional experiences, perceived task value, and self-efficacy into the evaluation model, the study integrates the perspective of individual learners and explores the mechanisms behind the effects on learning outcomes in blended learning evaluation models.

Thirdly, the evaluation model and causal pathways of the blended learning effect are empirically tested through questionnaire surveys, in conjunction with the existing mature measurement scales of various factor variables. By clarifying the learning effect based on the blended learning approach centered on the students from diversified resources, corresponding teaching practices and evidence are provided to enhance the learning effect of students from diversified resources in the blended learning environment.

The research questions for this study are presented as follows: (1) What is the mechanism by which the teaching behavior of blended learning improves the learning outcomes of diverse adult students enrolled in an expanded program? (2) How do different factors affect the learning engagement and blended learning outcomes of students from diversified resources in a blended learning environment? (3) By evaluating the differences in individual learning motivation and self-efficacy in students from diversified resources, how can we further consider promoting the improvement of learning outcomes for expanded student sources by enhancing their perceived learning task experience?

3.Research Significance

The present study holds significant theoretical and practical implications. This study investigates the impact mechanism of the learning outcomes of students from diversified resources in the blended learning mode for millions of vocational college students. Not only does it break the existing behaviorist "teacher-centered" teaching theory research, but it also explores the blended learning effect of students from diversified resources from the perspective of students based on humanistic learning theory, constructivist learning theory, and distance education theory. It advocates further attention to students' psychological needs, learning motivation, learning task assessment, and emotional experience, thereby further enriching the relevant theoretical research on the influencing factors of online teaching in higher vocational education. The present study aims to evaluate the effectiveness of the blended learning mode of students from diversified resources in vocational colleges, which has expanded admission to millions of students. By combining theoretical frameworks and empirical verification of the theory, a model for evaluating the learning effect of blended learning with students from diversified resources is constructed. This model can help teachers

design targeted blended teaching strategies by clarifying the interaction between teaching behavior and learning investment. The evaluation of blended learning in vocational colleges with expanded admission can be assessed through this model, and teaching strategies for blended learning can be adjusted accordingly. Ultimately, this study provides guidance and reference for vocational colleges to promote blended learning for expanded student sources. By promoting the discovery of expanding the source of students and improving the process of talent cultivation in vocational colleges, we aim to address issues related to the rationality of online and offline teaching arrangements as well as the soundness of management systems. This approach will allow us to implement targeted strategies based on the guidance of blended learning models, and drive reforms in talent cultivation for vocational colleges.

4.Research Innovations

This study focuses on innovation by diversifying the recruitment sources of expanding groups. The research topic is approached with a certain degree of novelty. The model's construction combines the required blended learning mode for expanding sources, demonstrating innovation within the theoretical framework. The study's outcomes provide valuable insights for talent development services aimed at the adult population, with potential for widespread application.

Chapter II Theoretical Foundation and Literature Review

After enrollment expansion, the learning needs of students from diversified resourceshave made it necessary for vocational colleges to adopt flexible and dynamic teaching models, with blended learning becoming the main way of teaching reform. Diverse students have characteristics of adult roles and social life and work experience. Therefore, vocational education must consider the training methods of adult education on the basis of the original school education and adapt to the social development of learning activities according to the learning needs of the adult group. The student-centered teaching theory is developed and constructed based on the humanistic teaching theory and constructivist teaching theory.

2.1Theoretical Foundation

2.1.1Humanistic Learning Theory

Through continuous improvement and development, education has been greatly influenced and extensively studied and applied by the humanistic learning theory in the process of practice. Firstly, the teaching objectives of the humanistic learning theory have undergone

some changes. Humanistic learning theory not only focuses on imparting knowledge content but also emphasizes promoting students' self-understanding and in-depth learning, highlighting students' creative and personalized needs in the learning process. Humanistic teaching theory advocates for students' autonomous research learning process, emphasizes students' emotional involvement, and values students' knowledge construction. Furthermore, the humanistic approach, which places the student at the center of the learning process, promotes a student-centered teaching design concept. Ultimately, the humanistic learning theory, based on a teaching design concept that fully values the student's position, drives the demand for self-directed learning and autonomous inquiry among students.

Empirical research has shown that both humanistic learning theory and blended learning have been widely applied in educational practice. Blended learning, when integrated with humanistic learning theory, can effectively enhance students' learning outcomes, motivation, and engagement. Blended learning can provide a more flexible and personalized learning experience, while humanistic learning theory emphasizes student-centered, emotion-based learning. The combination of the two can help improve students' motivation and engagement. These studies provide some reference for educational practice and also provide useful insights for exploring humanistic learning theory in the blended learning of students from diversified resources.

2.1.2Constructivist Learning Theory

The constructivist learning theory effectively explains the cognitive patterns of individual learning processes, emphasizing that the acquisition and internalization of new knowledge is an active and meaningful process of students constructing their own understanding based on their existing experiences. This reinforces the crucial role of cognitive psychology in the education field. The constructivist theory provides new explanations for teaching and learning, promoting the development of new learning theories based on students' prior knowledge. It has also had a profound impact on existing teaching theories, providing a new starting point for teaching practices. The constructivist learning theory has put forth a new paradigm for teaching practice, emphasizing the active construction of new knowledge by students through the integration of their existing knowledge and experiences. This concept and guiding principle have practical significance in actual teaching practices and have played a certain role in enhancing the efficacy of instruction.

To begin with, the constructivist learning theory highlights the active role of students in constructing knowledge and their status as the subject of learning. Secondly, the constructivist teaching theory

emphasizes the interaction between students and teachers, as well as between old and new knowledge, during the learning process. Lastly, the constructivist learning theory underscores the crucial role of creating a conducive learning environment.

2.1.3 Distance Education Theory

Remote education, as its name suggests, is an educational activity that is non-face-to-face and sometimes separated by temporal and spatial distances. From a technological perspective, it is defined as an educational activity that adapts to the needs of social development and digital technology. Based on the new characteristics and trends of modern remote education, Ding Xingfu (2001) defines it as an educational activity in which teachers and students are separated by time and space, and their connection is established through various educational activities using educational media resources. Li Kang (2003) further pointed out on the basis of Ding Xingfu's research that distance education is an educational activity that breaks through the limitations of time and space by utilizing new media technology to implement teaching resources. It has specific information transmission and communication methods, as well as educational resources and corresponding management systems and methods that are adapted to distance education methods. The theoretical analysis of the distance education system is analyzed from a systematic scientific perspective, which is used to comprehensively analyze and explain distance education through a systemic approach.

2.2. Blended Learning Model and Learning Effect

Blended Learning, also known as "Hybrid Learning", is a diverse and integrated learning method that combines different forms of educational dissemination, such as face-to-face teaching and online learning. Blended Learning blends the advantages of both online and offline learning conditions, fully utilizes the teacher's leadership and emphasizes the student's subjectivity, providing each student with a suitable learning environment, learning process, and learning content. This approach encourages students to take initiative in their own learning while receiving comprehensive support from their teachers, ultimately resulting in optimal learning outcomes.

In adult education, it is important to adhere to the concept of student-centered development, which emphasizes attention to individual development needs, respect for the diversity of learning styles and unique life circumstances, and the promotion of independent growth in order to achieve the ultimate goal of "pursuing self-development". Additionally, it is essential to focus on multifaceted educational attainment and the personal development of skills beyond skill enhancement in order to ultimately achieve the goal of "benefiting the public". In response to the characteristics of students from diversified

resources resulting from the enrollment expansion, vocational colleges have adopted a blended learning approach that combines online and offline teaching methods, integrates various learning platforms such as MOOCs, Chaoxing Network, face-to-face instruction, and Tencent Meeting, and utilizes video or live streaming as the main carrier to transcend the limitations of time and space, thereby improving the quality of learning and time utilization. However, due to the diversity of blended learning, research on the impact of teaching behavior on learning engagement and effect in blended learning situations is still scarce. Moreover, the lack of research conditions for adult student groups further exacerbates the scarcity of research in the field of adult education. This study focuses on the students from diversified resources resulting from the enrollment expansion in vocational education, the aim of which is to investigate the impact mechanism of teacher behavior in blended learning on actual learning outcomes, by analyzing the learning input of adult learners. The study will also take into account the individual characteristics of adult learners, such as learning motivation and self-efficacy, in order to explore the promoting effect of teaching behaviors on learning input. The ultimate goal is to provide more adaptive and effective improvement measures for blended teaching design, and to enhance the effectiveness of adult vocational education.

Through blended learning, students can find multiple corresponding teachers from online learning. In the implementation of blended learning, teachers can formulate matching teaching plans based on personalized learning information obtained from online teaching software, and students can also obtain the learning content they need more conveniently through the system's recommendations, further shortening the retrieval time required for their own learning. Moreover, the characteristics of blended learning have also expanded the application of information technology in education and teaching, achieving cross-regional and cross-time communication, so that students with different regions, ages, and educational backgrounds can benefit from it.

2.3 Research Status of Blended Learning with Students from Diversified Resources

Ma Zhongwen and Pan Jiajun (2019) suggested that vocational colleges should develop diversified talent training programs according to the categories of social roles, in order to cater to the characteristics of diversified student sources. The main teaching modes should be flexible learning system and online learning. Based on in-depth industrial research, individual classes and separate teaching should be adopted for students from diversified resources. Wang Xiaogang (2019) proposed to promote lifelong learning of enrollment sources and improve students' ability to learn actively, constantly explore, and

apply knowledge through online open course learning. Zhao Yunlong (2019) explored the deepening of teacher, textbook, and teaching methods, and the promotion of school-enterprise cooperation based on the distance education teaching model to adapt to the training of students from diversified resources. In May 2019, the Chinese Ministry of Education issued the Implementation Plan for the Special Work of Expanding Enrollment in Higher Vocational Education which proposed to use the enrollment expansion as an opportunity to strengthen regular teaching management, in order to adapt to the diversified arrangement of learning time and methods of diversified student sources. Through innovative teaching and learning assessment methods, the plan explores the conversion of credit recognition for students' existing technical and skill learning achievements. This policy also provides some reference for the cultivation of diversified student sources. Liu Xiao and Liu Wankun (2019) proposed to add the 1+X certificate system as a graduation standard, integrate cultural courses with professional courses, and integrate vocational education with social training as training methods. According to Zhang Min (2020), measures such as optimizing the enrollment system, innovating talent development models, constructing a vocational certificate system, and improving funding mechanisms should be taken to adapt to the expansion of enrollment. Meanwhile, Wang Qin and Ma Qingfa (2020) have proposed flexible curriculum systems, such as implementing a fully credit-based system and a prior learning recognition system, developing vocational education MOOCs, establishing a blended learning system combining online and offline learning, and implementing the 1+X certificate system in collaboration with enterprises, as measures to reform the education and teaching system after the enrollment expansion.

Based on the above analysis, it can be concluded that the recent expansion of vocational education in China is not only a matter of cultivating adult learners, but also a response to the practical needs of economic development. In order to achieve this, vocational colleges need to move beyond traditional closed models of vocational training and consider adult education, vocational education, and skill training as part of a comprehensive approach. To this end, vocational colleges should fully integrate classroom and online education, leverage the flexibility of blended learning, and ensure the quality of expanded enrollment through this mode of instruction.

Chapter III Research Methodology and Design

3.1Research Model and Hypothesis

3.1.1 Research Model

Based on the theoretical foundation related to this study, the model of "teaching behavior-learning input-learning effect" was constructed to determine the effect of blended learning on the learning effect of students from diversified resources.The effect of blended learning is influenced by students' intrinsic learning engagement and external teaching behavior. The external teaching behavior affects learning outcomes through students' intrinsic learning engagement. Moreover, students' learning motivation and self-efficacy promote the impact of teaching behavior on learning engagement.

3.1.2 Research Hypotheses

This study proposes 18 main hypotheses, specifically:

H1: There is a significant positive contribution of teachers' teaching attitudes in the blended learning model to the learning effect of students from diversified resources.

H2: Teachers' preparation for teaching in the blended learning model has a significant positive contribution to the learning effect of students from diversified resources.

H3: There is a significant positive contribution of teachers' teaching contexts to the learning effect of students from diversified resources in the blended learning model.

H4: Teachers' teaching attitudes in the blended learning model significantly and positively contribute to the cognitive (4a), affective (4b), and behavioral (4c) inputs to the learning of students from diversified resources.

H5: Teachers' preparation for teaching in the blended learning model significantly and positively contributes to the cognitive (5a), affective (5b), and behavioral (5c) inputs to the learning of students from diversified resources.

H6: The teacher's instructional context in the blended learning model significantly and positively contributes to the cognitive (6a), affective (6b), and behavioral (6c) inputs to the learning of students from diversified resources.

H7: The cognitive inputs of the learning of students from diversified resources in blended learning significantly and positively contribute to their learning outcomes.

H8: The emotional engagement of students from diversified resources in blended learning contributes positively to their learning outcomes.

H9: The behavioral input of students from diversified resources in blended learning contributes positively to their learning outcomes.

H10: the learning motivation of students from diversified resources moderates the effect of teachers' teaching attitude on cognitive input (10a), affective input (10b) and behavioral input (10c) in blended learning mode, i.e., the stronger their learning motivation, the greater

the effect of teachers' teaching attitude on their cognitive input, affective input and behavioral input.

H11: The learning motivation of students from diversified resources moderates the effect of teachers' instructional preparation on learning cognitive input (11a), affective input (11b) and behavioral input (11c) in the blended learning model, i.e., the stronger their motivation to learn, the greater the role of teachers' instructional preparation on their cognitive input, affective input and behavioral input.

H12: The motivation of students from diversified resources moderates the effect of teachers' teaching contexts on cognitive (12a), affective (12b), and behavioral (12c) inputs to learning in the blended learning model, i.e., the stronger their motivation to learn, the greater the effect of teachers' teaching contexts on their cognitive, affective, and behavioral inputs.

H13: Self-efficacy of students from diversified resources moderates the effect of teachers' teaching attitudes on cognitive (13a), affective (13b), and behavioral (13c) inputs in the blended learning model, i.e., the stronger the self-efficacy, the greater the effect of teachers' teaching attitudes on students' cognitive, affective, and behavioral inputs.

H14: Self-efficacy of students from diversified resources moderates the effect of teachers' instructional preparation on cognitive (14a), affective (14b), and behavioral (14c) inputs of learning in a blended learning model, i.e., the stronger the self-efficacy, the greater the effect of teachers' instructional preparation on students' cognitive, affective, and behavioral inputs.

H15: Self-efficacy of students from diversified resources moderates the effect of teachers' instructional contexts on cognitive (15a), affective (15b), and behavioral (15c) inputs to learning in a blended learning model, i.e., the stronger the self-efficacy, the greater the role of teacher' instructional contexts on students' cognitive, affective, and behavioral inputs.

H16: Teachers' teaching attitudes in blended learning significantly influence students' learning outcomes through their cognitive input (16a), affective input (16b), and behavioral input (16c).

H17: Teachers'teaching preparation in blended learning significantly affects their learning outcomes through students' cognitive (17a), affective (17b), and behavioral (17c) inputs to learning.

H18: Teacher's instructional context in blended learning significantly influences their learning outcomes through students' cognitive input (18a), emotional input (18b), and behavioral input (18c) to learning.

3.2 Research Methodology and Design

3.2.1Research Methodology

In terms of research methodology, this study primarily adopts a research process of theoretical deduction and empirical verification. Based on the research needs of each section, appropriate research methods have been selected for each part, specifically including literature review, questionnaire survey, and statistical analysis.

3.2.2Research Design

3.2.2.1 Research Subjects

Due to the inherent bias in the role categories of enrollment expansion in vocational colleges, the number of students from the four groups admitted is not evenly distributed. Therefore, it is not sufficient to rely solely on selecting subjects from one institution when conducting research. Based on the purpose of this study, the research subjects have been identified as the expanded enrollment student groups from three different types of vocational colleges, namely A, B, and C, which specialize in finance, engineering, and science.

3.2.2.2 Scales

The measurement scales used in this study were derived from mature research results both domestically and internationally. After initially selecting the measurement scales, the items were discussed, selected, and revised by relevant experts and supervisors to form three dimensions of teacher's teaching behavior: teaching attitude, teaching preparation, and teaching context. The learning behavior includes three dimensions of cognitive input, emotional input, and behavioral input, as well as measurement scales for learning motivation, self-efficacy, and learning outcomes. Following the basic process of scale development, once the initial version of the scale is formed, it is necessary to carefully consider the phrasing and common understanding of the statements in the scale through qualitative methods. Additionally, through quantitative methods, the items in the scale must undergo reliability and validity testing, resulting in the creation of a formal measurement scale.

3.2.2.3Pretest Test

By conducting a preliminary test on a partial sample of the initial scale through data collection, using exploratory and confirmatory factors for data analysis, we can detect whether the relationships between variables of the scale and their corresponding items meet the actual measurement requirements of the study. Any items that do not meet the requirements will be deleted or adjusted to ensure that the scale items ultimately meet the research objectives.

To ensure a comprehensive and accurate measurement of variables corresponding to the theoretical model of learning effects in the

blended learning of students from diversified resources, this study conducted an exploratory factor analysis to test the content validity of the questionnaire. The KMO test and Bartlett's test of sphericity were performed on the pre-test sample data using SPSS 25.0 statistical analysis software. The results of the tests showed that KMO was greater than 0.9 and the significance of the difference test was less than 0.05, indicating a high suitability for factor analysis. Additionally, the data collection method used in this study was solely based on questionnaire surveys, which may be subject to common method bias. Following the suggestion of Podsakoff et al. (2003), the Harman single-factor test was used to assess the influence of the common method bias. For the research sample, the variance contribution of a single factor was less than the critical value of 40%. Therefore, there was no single common factor that could explain most of the variance, indicating that the impact of common method bias was limited.

To ensure the quality of the scale and further examine its construct validity, a confirmatory factor analysis was conducted using the sample data, after performing exploratory factor analysis. Confirmatory factor analysis can verify and further confirm the correspondence between the items in the scale and the extracted variable factors (Hou Jietai et al., 2004). Typically, if the standardized factor loading of the item in the confirmatory factor analysis is greater than 0.5, the item is considered to converge with its corresponding latent variable. In this study, a confirmatory factor analysis was conducted using AMOS 21.0 structural equation software to establish a model of the effects of students from diversified resources on blended learning with 9 latent variables, and the model fit and analysis results met the standard.

Hu and Bentler (1999) conducted a study on the validation factors and suggested that a model is considered well-fitted when the chi-square to degrees of freedom ratio (χ^2/df) is between 1 and 3, the comparative fit index (CFI) is greater than 0.9, the Tucker-Lewis index (TLI) is greater than 0.9, the root mean square error of approximation (RMSEA) is less than 0.05, and the standardized root mean square residual (SRMR) is less than 0.05. Based on these fit indices, the nine-factor model demonstrated good model fit with the data.

After the initial design of the questionnaire, careful consideration of the items, and an analysis of the reliability and validity of the pre-test data, this study ultimately developed a measurement scale for learning effectiveness in blended learning of students from diversified resources. Furthermore, all measurement items were re-coded to form the formal scale of this study. This scale, which is based on nine variables in the theoretical model of this study, consists of 62 measurement items.

The design of the survey questionnaire is the primary step in collecting data using the survey method. To ensure the quality of the survey questionnaire, this study carefully designed the composition, response format, and item settings. Finally, the three parts of the questionnaire were determined to include relevant introductions, personal basic information, and measurement items. A total of 1,532 valid questionnaires were obtained.

Chapter IV Analysis of Research Results

After completing the empirical research design and sample data collection, the next step will involve conducting basic statistical analysis on the collected 1,532 sample data. The reliability and validity of the scale will then be tested, followed by hypothesis testing of the direct effect, moderating effect, and mediating effect of this study through regression analysis and the Bootstrap method. Finally, the results of the hypothesis testing on the relationship will be analyzed. Below are the specific details:

4.1 Basic Statistical Analysis

4.1.1 Descriptive Statistical Analysis

The main objective is to grasp the basic characteristics of the sample data. In order to accurately and clearly understand the distribution characteristics of the sample data, this study selected five indicators, namely mean, standard deviation, variance, skewness and kurtosis, to describe the 1,532 samples collected in this study.

The numerical distribution of teaching attitude, teaching preparation, teaching situation, cognitive input, emotional input, behavioral input, learning motivation, self-efficacy, learning effect, and various control variables are all within a balanced range, with standard deviations ranging from 0.3 to 0.8. Moreover, the standard deviations of the variables are all less than 1, indicating that the collected sample data has a clear concentration tendency and a small degree of dispersion. Furthermore, the absolute values of skewness are between 0.689 and 1.878, the absolute values of kurtosis are between 1.118 and 1.429, both of which are less than 2. These findings demonstrate that the 1,532 sample data used in this empirical study follow a normal distribution, which satisfies the requirements of hypothesis testing for empirical analysis.

4.1.2 Correlation Analysis

In order to measure the closeness between two variables, and to gain a preliminary understanding of the relationship between variables, it is necessary to analyze the correlation between variables. For this study, the Pearson correlation coefficient method was selected to analyze the correlation between variables.

The present study utilized SPSS 25.0 statistical analysis software to calculate Pearson correlation coefficients. The data indicated a significant positive correlation between three dimensions of teaching behavior, namely teaching attitude, teaching preparation, and teaching context, and three dimensions of student learning engagement, namely cognitive, emotional, and behavioral engagement. These initial findings suggest that the three dimensions of teaching behavior can positively affect the three dimensions of student learning engagement. Furthermore, there were significant positive correlations between the three dimensions of teaching behavior and student learning engagement, learning motivation, self-efficacy, and learning outcomes, which provide preliminary evidence for the positive impact of teaching behavior, learning engagement, motivation, and self-efficacy on learning outcomes. All of the control variables showed significant correlation with the learning outcomes. Among them, income level and years of work experience exhibited a negative correlation with learning outcomes, indicating that the selected control variables have a certain degree of influence on the dependent variable in this study. In addition, the maximum correlation coefficient between the research variables was 0.612, all of which were less than 0.65. Generally, a correlation coefficient above 0.7 is considered the standard for highly correlated variables. Therefore, it can be concluded that the variables in this study do not have a high degree of correlation and meet the requirements for data analysis (Wu Minglong, 2010).

4.1.3 Common Method Bias Analysis

The common method bias analysis refers to the artificial covariation between the predictor variable and the criterion variable caused by the same data source, the same rater, the same measurement environment or project context, and the features of the project itself during the data collection process. In this study, the possibility of common method bias in the sample data exists because all items in the same questionnaire were filled out by the same respondent. Therefore, it is necessary to conduct a common method bias analysis. This study selected the single-factor method proposed by Harman to test the potential common method bias in this study (Podsakoff et al., 2003).

The present study utilized SPSS 25.0 statistical analysis software to conduct an unrotated principal component analysis of the measurement item data for all variables. The results of the analysis revealed nine components with eigenvalues greater than the first component. Furthermore, the total variance explained by the first component was 24.132%, which fell below the critical value of 40%. Additionally, according to the results of the exploratory factor analysis, there was no issue of entanglement between the independent and

dependent variables in the same component. Therefore, it can be concluded that there was no significant common method bias in the sample data of this study.

4.2 Reliability Test

4.2.1 Confidence Test

The analysis of reliability is a fundamental step in empirical analysis. It is used to determine whether the data collected meets the expected indicators set by the scale developer, reflecting the degree of fit between the data and the expected values. This study primarily examines the Cronbach's α coefficient to measure the reliability of the scale, which generally requires a Cronbach's α coefficient for the overall scale of 0.7 or higher.

After conducting statistical analysis using SPSS 25.0, this study obtained the Cronbach's α coefficients of the overall scale as well as each variable. The coefficient value of the overall scale was 0.886, indicating that the scale of this study met the reliability standards. Among the nine variables studied, the lowest Cronbach's α coefficient was 0.820, which was for the cognitive input variable, indicating that all variables' Cronbach's α coefficients were above 0.7, demonstrating that the measurement item settings for each variable met the reliability standards.Furthermore, the total correlation of each measurement item with the correction item is above 0.5, and the Cronbach's α coefficient does not show significant changes after removing any item. Based on the above results, it can be concluded that the reliability of the scale in this study is relatively high and meets the requirements of empirical analysis.

4.2.2 Validity Test

Validity refers to the degree of closeness between the measured value and the true value, which is used to test whether the measuring tool can accurately measure the variable to be measured, and is divided into content validity and structural validity. Content validity refers to the degree to which a specific set of items reflects a content category, mainly testing whether the content of the measurement items in the scale can accurately reflect the research question. In this study's measurement scale, all variables except control variables are derived from mature scales found in domestic and foreign literature. After forming the initial scale, language expression was polished and item settings were adjusted through expert review and group discussion to ensure clarity and improve the compatibility between the measurement scale and research content. These efforts also aimed to increase the effectiveness of responses and ensure the high content validity of the measurement scale used in this study.

The convergence validity refers to the degree to which the questionnaire items converge on the latent variable they correspond

to, mainly testing whether the measurement items can converge on their corresponding variables. In this study, we employed AMOS 22.0 data analysis software to conduct confirmatory factor analysis. The data from the analysis of model fit and validity indicate that all fit indices of the confirmatory factor analysis model meet the reference standards (Wu Minglong, 2010), demonstrating that the research model has good fit indices. The minimum factor loading of each measurement item on the corresponding latent variable in the scale is 0.579, all of which are greater than 0.5. The minimum C.R. is 9.667, all of which are greater than 8, and all are statistically significant at the P < 0.01 level. The minimum C.R. for each variable is 0.821, all of which are greater than 0.7. The minimum AVE is 0.566, all of which are above 0.5. These results indicate that the convergent validity of the scale in this study is good.

The discriminant validity refers to the degree of difference between variables, primarily testing whether variables are not closely related. When testing discriminant validity, it is required that the square root of the average extracted variance (AVE) for each variable is greater than the correlation coefficient between that variable and other variables (Fornell & Larcker, 1981). Based on our calculations, the comparison of the square root value of AVE in this study with the correlation coefficient values between variables is represented by the values on the diagonal, which are the square root of AVE for each variable. The data shows that the minimum value of the square root of AVE for each variable is 0.752, and all the values for the square root of AVE are greater than 0.7 and significantly greater than the correlation values in their respective rows and columns (i.e., values below the diagonal).

4.3 Hypothesis Relationship Test

After conducting preliminary statistical analysis on sample data, this study utilized SPSS 25.0 statistical analysis software to perform regression analysis, in order to examine the mediating and moderating effects in the theoretical relationships proposed by this study.

4.3.1 Relationship Test of Direct Effect

This study posits that the teaching behavior of teachers in blended learning mode has a direct effect on both the learning engagement and learning outcomes of students from diversified resources. Additionally, this study suggests that the learning engagement of students from diversified resources has a direct effect on their learning outcomes, and corresponding hypotheses for these positive relationships have been proposed. In order to verify the direct causal relationships constructed in the research model, regression analysis was performed using SPSS 25.0 statistical analysis software in this study. The dependent variables were the dimensions of learning

effectiveness and learning input. The specific analysis results showed significant differences between the variables, indicating that the scale used in this study has good discriminant validity.

4.3.2 Hypothesis Relationship Test of Moderating Effect

The present study examines the relationship between the dimensions of teacher's teaching behavior in blended learning modes, the learning motivation, and the self-efficacy of students from diversified resources. The study proposes corresponding relationship hypotheses and tests the moderation effect of the hypotheses using hierarchical regression analysis with SPSS 25.0 statistical analysis software. Prior to data testing, the study creates an interaction term by multiplying the independent variable and the moderating variable, and then conducts regression analysis step by step. Specifically, the study performs separate stepwise regressions for learning motivation and self-efficacy.

4.4 Hypothesis Test Results

This study conducted data analysis on 1,532 collected sample data using SPSS 25.0 statistical analysis software. The variables in the sample data did not have a high degree of correlation, and the common method bias had a limited impact. The reliability and validity met the statistical requirements. By conducting regression and Bootstrap analysis on the relevant hypotheses, 30 out of 42 sub-hypotheses in the 18 main hypotheses proposed in this study were supported by data analysis, while 12 were not validated by the data.

Chapter V Research Findings and Discussion

Starting from the issue of the practical environment demands for students from diversified resources in the expansion of vocational education, this study constructs a mechanism model of the impact of learning effects on students from diversified resources under blended learning mode, combining humanistic learning theory, constructivist learning theory, distance education theory, and teaching practice paradigms of teacher's teaching behavior and student's learning engagement. Hypotheses on the relationships between relevant variables are proposed based on the model. Through a large-scale survey and verification of the expanded student population, this study ultimately draws the following main research conclusions:

The first finding explores the connotations of teaching behaviors and adult learners' learning engagement in the context of vocational education expansion.

The second finding develops a influence mechanism scale for the blended learning effect of students from diversified resources with high reliability and validity.

The third finding constructs a theoretical model of the blended learning effect mechanism for diversified student sources, revealing the internal pathways of the learning effect under blended learning mode.

The fourth finding clarifies the direct impact of teacher's teaching behavior, learning engagement, and learning effect in blended learning.

The fifth finding confirms the moderating role of diverse learning motivations and self-efficacy in the relationship between teaching behavior and learning engagement.

The sixth finding supports the multiple mediating effect of diverse learning engagements on the relationship between teacher behavior and learning outcomes in blended learning.

The present study offers both theoretical and practical contributions, which can be further elaborated as follows:

5.1 Theoretical Contribution

The study deepens the understanding and contemplation of the talent cultivation mode for expanding enrollment in higher vocational colleges from a theoretical perspective, and creatively proposes a blended learning theory for expanded enrollment students, enriching the theoretical framework for cultivating talent in students from diversified resources. This further promotes the theoretical development and application of talent cultivation in higher vocational education. The theoretical contributions of this study are demonstrated in several aspects.

Firstly, it examines the relationship between teacher behavior, student learning engagement, and learning outcomes in a blended learning teaching mode with students from diversified resources, thereby expanding the boundaries of mixed learning mode application.

Secondly, this study confirmed the moderating role of diverse student learning motivations and self-efficacy on the relationship between teacher instructional behavior and student learning engagement, which further enriches the theoretical implications of adult education.

Thirdly, this study also sheds light on the underlying mechanism of how teacher instructional behavior affects learning outcomes through student learning engagement, which supplements the research on the role of instructional behavior in promoting student learning engagement in blended learning.

5.2 Practical Implications

The diversification of student sources and talent cultivation mode in the expansion of higher vocational education is still in the exploratory stage, and there are imperfections in enrollment, teaching, and management. This study aims to address this issue by developing a

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learning effect evaluation model for blended learning of students from diversified resources in higher vocational education. By clarifying the interaction between teaching behavior and learning input, teachers can design blended teaching with a targeted approach. This can further enable effective adjustment of teaching strategies for blended learning.This study provides practical guidance and corresponding references for the students from diversified resources and subsequent adult education in response to the enrollment expansion. The focus is on identifying the adult roles of students from diversified resources and valuing their individual development. It also emphasizes on improving the level of self-directed learning for students from diversified resources by addressing teacher behavior in blended learning and cultivating their self-learning abilities. Additionally, highlighting the task value in blended learning can enhance the motivation and self-efficacy of students from diversified resources.

5.3 Research Limitations and Prospects

This study aims to empirically investigate the effectiveness of blended learning on students from diversified resources in the context of the expansion of higher vocational education. Based on theoretical deduction, the characteristics of the students from diversified resources and theoretical analysis of the expansion of higher vocational education are considered. A model is constructed to explore the impact of blended learning environments on the learning outcomes of the students from diversified resources. The model proposes relevant hypotheses, which are tested through primary data collected via a questionnaire survey. Most of the hypotheses of this study have been validated by data. However, due to limitations in research conditions and sample content, there are still many shortcomings in this study. Specifically, there are three main aspects: first, due to the limitation of research level and article length, the comprehensiveness of teaching behavior variables in the study is insufficient; second, the use of questionnaire surveys in this study has some drawbacks compared to actual objective data; third, due to the limitations of research conditions, there is still a gap between the research sample and the analogy of adult education.

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