Problems and Countermeasures of Double-qualified TeacherCompetence in Vocational Colleges
——Taking Guangxi Region as an Example

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Abstract: With the rapid development of vocational education, how to improve the competence of double-qualified teachers in vocational colleges and improve the quality of vocational education is particularly important. In this study, 292 teachers from vocational colleges in Guangxi region are selected as research objects, and quantitative and qualitative research is carried out in seven aspects, such as teaching age, gender, education level, title, vocational qualification grade, double-qualified teacher qualification grade, and teaching profession, etc., to construct four dimensions of teacher's knowledge accomplishment, teaching ability, vocational skills, and personal traits, to analyze the current status of double-qualified teacher's competence in vocational colleges, to find out the limiting the current situation of double-qualified teacher competence in vocational colleges is analyzed to find out the reasons restricting the improvement of teachers' competence, and four countermeasures are put forward, namely, constructing a cooperative learning mode, integrating the training mode, broadening the channels of practicing competence exercise, and perfecting the teaching incentive mechanism. It provides new perspectives and methods for the study of double-qualified teachers in vocational colleges, and is conduciveto providing theoretical references and policy guidance for teachers, colleges, and education authorities in the construction of the teaching force.

Keywords: Teacher Competence; Knowledge Accomplishment; TeachingAbility; Vocational Skills; Personal Traits.

Introduction

Vocational education i s an important part of the national education system and the development of national human resources, and bears the important responsibility of cultivating diversified talents, passing on technical skills and promoting employment and

entrepreneurship. Under the new economic and social development situation, the development of vocational education has become an important strategic choice for all countries in the world to meet economic, social, demographic, environmental and employment challenges and to achieve sustainable development, and has generally received the attention of the international community (MOE of PRC, 2022). Guangxi, as an economically underdeveloped minority region, the construction of double-qualified teacher teaching force in vocational colleges is a bottleneck problem restricting the high-quality development of vocational education in Guangxi, and there exist problems such as insufficient number of double-qualified teacher teaching force, low level, and no standard measure of quality. For a long time, there is a lack of scientific and effective research on the analysis of factors affecting the competence of double-qualified t eachers, the construction and evaluation of competence standards and other related issues, which makes the training, qualification, employment, assessment and evaluation of double-qualified teachers in vocational colleges lack of scientific, pertinent and effective guidance for the work of building the teaching force, and thus affects the improvement of the level of professional development of teachers in vocational education. Therefore, it is an important and urgent task to promote the reform and development of vocational education in Guangxi by exploring the establishment of a model of competence of double-qualified teachers in vocational colleges in line with the actual situation in Guangxi, motivating t eachers to continuously improve their theoretical and practical teaching abilities, and guaranteeing the sustainable and healthy development of the teaching force in vocational colleges from the system.

1. Literature Review

1.1 The Concept of the Double-qualified Teacher

The high-quality development of vocational education cannot be achieved without a high-quality teaching force, and the unique orientation of vocational education and the objectives of personnel training require teachers engaged in vocational education to have double-qualified teacher qualifications. For example, in Germany, there are two types of teachers in the vocational education system, one is the vocational school teacher and the other is the enterprise trainer, thus forming a unique dual vocational education model; in the United Kingdom and the United States, it is necessary to have both the industry or vocational qualification certificate and the teacher qualification certificate before becoming a vocational education teacher. Unlike developed countries in vocational

education, China has creatively put forward the concept of double-qualified teacher in the field of vocational education. Double-qualified teacher is a unique phenomenon in the development process of vocational education in China, which was initially an attempt to solve the problem of serious shortage of skilled t eachers in vocational colleges, and has been the focus of attention in the construction of vocational education faculty since it was proposed in the early 1990s. Chinese scholars' definitions of double-qualified teachers range from the broad sense to the narrow sense, from the original meaning of the word to its derivation, from elements to functions, from static to dynamic, and from process to result, and different scholars have put forward different definitions, as shown in Table 1 below.

It was not until the implementation plan of the National Vocational Education Reform in 2019 that the concept of double-qualified teacher was uniformly expressed. Luo et al. (2022) argue that a dual teacher refers to a teacher who possesses both theoretical and practical teaching abilities. Professional course teachers in any vocational college should first and foremost be double-qualified teachers, which are not the combination of two abilities or qualities, but rather focus on a comprehensive structure, that is, the requirements for the competence of vocational education teachers. And designed the competence standards for double-qualified teacher types used in Guangxi region, as shown in Figure 1.

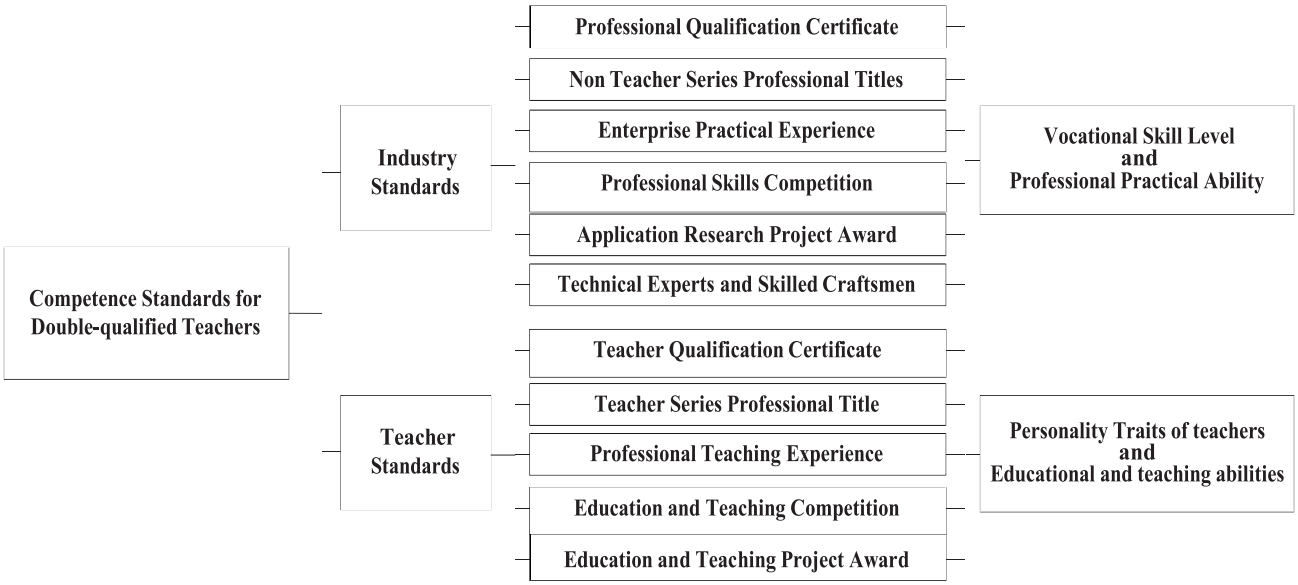

Figure 1 The Competence Standards for Double-qualified Teachers
Source: Luo et al., 2022

1.2 The Concept of Teacher Competence

As competence research continues to evolve, researchers have also introduced the concept to the field of teaching, arguing that elements of teacher competence are closely related to the successful implementation of

teaching and learning, and that this set of competence elements is known as teacher competence (Medley & Crook, 1980). Scholars generally strike a balance between skills, qualities, knowledge and understanding, resulting in two basic tendencies in teacher competence research. One tendency is the 'skills-based' exoteric teacher competence research, for example, Olson and Wyett(2000) argue that teacher competence is the ability of teachers to possess. Danielson(2007) suggests that teacher competence consists of four dimensions: planning and preparation, teaching, professional responsibility, and monitoring of the teacher's environment; Skvortsova and Vtornikova(2013) suggest that teacher competence is hierarchical, and that in addition to meeting the basic requirements, teachers must also possess the higher-level skills needed to perform a particular profession. Xiong and He(2016) suggest that teacher pedagogical competence is a cluster of traits needed for teachers to accomplish their teaching goals productively, which can be described in terms of the way they behave in teaching. Another tendency is the "quality-based" implicit research on teacher competence, for example, the components of teacher competence change with the progress and development of modern educational concepts, and consist of six parts: self-intention, self-esteem, work motivation, job satisfaction, task perception, and future prospects (Kelchtermans & Vandenberghe, 1994). Tigelaar et al.(2004) view teacher competence as a set of personality traits, knowledge and teaching skills required to perform effectively in a variety of teaching environments as well as attitudes. Xu(2004) defines teacher competence as individual characteristics such as ability, self-awareness, motivation, and related personality traits that can differentiate between high-performing outstanding teachers from the potential individual characteristics of the average common teacher. Other experts and scholars have sought to integrate the two research tendencies, considering both exogenous and implicit characteristics, for a more comprehensive and objective assessment of teacher competence. For example, Shinkfield and Stufflebeam(20 12) argue that teacher competencies are divided into three categories: professional knowledge, professional skills or competencies, and professional attitudes or values. Xu(2010) argues that teacher competencies are composed of two parts: baseline competencies consisting of professional knowledge and professional skills, and discriminative competencies consisting of professional attitudes or values. Hol and Aktas(2013) defined the concept of teacher competence in terms of nine dimensions, comprising the sum of knowledge, skills, and characteristics that enable teachers to achieve good performance on the job. Wang(2017) proposed the concept of teacher competence development based on the three dimensions of the scholarship of teaching, the scholarship of inquiry, and the scholarship of application. Mutiara and others(2022) proposed that in the era of Industry 4.0, teacher

competence should include pedagogical competence, personal competence, professional competence, and social competence, which further enriches the connotation of teacher competence. Taken together, the above scholars' research suggests that teacher competence should have comprehensive characteristics such as deep knowledge reserves, comprehensive teaching ability, strong professional development ability and good professional attitudes or values.

2. The Current Status of Teacher Competence in Vocational Colleges

2.1 Analysis of the Overall Situation

This study used the "Teacher Competence Questionnaire for Double-qualified Teacher Teachers in Vocational Colleges" as a scale and a combination of in-depth interviews as a research method. In the formal research stage, the questionnaire was distributed to selected double-qualified teachers or vocational college teachers engaged in double-qualified teaching of theory and practice in national demonstration higher vocational colleges, national backbone higher vocational colleges and ordinary higher vocational colleges in Guangxi region. And based on the data recovered from the questionnaire, we carried out exploratory factor and validation factor analyses in order to construct an objective, scientific and real model of the competence of double-qualified teachers in vocational colleges. This survey mainly adopts the form of questionnaire star to send questionnaire link to the double-qualified teachers of vocational colleges in Guangxi area, the first time to recover 297 copies, excluding invalid 7 copies, retaining the valid data 292 copies, the recovery rate of 98.3%. In the interview stage, 24 teachers of vocational colleges with different teaching age, gender, academic qualification, title, double-qualified teacher qualification level and other seven relevant categories were selected.

In terms of teachers' highest educational attainment, the distribution of teachers' educational level is 1.1 %, 2.2 %, 79.3 %, 15.2 % and 2.2 % for secondary school and below, tertiary school, bachelor's degree, master's degree, and doctoral degree, respectively. In terms of gender ratio, females are slightly higher than males. In terms of professional and technical titles in the teaching series, it contains unobtained, junior, intermediate, deputy senior, and full senior, accounting for 37.0 %, 14. 1 %, 27.2 %, 19.6 %, and **2.2** % respectively. In terms of the grade of vocational qualification certificate, it contains unobtained, junior, intermediate, senior, technician, and senior technician, accounting for 22.8%, 10.9%, 23.9%, 29.3%, 6.5%, and 6.5% respectively. In terms of the qualification level of double-qualified teachers, it is mainly dominated by masters who have not been awarded, accounting for 50.0 %, followed by junior and intermediate, accounting for 29.3 % and 17.4 %. The remaining senior and part-time total accounted for 3.3%. In terms of teaching experience, it includes 1-5 years, 6-10 years, 11-15 years, 16-20 years, and more than 20 years, accounting for 38.0 %,

20.7 %, 14.1 %, 12.0 %, and 15.2 % respectively. In terms of specializations, there are 11 major categories of specializations. Mainly civil construction and equipment construction, accounting for 13%, 12%. The questionnaire recovery is shown in Table 2.

Table 2 Competence Questionnaire Recovery of Double-qualified Teacher Teachers in Guangxi Vocational Colleges

Category	Classification	Frequency	Percentage
Gender	Male	141	44.6
	Female	151	55.4
Educational level	Secondary school and below	41	1.1
	College	42	2.2
	Undergraduate	113	79.3
	Master's Degree	54	15.2
	PhD	42	2.2
Professional and technical titles in the	Not obtained	74	37.0
	Beginner	63	14.1
	Intermediate	75	27.2

teaching series	Associate Senior	58	19.6
	Full Senior	42	2.2
	Not obtained	21	22.8
Grade of vocational qualification certificate	Junior Labourer	60	10.9
	Intermediate Labourer	72	23.9
	Senior Labourer	67	29.3
	Technician	46	6.5
	Senior technician	26	6.5
Qualification level of double-qualified teacher	Not obtained	46	50.0
	Beginner	97	29.3
	Intermediate	116	17.4
	Advanced	42	2.2
	Part-time	11	1.1
Specialization	Electronic Information	23	3.3
	Education and Sports	13	3.3
	Culture and Art	11	1.1
	Equipment Manufacturing	31	12.0
	Transport	22	2.2
	Finance and Trade	21	1.1
	Civil Engineering and Construction	32	13.0
	Culture	21	1.1
	Healthcare	22	2.2
	Agriculture, Forestry, Animal Husbandry and Fisheries	22	2.2
	Others	23	3.3
Teaching experience	1-5 years	75	38.0
	6-10 years	59	20.7
	11-15 years	53	14.1
	16-20 years	51	12.0
	More than 20 years	54	15.2

2.2 Analysis of the Overall level

Based on the competence model of double-qualified teachers in vocational colleges, the competence of double-qualified teachers and the level of competence in the four dimensions of knowledge accomplishment, teaching ability, vocational skills and personal traits were analyzed separately from the overall data. N stands for the number, M stands for the mean, and SD stands for the standard deviation, and the details are shown in Table 3.

Table 3 Overall Competence Level of Double-qualified Teachers inGuangxi Vocational Colleges

Component	Items	N	M	SD

Knowledge Accomplishment	Professional knowledge	292	4.2609	0.92427
	Inter-disciplinary knowledge	292	4.3043	0.83520
	Innovative knowledge	292	4.1630	0.96393
	Cultural knowledge	292	4.3370	0.78834
Transnational communication, competition	learning, and	292	3.9457	0.96492
subscale			4.2022	
Teaching ability	Feedback	292	4.2826	0.74607
	Questioning	292	4.0543	0.94187
	Homework assignment	292	4.3478	0.79053
	Induction	292	4.2609	0.75403
	Diverse guidance	292	4.2717	0.79977
	Time control during teaching	292	4.3152	0.74020
	Reflective ability after teaching	292	4.2826	0.76065
	Creativity thinking	292	4.1739	0.79295
subscale			4.2486	
Vocational Skills	Technical aptitude	292	4.1413	0.89665
	Dgital learning management	292	4.2065	0.87125
	Teaching evaluation	292	4.3913	0.81141
	Curriculum design	292	4.3478	0.79053
	Personalized learning	292	4.3804	0.76808
subscale			4.2935	
Personality Traits	Sense of control	292	4.3478	0.77651
	Growth mindset	292	4.3696	0.78050
	Personality integrity	292	4.4457	0.81691
	Personal moral	292	4.4891	0.76308
	Emotion stability	292	4.3261	0.82687
	Professional attitudes	292	4.5000	0.73380
	Professional values	292	4.2935	0.80572
	Interpersonal relationship	292	4.3804	0.79618
	Lifelong learning	292	4.4130	0.75814
subscale			4.3961	

Overall, the competence level of double-qualified teachers in vocational colleges in Guangxi is 4.2550 on average, which is higher than the average score of 3, and is in the state of "Agree", indicating that the current double-qualified teachers in vocational colleges are basically capable of performing vocational education work. The overall level of the four dimensions of competence is shown in Figure 2.

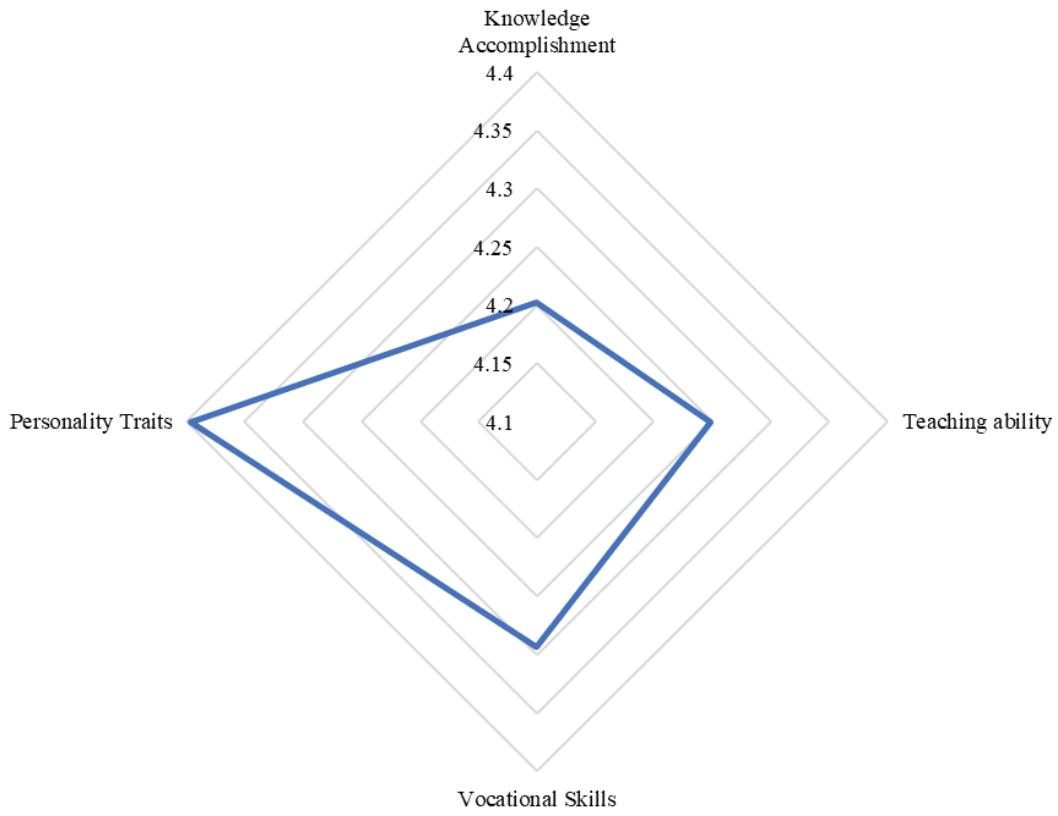

Figure 2 Competence Level of Double-qualified Teachers in GuangxiVocational colleges

From the radar chart, it is clear that the vocational education literacy of the double-qualified teachers is at a high level of competence, which indicates that the existing basic conditions of the double-qualified teachers are in a relatively good state. The next level of competence in descending order is personality traits, vocational skills, teaching ability and finally knowledge accomplishment.

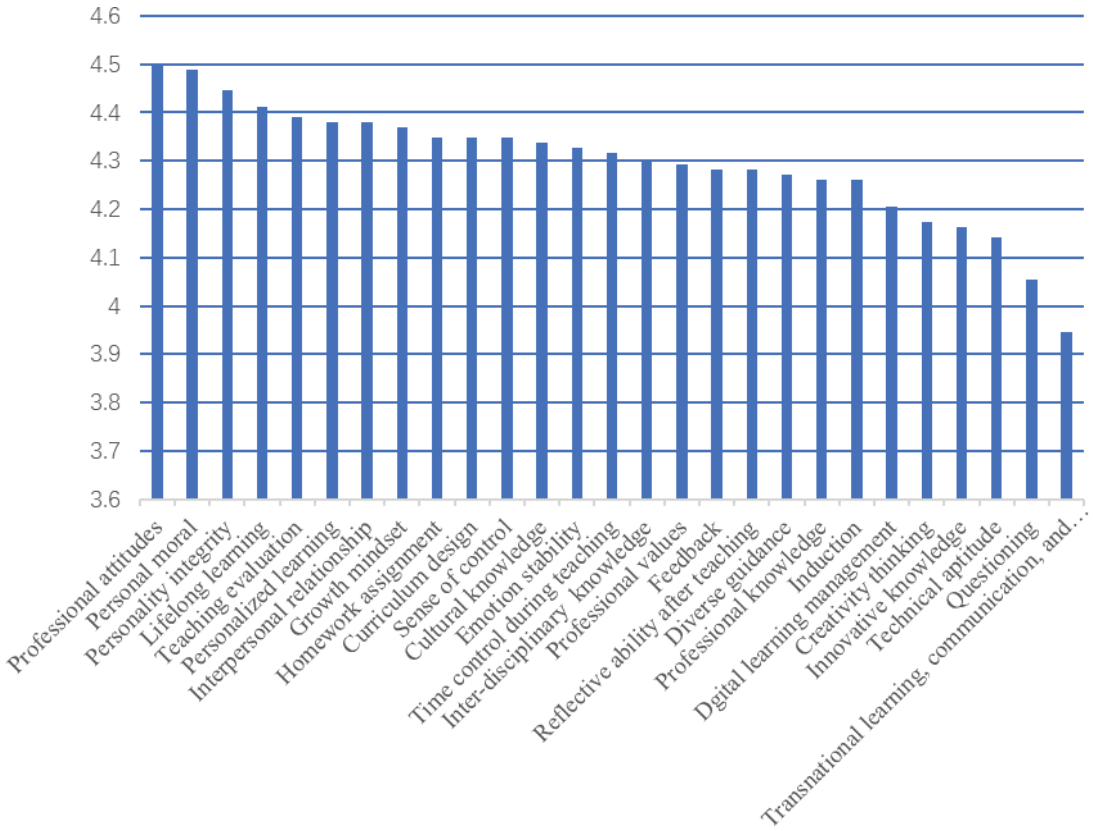

Figure 3 Competence Field Level of Double-qualified Teachers in Vocational Colleges in Guangxi

Looking again at the various competence areas, as shown in Figure 3, at the 4 (M) grade and above, the mean values are, in descending order, the following are professional attitudes(4.5), personal moral(4.4891), personality integrity(4.4457), lifelong learning(4.413), teaching evaluation(4.3913), personalized learning(4.3804), interpersonal relationship(4.3804), growth mindset(4.3696), homework assignment(4.3478), curriculum design(4.3478), sense of control(4.3478), cultural knowledge(4.337), emotion stability(4.3261), time control during teaching(4.3152), Inter-disciplinary knowledge(4.3043), professional values(4.2935), feedback(4.2826), reflective ability after teaching(4.2826), diverse guidance(4.2717), professional knowledge(4.2609), induction(4.2609), digital learning management(4.2065), creativity thinking(4.1739), innovative knowledge(4.163), technical aptitude(4.1413), questioning(4.0543)。The standard deviation of 1.158 for the ability to organize practical assessment is at a high level, indicating that this competence area is highly fluctuating and the development of competence items is relatively unbalanced. The competencies below 4(M) are: transnational learning, communication, and competition (3.9457), which

indicate that double-qualified teachers in vocational colleges have relatively weak competencies in this competence area, and the ability to carry out internationalization projects is the weakest competence of double-qualified teachers in vocational colleges at present. The standard deviation for this competence is 0.96492, which is at the highest level, indicating that there is a large gap in competence among double-qualified teachers in vocational colleges.

3. Major Problems and Causes of Teacher Competence in Vocational colleges

3.1 Insufficient Stock of Knowledge Accomplishment and Expertise out of Step with Industry Frontiers

When answering the question of "paying close attention to cutting-edge issues at home and abroad, and learning the education methods and concepts of other countries", 40 people chose to agree completely, 22 people chose to basically agree, and 20 people chose to agree. The number of people who chose these three options only accounted for 28.3% of the total number of people, which shows that there is a serious problem of the knowledge of double-qualified teachers being out of step with the frontiers of the industry. Vocational colleges, as an important channel for cultivating technical and skilled talents, play a crucial role in the transformation and upgrading of regional industries and technological innovation. If the level of teachers cannot keep up with the needs of the industry's cutting-edge development, it is impossible to support and lead the development of the industry, which will inevitably lead to the backwardness of the level of the entire regional industry over time. During an interview with a double-qualified teacher at a vocational college in Guangxi, he mentioned, "Although the state conductsa five-year rotation training programmer for teachers in schools, due to limited funding, the training period is short and the training content is ratheroutdated, with a big gap with the international level, which restricts the learning of new technologies and new methods."

3.2 Teaching Skills Need to be Improved for Effective Classroom Management

Classroom management ability is an important part of a teacher's teaching ability, which can not only improve classroom efficiency, but also contribute to the formation of a favorable learning atmosphere and enhance the interaction between teachers and students, so as to achieve the healthy development of learning. On the element of "being able to control the atmosphere and rhythm of the classroom to ensure the smooth running of teaching", 84 people chose "not at all" and 27 people chose "not at all". The number of people who chose these two options accounted for 34.6% of the total number of people, indicating that double-qualified teachers have great

deficiencies in classroom management. In the interview, teacher B of a school's Academic Affairs Office mentioned that "nowadays the classroom is basically a monologue of the teacher alone, the teacher talks about himself, the students play with themselves, few students take the initiative to ask questions, and the kind of learning atmosphere in which the students and the teacher discuss the problems is not strong enough." Teacher C further analyzed this: "On the one hand, the lack of classroom management ability means that there is a shortage of teachers in the classroom management. "The lack of classroom management ability on the one hand reflects the students' lack of enthusiasm for learning, and on the other hand reflects that the teachers' teaching ability needs to be improved; there is another important factor is that colleges don't pay much attention to the teachers' teaching assessment, which leads to the fact that the teachers put more emphasis on teaching than on scientific research, and devote very little time to teaching".

In addition, the teaching methods of double-qualified teachers in vocational colleges are not innovative and flexible enough. On the question of "can teach students according to their characteristics and adopt different teaching methods", 12 people chose not at all, 52 people chose not at all, and 35 people chose in line with the question. The number of people who chose these three options accounted for 33.9% of the total number of people,which shows that a lot of teachers follow the rules in teaching methods and fail to follow the progress of the times and technology to adjust their teaching methods. Teacher D expressed his opinion: "A lot of veteran teachers are still using the same teaching methods as those of more than ten years ago, and they are not willing to try out the new technologies and methods, such as the project-type based on the work process, task-type,etc.". etc." Teacher E, on the other hand, explored the issue in more depth, arguing, "The innovation of teaching methods, especially the online and offline hybrid teaching, virtual simulation teaching and other methods that have emerged since the new coronavirus outbreak, is an important feature of the advancement of the level of technology, and the teachers of vocational colleges and universities should also apply the new teaching methods and tools to their teaching. At the same time, the lack of training for teachers' teaching skills in vocational colleges is also the main reason for teachers' old-fashioned teaching methods".

3.3 Outdated Level of Vocational Skills and Weak Theoretical and Practical Skills

The most important ability of double-qualified teachers in vocational colleges is "vocational skills". Double-qualified teachers should not only have good professional qualities, but also be able to solve professional

problems by themselves in terms of practical ability, frequently participate in enterprise practice to sum up experience and constantly improve the practice method, and improve the level of vocational skills, as well as participate in internship and practical training work. Participate in internship and practical training work. In the results of the questionnaire survey, the lowest mean value of the dimension of "vocational skills" literacy is the element of "endeavoring to look for learning opportunities and acquiring new professional knowledge and vocational skills", with 18 people choosingnot to meet the requirement, 71 people choosing not to meet the requirement,and 30 people choosing not to meet the requirement at all. The lowest mean value was for the element "Endeavour to seek learning opportunities to acquire new professional knowledge and skills", with 18 people choosing not to comply, 71 people choosing not to comply and 30 people choosingnot to comply at all. These three choices accounted for 44.2 % of the total number of respondents, indicating that many teachers lacked the willingnessto learn new knowledge and skills. In the interviews, Teacher F explored thisissue in more depth, arguing that "this situation is more a matter of school management and incentives, as some colleges require new teachers to have certain professional skills, but then stop requiring them to do so once they are in the profession. Technology is constantly evolving, and once they are out of touch with frontline technology, the skills they have acquired will inevitably fall behind". Mr G mentioned that "many teachers wish to workin the frontline of enterprises, but due to the lack of support from school policies, there are few opportunities for internships, which do not satisfy theteachers' needs to get in touch with and learn new vocational skills". In addition, some enterprises have arranged some unimportant positions for teachers, which are not in line with teachers' needs and make it difficult for them to learn new and cutting-edge vocational skills."

A combination of theory and practice is an indispensable way of teaching technical and skilled personnel. For the question of "good at self-study and able to link theory with practice", 152 teachers chose "fully compatible" and 42 chose "basically compatible". The number of people who chose these two options only accounted for 66.4% of the total number of people, which shows that there are still a lot of teachers who do not consciously combine theory and practice in teaching. In the interview, Mr. H talked about his ownviews on this issue: "Theory and practice teaching is a basic requirement fordouble-qualified teachers, but not many teachers do this in the actual teaching process, although it is the use of integrated teaching, but the realityof the teaching is that the classroom is purely theoretical, the practical class is only about the operation of the two, the degree of integration between them is not high, how to organically combine the two? How to combine the two

organically requires teachers to master more vocational skills and makemore efforts. "

3.4 Insufficient Stimulation of Personality Traits and a Weak Sense of Innovation and Learning

Being good at learning and daring to innovate is an important factor in improving teachers' competence. On the question of "possessing innovative thinking and being good at coming up with new ideas and methods in work", 20 teachers chose undecided, accounting for 6.8 % of the total; 8 teachers chose basically not in line with this, accounting for 2.7 % of the total; and 5 teachers chose completely not in line with this, accounting for 1.7 % of the total. The proportion of teachers choosing these three options was 11.2 % of the total. In order to get a better understanding of the real situation, further interviews were conducted with the teachers who chose these three options, in which Mr. I mentioned that "most of the teachers are able to do continuous learning and make changes in teaching and learning, only that the school is often slow in responding to innovations, which may be one of the reasons why many of them chose not to be sure about this element. In addition, this element has something to do with the working atmosphere of the colleges, if there is a teacher with particularly outstanding ability within a certain team, everyone will naturally be influenced by him, and slowly form the habit of learning from each other and innovating continuously."

4. Countermeasures to Enhance the Competence of Teachers in Vocational Colleges

4.1 Building a Cooperative Learning Model to Enrich the Knowledge of Double-qualified Teachers

Firstly, it is necessary to strengthen the lifelong learning consciousness of teachers in vocational colleges, dare to accept new things, learn in teaching, explore in scientific research, constantly update their subject knowledge and professional knowledge, so that their own knowledge reserves keep pace with the times and improve their own ability. Secondly, it is necessary to expand the international vision, make full use of the resources with the help of the developed Internet and means of transport, connect with the international frontier, and form the international consciousness of double-qualified teachers. Finally, it is necessary to build a cooperative learning mode in the school, teachers through cooperative learning can do to complement each other's strengths and weaknesses, to achieve a balanced development of their own abilities, significantly improve the psychological atmosphere between teachers, which can play a leading effect, promote vocational colleges and universities to achieve rapid development of double-qualified teachers. Cooperative learning between teachers does not necessarily require formal occasions or specific time, and because this mode

of cooperative learning is more convenient and active, the effect and efficiency will be greatly improved compared with the traditional collective training. In addition, co-operative learning between teachers can significantly boost teachers' self-confidence. In the process of continuous learning, the knowledge quality of double-qualified teachers will be increased.

4.2 Implementing an Integrated Training Model to Improve the Teaching Ability of Double-qualified Teachers

The improvement of the teaching ability of double-qualified teachers in vocational colleges can be realized through the implementation of the trinity model of teacher teaching training and training for schools, colleges, and teacher teams. Firstly, at the school level, the school should establish a perfect teaching training system for double-qualified teachers, and carry out reforms in terms of training content, training mode, training effect, training purpose and training implementation, to be more in line with the needs of the enhancement of the teaching ability of double-qualified teachers in vocational colleges. Secondly, in terms of colleges and universities, they can organize training on teaching topics, teaching salons or special seminars. Discussions on the difficult problems concentrated in the teaching process of double-qualified teachers, reporting, and exchanging of hot issues in the process of education and teaching in the form of academic reports, providing a seminar platform for double-qualified teachers, to stimulate the enthusiasm and participation of teachers in training, so that they can learn interactively and endeavor to improve their teaching ability. Finally, in the double-qualified teacher team, can be implemented in the old teacher with new teachers of a training mode, play the role of the old teacher "pass, help, bring". Teachers who are older, joined the profession earlier and have stronger vocational skills can be appointed to teach the teaching experience and at the same time increase the relationship between teachers and pupils. After a period of training, the teaching level of new teachers can often be improved faster, and eventually achieve a qualitative leap, to effectively improve the teaching ability of double-qualified teachers.

4.3 Broadening the Channels for Practical Ability Exercise and Enhancing the Vocational Skills of Double-qualified Teachers

In order to improve teachers' vocational skills, vocational colleges need to form an "industry-university-research" co-operation mechanism in accordance with the principle of "integration of industry and education, and co-operation between schools and enterprises". First, to build good internship and training bases inside and outside the school, according to the school's own professional characteristics and enterprises to carry out school-

enterprise co-operation, and establish relatively stable practical training bases for teachers. According to the principle of "close to enterprises, school-enterprise co-construction, resource sharing and technology tracking", schools can carry out good and long-term co-operation withenterprises, and at the same time, schools can renovate or build new trainingbases of their own, to provide necessary hardware guarantee for the improvement of the vocational skills of double-qualified teachers. Secondly,to promote the depth of "school-enterprise co-operation", it is necessary to form a common interest chain between schools and enterprises. Enterprises can obtain lower manpower costs from "school-enterprise co-operation", help enterprises to solve technical problems, and improve the efficiency of

enterprises with professional knowledge. Schools can realize more convenient enterprise practice through enterprises and improve the vocational skills of double-qualified teachers. Thus, the benign development of "school-enterprise co-operation" is formed. Lastly, we should establish a mechanism for entrepreneurship of "industry-university-research", formulate feasible incentives and policies, do our best to meet the educational resources and experimental facilities needed in the process of "industry-university-research", and encourage teachers to carry out innovation and entrepreneurship in their own professional fields, so that they can fully verify their creativity and technological innovation, and effectively give fullplay to their own creativity and technological innovation. This will enable teachers to fully validate their creativity and technological innovation, effectively utilize the vocational skills of double-qualified teachers, and further hone their practical abilities.

4.4 Improve the Teaching Incentive Mechanism to Stimulate the Personality Traits of Double-qualified Teachers

To stimulate the personal characteristics of teachers in vocational colleges so that they are willing to devote themselves to teaching and practice, the first step is to enhance teachers' sense of professional identity. According to Maslow's hierarchy of needs theory, teachers in vocational colleges have insufficient sense of professional identity only because some of their needs are not satisfied, and there is a need to provide useful guidance to the experiences, feelings, cognitions, and behavioral tendencies of individual teachers in the process of their interactions with the profession. Secondly, teachers' sense of innovation needs to be cultivated. Teachers should be encouraged to innovate, and new inventions and theories should be supported. The practical and innovative concepts of the subject should be given a certain degree of inclination, increase the investment in research funds, to ensure that teachers can have sufficient

funds to verify their innovative theories. In the performance appraisal, it is required to have certain innovative achievements to promote teachers to establish a sense of innovation and achieve benign development. Finally, it is to build a scientific and reasonable incentive mechanism to enhance teachers' sense of achievement. Scientific incentive mechanism can make vocational college teachers more focused on their own work, when they are fully committed to their work, creativity will be greatly increased, thus strengthening the sense of identity of their own ability, therefore, building a reasonable incentive mechanism is particularly important.

Conclusions

The improvement of teacher competence in vocational colleges is afundamental guarantee of the quality of vocational education. Teacher competence in vocational colleges and universities includes the knowledge accomplishment, teaching ability, vocational skills, and personal traits of serving vocational teachers. In terms of theoretical research, teacher competence impact research is in the field of education research has been more mature, this study through the review of competence theory, based on the Guangxi region, double-qualified teacher qualification standards and the identification of related issues to clarify the definition of double-qualified teachers, the construction of the teacher competence standards, the use of a combination of quantitative and qualitative research methodology, to study the extent to which they affect the teacher competence. In terms of practical research, teacher competence research is of great practical significance in improving teachers' educational and teaching ability and quality. The level of their quality directly affects the quality of education and the growth and development of students, and provides reference information for the development of a more effective teacher training model that suits the needs of different types of teachers and promotes their professional development. It can improve teachers' knowledge, abilities, and skills as well as personal qualities, thus ultimately improving the quality of education.

Overall, this study helps to explore the connotation and composition of teacher competence in depth, which is conducive to guiding the professional development of teachers in vocational colleges and universities. As a next step, the teacher professional development theory, adult learning theory, creativity theory and self-determination theory can be applied to explore the model of the influence of different dimensions of the dual teacher training model on the level of teacher competence, especially the mediating role of innovative thinking and perseverance in the

level of teacher competence, using the dual teacher training model as the extrinsic motivation and the innovative thinking and perseverance of the teachers as the intrinsic motivation. The findings seek to enrich the theoretical system of teacher competence, further explore the understanding of existing research on the role mechanism of double-qualified training model in the influence of teacher competence, and provide new perspectives and methods for vocational education research. It is conducive to providing theoretical references and policy guidance for teachers, colleges, and education authorities in the construction of the teaching force.

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Conflict of Interest

Conflict of Interest The authors declare no conflict of interest.

REFERENCES

Danielson, C. (2007). *Enhancing professional practice: A framework for teaching*. AsCD.

Dong, G. L., Tang, L. W., & Zhou, M. X. (2005). A new interpretation of the connotation of "double qualified" teachers in vocational colleges. *Journal of Tianjin Engineering Normal University*, *02*(02), 51–53.

He, W. J. (2008). Interpretation of the concept of "double qualified" vocational teachers (Part 1). *Journal of Jiangsu Normal University of Technology (Vocational Education Communication)*, *07*, 48–51.

Hol, D., & Aktas, S. (2013). An evaluation of competence perceptions of non-native English instructors. *Procedia-Social and Behavioral Sciences*, *70*, 1163–1173.

Huang, B., & Mao, Q. S. (2006). A Preliminary Study on the Standard System of "Double Qualification" Teachers. *Education and Occupation*, *30*, 41–42.

Kelchtermans, G., & Vandenberghe, R. (1994). Teachers' professional development: A biographical perspective. *Journal of Curriculum Studies*, *26*(1), 45–62.

Liu, Z. C., & Jin, B. J. (2017). A Study on the Identification Criteria of "Double Qualified" Teachers in Local Undergraduate Education and Vocational Colleges—From the Perspective of Students' Needs. *Vocational and Technical Education*, *38*(10), 65–68.

Liu, Z. Z. (2008). An Analysis of the Connotative Dimension and Quality Structure of "Double Qualified" Teachers. *Contemporary Education Forum (Principal Education Research)*, *08*, 101–102.

Luo, Q. L., Qin, F. L., Wu, B., Zhang, X. L., Li, M., Wu, L. Y., & Wei, J. Y. (2022). *Research on the Identification of Double-qualified Teachers in Vocational Education*. Beijing: Science Press.

Medley, D. M., & Crook, P. R. (1980). Research in teacher competence and teaching tasks. *Theory into Practice*, *19*(4), 294–301.

MOE of PRC. (2022). *Report on the Development of Vocational Education in China*. Ministry of Education of the People's Republic of China. http:// http://www.moe.gov.cn/.13,23-25

Mutiara, D. (2022). Teacher Competence In Industrial Revolution Era 4.0. *The Social Perspective Journal*, *1*(4), 259–266.

Olson, C. O., & Wyett, J. L. (2000). Teachers need affective competencies. *Education*, *120*(4), 741–741.

Qiang, G. F., & Cha, Z. H. (2010). On the identification, training and evaluation of "double qualified" teachers in higher vocational colleges. In *Education and occupation* (CNKI; Issue 33, pp. 53–55).

Qu, G. T. (1998). The "double qualified" teacher team focuses on the construction. *Education and Occupation*, *06*, 24–26.

Shinkfield, A. J., & Stufflebeam, D. L. (2012). *Teacher evaluation: Guide to effective practice* (Vol. 41). Springer Science & Business Media. https://files.eric.ed.gov/fulltext/ED435632.pdf

Skvortsova, S., & Vtornikova, Y. (2013). Teacher professional competence: Concept content and structure. *Science and Education a New Dimension: Pedagogy and Psychology*, *3*, 26–31.

Sun, F. M., Jiang, H. J., & Sun, J. H. (1995). Strive to build a "double qualified" teacher team. In *Mechanical vocational education* (CNKI; Issue 11, pp. 15–16).

Tigelaar, D. E., Dolmans, D. H., Wolfhagen, I. H., & Van Der Vleuten, C. P. (2004). The development and validation of a framework for teaching competencies in higher education. *Higher Education*, *48*, 253–268.

Wang, C. (2017). A Study on the Competence of Teachers in Application-oriented Undergraduate Colleges and Universities under the Multi-academic View. *Educational Review*, *01*, 48–51.

Wang, X. C. (1998). Implement the "double certificate" system to cultivate "integrated" vocational teachers. *Research on Higher Engineering Education*, *02*, 21–24.

Xiong, S. P., & He, Q. Z. (2016). Investigation and Thinking on the Teaching Competence of Young Teachers in Colleges and Universities. *Educational Research*, *37*(11), 126–132.

Xu, J. P. (2004). *Research on teacher competence model and evaluation* [Doctoral Thesis]. Beijing Normal University.

Xu, M. X. (2010). University performance management strategy based on teachers' competence. *Continuing Education Research*, *07*, 123–125.

Zhou, Z. W. (2002). Strive to build a high-quality double-qualified teacher team. *Journal of Taiyuan University*, *02*, 7–8.

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