Assessing Teaching Practices: A Checklist for Observing Theoretical Classes Taught by "Double-Qualified" Teachers in Chinese Higher Vocational Colleges

Shujuan Xu[1], Eng Tek Ong[2]
{1002163823@ucsiuniversity.edu.my, OngET@ucsiuniversity.edu.my}

[1,2] Department of Education, UCSI University, 56000 Kuala Lumpur, Malaysia

Abstract. The National Implementation Plan for Vocational Education Reform defines "double-qualified" teachers as those who can teach both theory and practice. However, there is a scarcity of comprehensive classroom observation checklists for assessing such teachers in Chinese higher vocational colleges. This study aimed to develop an encompassing observation checklist for evaluating the teaching of theoretical classes. The literature search identified 28 references published between 2000 and 2022, covering various aspects of classroom observation, teaching quality assessment, teacher evaluation, evaluation of classroom teaching, evaluation index systems for teachers, and effective classroom observation practices. Items appearing at least three times were retained, and items with low frequency, duplication, or that could not be observed well were removed. The resulting checklist contains 70 items, divided into eight dimensions: teaching objectives and content, teaching methods and approaches, use of teaching resources, use of IT-supported teaching media, classroom organization and management, teaching expression, teaching communication and interaction, and stimulation of learning motivation. This observation checklist can be used to evaluate "double-qualified" teaching in higher vocational colleges, providing an encompassing and accurate assessment of classroom performance. The checklist addresses shortcomings of existing observation checklists and can ultimately contribute to high-quality teaching in these institutions.

Keywords: Classroom observation, Higher vocational colleges, “Double-qualified” teachers, Checklist

1 Introduction

In recent years, the reform of China's vocational education has continued to advance, and cultivating "double-qualified" teachers [DQTs] has become a key direction of vocational education reform. Teachers in higher vocational colleges are the first resource for developing vocational education and the critical force to support the national vocational education reform in the new era. Building a high-quality "double-qualified" teacher team is a fundamental task to accelerate the modernization of vocational education[1]. The National Implementation Plan for Vocational Education Reform defines "double-qualified" teachers as teachers who have both theoretical and practical teaching abilities[2]. Therefore, the teaching evaluation of such teachers is particularly important. Firstly, it helps to determine whether the effect of classroom teaching meets expectations[3]. Secondly, it can help higher education institutions to optimize their curriculum and teachers to improve their teaching methods. However, assessing the

ICONESS 2023, July 22-23, Purwokerto, Indonesia

DOI 10.4108/eai.22-7-2023.2334982

comprehensive teaching ability of "double-qualified" teachers, especially the teaching ability of theoretical courses, has become a challenging and hot issue in higher education and higher vocational colleges' teaching management and research.

Classroom observation has become one of the effective methods to assess and measure the quality of teaching[4][5]. It can evaluate several aspects of teachers' instructional design, teaching methods, instructional expression, communication and interaction, and information technology teaching skills by directly observing teachers' and students' behaviors and interactions in the classroom[6][7]. Classroom observation can provide formative feedback to teachers and prompt them to take measures such as changing teaching behaviors or strategies to improve the quality of classroom teaching[8][9]. Classroom observation requires a scientific and reasonable observation checklist as an evaluation tool to ensure the observation's objectivity, systematization, and comprehensiveness. However, in Chinese higher vocational colleges, there is a lack of adequate classroom observation checklists for "double-qualified" teachers' theoretical teaching, and most of the existing classroom observation checklists are designed for public primary and secondary schools or university classrooms, which lack relevance and applicability.

This study aims to develop a checklist for observing theoretical classes taught by "double-qualified" teachers (OTCDQTs) in higher vocational colleges. This checklist can be used to assess the quality of theoretical classes taught by "double-qualified" teachers. The checklist for OTCDQTs can be used to systematically record and analyze critical elements of the teaching process, such as the teacher's teaching skills and the practical application of the content. This study adopts a combination of literature analysis and expert consultation methods to extract the main factors affecting the teaching quality of theoretical classes by sorting out and summarizing the relevant domestic and foreign literature and then filtering and revising them through the expert consultation method. The checklist contained 70 items and divided into eight dimensions was formed. These dimensions are: teaching objectives and content, teaching methods and approaches, teaching resources utilization, use of IT-supported teaching media, classroom organization, and management, teaching expression, teaching communication and interaction, and motivation for learning. This observation checklist can be used to evaluate the theoretical class teaching of "double-qualified" teachers in higher vocational colleges and comprehensively and accurately assess classroom performance.

This study has the following contributions and implications: We chose to develop a classroom observation checklist because it can help us to systematically record and evaluate the quality of theoretical classes taught by "double-qualified" teachers in higher vocational colleges. In addition, the classroom observation checklist can be used as an effective tool to improve the quality of teachers' teaching because it can help teachers to identify problems and deficiencies in their teaching. By using this checklist, we can better understand the quality of teachers' teaching and provide appropriate training and support to address the problems in teaching. At the same time, the classroom observation checklist can also provide students with a higher quality education because, through the feedback from the observation checklist, teachers can identify the strengths and weaknesses in their teaching, adjust and improve their teaching strategies and methods, and thus improve the effectiveness and quality of their teaching.

2 Literature Review

2.1 Characteristics of classroom performance of "double-qualified" teachers (DQTs)

"Double-qualified" teachers are a typical localized concept formed after the development of Chinese higher education to a particular stage[10], and they have not only the professional qualifications required by teachers in public universities but also the essential quality required

by practitioners in related industries[11]. The "double-qualified" teachers not only have professional theoretical knowledge and practical skills but also can design and implement practical teaching activities close to the workplace and cultivate students' vocational skills and professionalism by considering the actual situation of the industry and enterprises[12]. They also have good information literacy[6][13] and are not only able to use a variety of teaching methods and means, such as case studies, project teaching, work tasks, and simulation exercises, to stimulate students' learning interest and initiative, and guide them to investigate problems and solve them[14], but also to adopt modular, hierarchical, and personalized teaching organization according to the characteristics of different majors and courses to achieve flexible adjustment of teaching contents and effective management of teaching process[15].

2.2 Methods of classroom observation

Classroom observation is an essential educational research method with characteristics and classifications. First of all, a classroom observation is a professional practice, and classroom observation is an organized, prepared, and procedural professional activity, as well as a collaborative professional practice, which makes classroom observation an essential form of traditional "listening and evaluation"[16]. The primary purpose of classroom observation research is not to directly change teachers' behavior but rather to understand and theorize about the observed behavior[17]. When performed skillfully, classroom observations benefit both the observer and the observed and can help both parties understand and improve their professional skills[18]. Classroom observation, as a method of recording events that occur in the classroom, can traditionally be divided into quantitative and qualitative methods[4]. Quantitative classroom observations require the careful formulation of the purpose of the observation, the categories of behaviors to be observed, and the method of assigning instances of behaviors to categories before data collection begins, and there are various techniques for recording observations, but all involve some predetermined, standardized observation form, which is also known as structured or systematic observation[19]. There are three main styles of recording quantitative observations: a coding system, a notation system or item list, and a hierarchical scale, where the notation system or item list is a pre-listed list of behaviors that need to be observed and may occur, and the observer makes a notation each time it occurs, which serves to verify that the behavior to be observed has occurred. The notation system is more straightforward and is also known as a verification list, item list, or enumeration method, and it is relatively straightforward and easy to use and analyze[20]. For example, in 1994, E.C. Wragg designed an observation form for observing how teachers manage student behavior, known as the Tally System or Checklist. Suppose behaviors are clearly defined operationally and do not intersect with each other. In that case, it is easy to train observers to use the checklist and more accessible and more economical to process and analyze the information.

3 Methods

3.1 Development of a OTCDQTs Checklist

Search strategy. Predetermined selection criteria were used to ensure transparency and avoid subjectivity[21]. To improve the representativeness of the sample and to be able to cover a range of journals, these selection criteria were also used for the search of electronic databases[22]. A systematic literature review data collection process was used to conduct a comprehensive search of published literature on titles or topics such as classroom observation, classroom observation scales (checklists or protocols), teaching quality evaluation indicators, evaluation of "double-qualified" teachers' teaching competencies, teachers' classroom performance, and teacher evaluation index systems. The literature search was conducted in China Knowledge Network[CNKI] and Google Scholar. A broad period was used to improve

the quality of the retrieved literature. The keywords "classroom observation," or "classroom teaching evaluation," or "teaching quality evaluation" were used to search in CNKI and to filter out dissertations and academic journals that fit the above topics. The papers in these academic journals are included in CSSCI, CSCD, and Peking University Chinese Core Journals[PKU]. In addition, Publish or Perish software[23] was used, the data source was set to Google Scholar, and the title "classroom observation scale," or "classroom observation checklist," or "classroom observation protocol," or "observation of classroom" or "observation of classroom performance", and set the search to select the top 50 cited documents in the search results. A total of 733 documents were included after the search, and 606 documents were excluded based on the relevance of abstract reviews and book reviews, leaving 127 remaining, which in turn excluded another 99 based on the full-text relevance analysis, leaving 28 eligible. Figure 1 shows the results of the different stages of literature selection.

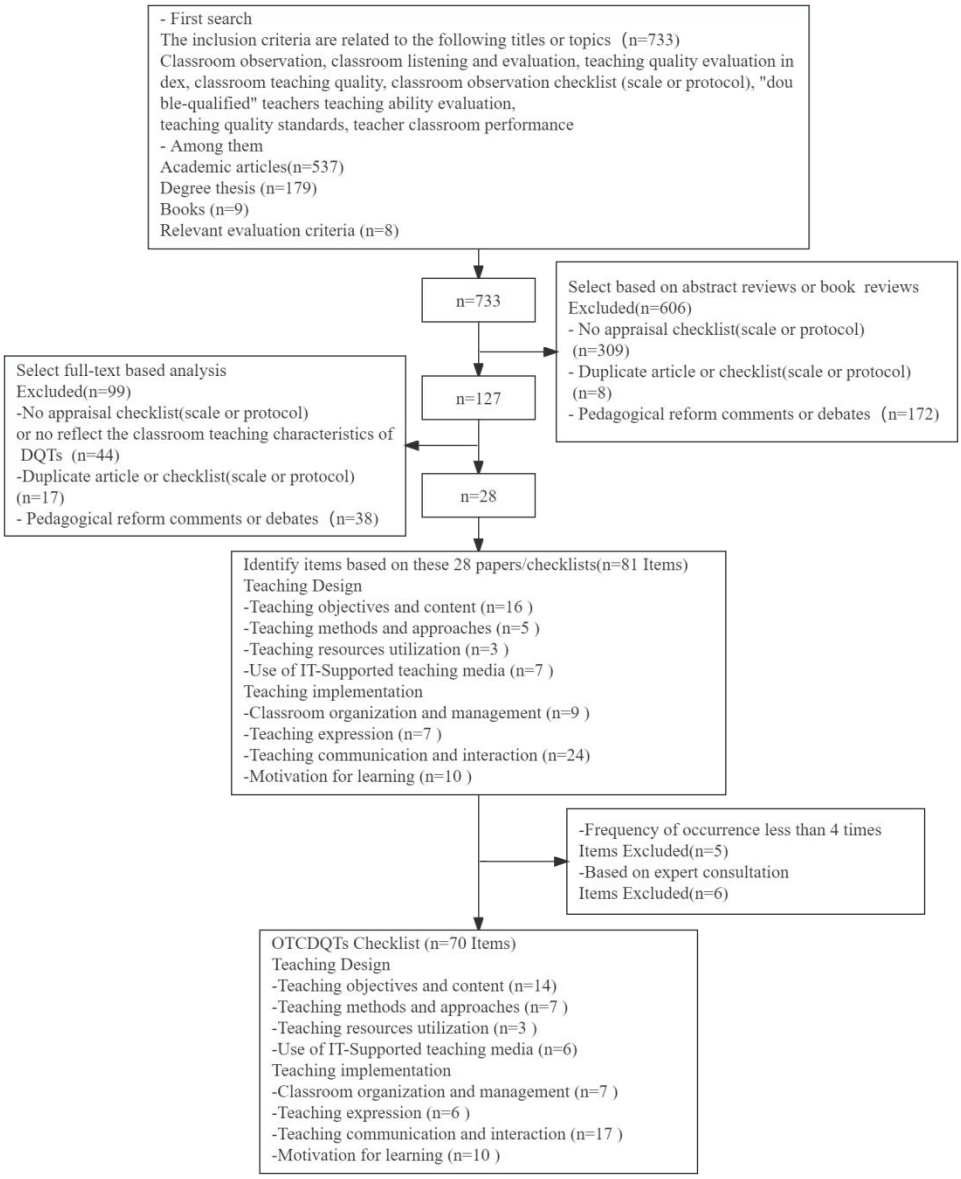

Figure 1 Development of the OTCDQTs Checklist

Data extraction. All observations of teachers' classroom teaching were extracted from each included publication about the classroom performance characteristics of "double-qualified" teachers. The 80 items from the classroom observation checklist from 28 publications were compiled into a comprehensive list. In the comprehensive list, we recorded the frequency of occurrence of each observation item, and those that occurred less than four times were removed to create a draft observation checklist. Figure 1 shows the development

process. The most common items in the checklist were related to introducing teaching objectives and content, using modern educational technology, classroom time management, respecting and encouraging students, and teaching with case studies. We divided all observed items into two domains: (i) instructional design and (ii) instructional implementation (see Tables 2-3). Within each domain, we simplified all relevant items by removing duplicates and those items that were ambiguous and not well observed in the classroom and rewording the remaining observation items for clarity when necessary.

*Observation checklist draft validation.*The number of experts needed to help validate your draft observation checklist can vary depending on the specific goals and requirements of your study. However, according to the guidelines provided by the American Educational Research Association (AERA), it is recommended to involve at least three experts in the validation process[24]. Meanwhile, Creswell and Plano Clark recommend using three to five experts to validate a draft checklist[25]. This is because having multiple experts provides a diversity of perspectives and increases the likelihood of identifying potential flaws in the checklist. On page 230 of "Research design: qualitative, quantitative, and mixed methods approaches", Creswell and Creswell stated that "Using three to five experts in the field is often sufficient for validating a preliminary checklist or coding scheme[26]." In addition to the number of experts, it is important to consider the expertise and qualifications of the individuals involved in the validation process. Experts should have knowledge and experience in the relevant subject area and be familiar with the specific methods and techniques used in the validation process. Therefore, when selecting experts for this study, consider contacting individuals who have published research on similar topics or who have expertise in the areas of classroom observation and teacher evaluation. Those with experience in the development and validation of assessment tools and checklists were also considered. Six experts who met the above eligibility requirements were invited to validate the draft observation checklist for this study. Determining the percentage agreement among experts is important in ensuring the reliability of the observation checklist. According to Krippendorff[27], the percentage agreement is calculated by dividing the number of agreements by the total number of judgments made by the experts. The result is then multiplied by 100 to get the percentage agreement. The percentage agreement required before an item in the checklist is retained may vary depending on the specific study and the nature of the checklist. However, Landis and Koch suggest that a minimum percentage agreement of 70% is required for the checklist to be considered reliable[28].

Two items in the draft observation checklist were moved based on expert consensus recommendations for the dimension to which they belonged, while four items with less than 70% expert consensus percentages were removed (see Table 1). Ultimately, the OTCDQTs checklist consisted of 70 observation items in eight dimensions(see Appendix A). The checklist is used in practice where the observer needs to fill in the basic information on the first page of the checklist and follow the observation instructions below for classroom observation. A yes/no option is set after each item to indicate whether the item is eligible or not. Depending on the teacher's specific classroom behavior, the classroom observation items listed in the checklist are checked (√), and comments or suggestions can be indicated in the comments field. For example, for the first item, "The teacher introduced the content summary/objectives of the course," if the observer finds that the item meets the criteria, he/she should put a tick in the "Yes" column; if he/she finds that the item does not meet the criteria, he/she should put a tick in the If the observer finds that the item meets the conditions, he/she will put a tick in the column of "No," and can write a similar statement such as "The content

summary/objectives of this course are not introduced" in the comment column. At the end of the observation, the observer signs the end page of the checklist.

Table 1 Item processing post expert consultation

Item	Expert post-consultation treatment
Teachers were able to incorporate practical industry experience into their teaching, and were able to teach by example	The dimension to which this item belongs has moved from teaching objectives and content to teaching methods and approaches
Used relevant examples to explain major ideas	The dimension to which this item belongs has moved from teaching objectives and content to teaching methods and approaches
Moved easily about room during presentation	Delete from draft checklist
Requested very difficult, time consuming, or irrelevant questions be addressed at a later time	Delete from draft checklist
Greeted students at the beginning of class	Delete from draft checklist
Used humor and/or anecdotes appropriately	Delete from draft checklist

3.2 OTCDQTs Checklist Contents

Evaluation of teaching is an essential element of educational research, and different researchers have proposed different evaluation criteria and models, several of which are compared and analyzed in this study. Cohen and McKeachie identified ten criteria for effective teaching[29] and concluded that fellow teachers are best qualified to evaluate these criteria, including: mastery of course content, selection of course content, organization of the course, the appropriateness of course objectives, instructional materials, assessment instruments and methods used to teach specific content areas, commitment to teaching and attention to student learning, student achievement, and support for departmental teaching efforts. Cohen and McKeachie's criteria emphasize teachers' mastery and selection of all aspects of the curriculum, but neglect teachers' teaching methods, interactions, and collaboration. Keig and Waggoner listed five categories[30] for collaborative review of teachers' quality of teaching: goals, content, and organization of course design; methods and materials of instruction; evaluation of student work; teachers' grading methods; and teachers' adherence to ethical standards. These categories cover the competencies required of teachers before, during, and after the classroom but do not take into account differences among teachers in different areas or levels. Feldman's top ratings of teachers included: subject matter knowledge; enthusiasm; sensitivity to the level and pace of class knowledge; classroom preparation and organization, and clarity[31]. These ratings are based primarily on student ratings of teachers and reflect student satisfaction with teacher performance, but may be influenced by subjective student factors or other variables. The evaluation of the core teaching ability of "double-qualified" teachers in higher vocational colleges can be carried out by classroom teaching observation method, and there are two categories of teaching design ability and teaching organization (implementation) ability, including 11 dimensions: selection of teaching materials and organization of teaching contents; planning of teaching process; selection of teaching methods and approaches; selection of teaching media and production of courseware; board design; classroom organization and coordination; teaching expression; teaching interaction and cooperation; motivation of learning; teaching monitoring; and

teaching implementation effect[14]. These dimensions reflect the requirements of professional knowledge, skills and education of "double-qualified" teachers, but do not cover the evaluation of professional ethics of "double-qualified" teachers. The evaluation model (DECPOIR Model) of teaching ability of "double-qualified" teachers in vocational education covers the main dimensions of comprehensive teaching ability that "double-qualified" teachers in vocational education should have in the information age, including the evaluation of course teaching, including teaching design, teaching implementation and teaching evaluation, which includes ten dimensions: teaching objectives, teaching activities, teaching resources, teaching environment, teaching evaluation, organization of teaching activities, maintenance of teaching order, self-evaluation of curriculum, self-evaluation of teachers' teaching, and evaluation of students' learning[6]. The model considers the professional knowledge and skills of "double-qualified" teachers and the self-reflection and moral responsibility of "double-qualified" teachers and is a more comprehensive and scientific evaluation model. In the process of identifying classroom observation domains, there are essential types of behaviors that cannot be directly observed in the classroom, for example, fairness, evaluation methods, teacher ethics, and professionalism[32]. These behaviors need to be evaluated by reviewing relevant course materials and student performance, which were not included in the classroom observation checklist of this study. The two domains and eight dimensions of the OTCDQTs checklist were constructed by combining the above criteria and the classroom performance characteristics of "double-qualified" teachers (see Tables 2-3).

Table 2 Items included in the 28 published papers: Teaching Design

Items	References																													
	[4]	[6]	[8]	[9]	[10]	[11]	[14]	[16]	[20]	[33]	[34]	[35]	[37]	[38]	[39]	[41]	[46]	[51]	[52]	[53]	[54]	[55]	[56]	[57]	[58]	[59]	[60]	[61]		
Domain I：Teaching Design																														
Dimension A. Teaching Objectives and Content																														
Presented overview of class content/objectives	●	●	●					●	●		●	●		●	●	●	●	●		●			●				●			
Clear course structure with clear learning objectives and pathways for students										●				●	●			●		●							●			
Teaching objectives focused on advanced cognitive skills (explanation/solution/transfer/synthesis/evaluation)								●		●					●				●	●					●		●		●	●
Teachers continue to learn and follow up on new technologies and knowledge in the industry, and update teaching contents		●			●	●															●									
Teachers had a clear understanding of professional ethics, professional norms, and professional responsibilities, and were able to infuse these concepts into their teaching to enhance students' professionalism		●			●	●									●						●									
Presented the key concepts of this teaching content, the important and difficult content		●	●						●		●	●			●	●	●		●	●			●				●			
Presented the content in an organized and logical manner								●	●			●	●				●		●											
Demonstrated accurate knowledge of content								●							●		●	●	●	●			●	●	●					
Teaching content was systematic								●		●					●		●	●		●					●					

Highly relevant teaching content								●		●					●		●	●		●						●		
The teaching content had practical value		●								●					●		●	●		●	●				●	●	●	
The curriculum content had appropriate distribution between theory and practice					●					●								●		●	●				●		●	
Used alternative explanations when necessary									●								●	●									●	
Covered class content / objectives	●						●	●	●	●		●	●		●		●	●		●				●				
Dimension B. Teaching methods and approaches																												
Used case method or situational simulation teaching									●	●		●		●			●		●	●	●					●		
Used small-group discussion				●							●		●	●			●		●	●						●		
Lecture				●				●						●		●	●											
Project-based teaching		●		●		●	●			●											●							
Teachers were able to incorporate practical industry experience into their teaching, and were able to teach by example		●			●	●				●					●						●							
Used relevant examples to explain major ideas		●					●		●	●					●	●	●	●		●							●	●
The design of the board book was concise, beautiful and closely related to the teaching content				●			●	●			●			●				●		●								●
Dimension C. Teaching resources utilization																												
Provided rich and clear materials related to the content of the lecture		●						●	●	●		●		●	●		●		●	●	●	●			●			
Used video, audio, models and other tools to demonstrate course content and effectively help students understand concepts										●	●	●		●	●			●		●	●	●			●		●	
Used textbooks, cases, examples, and other relevant resources to help students better understand and apply what they have learned		●						●		●	●			●	●						●							

Dimension D. Use of IT-Supported teaching media													
Media that can present declarative content using modern educational technology, such as PPT, Word, TV, projector, etc.	●	●	●	●	●	●	●	●	●	●	●	●	●
Media that can achieve interactive functions using modern educational technology, such as: online libraries, online resources, etc.	●		●	●				●		●	●		●
Media that enable communication functions using modern educational technology, such as forums, online meetings, etc.	●		●	●				●		●	●		●
Media capable of variable functions using modern educational technology, such as: laboratories, field trips, simulation programs, etc.	●		●	●	●			●		●	●		●
The media that can realize the function of writings using modern educational technology, such as: writing essays on the computer, programming, making animations, making models, etc.	●		●	●				●		●	●		●
Media debugging, teachers debug the media of information technology support in classroom teaching, such as: teachers switch the lecture content, connect the line, switch the projection equipment, etc.	●	●	●	●		●		●		●	●	●	●

●, the checklist included the item

Table 3 Items included in the 28 published papers: Teaching Implementation

Items	References																												
	[4]	[6]	[8]	[9]	[10]	[11]	[14]	[16]	[20]	[33]	[34]	[35]	[37]	[38]	[39]	[41]	[46]	[51]	[52]	[53]	[54]	[55]	[56]	[57]	[58]	[59]	[60]	[61]
Domain II. Teaching Implementation																													
Dimension E. Classroom organization and management																													
Started and ended class on time	●		●											●			●			●									
Organized students into learning effectively		●	●				●							●	●	●	●			●	●				●				
Strong classroom time management awareness and made efficient use of class time	●		●				●		●				●	●	●	●	●			●	●			●	●				
The teacher's instructions were clear and effective, and students maintained good classroom discipline									●			●		●				●		●		●							●
Actions that the teacher instructed and gave instructions to students to do, such as the teacher said: please sit, please stand up, please come to the front for the presentation, please say something, the discussion begins, the experiment ends; the teacher instructed the students when the students could not answer the questions or the group discussion students encountered problems, etc.								●		●				●	●	●				●		●							●
Effectively coordinated the handling of incidental events in the classroom	●	●					●	●	●					●	●		●			●	●		●						
Adjusted teaching strategies in response to new ideas generated occasionally in teaching	●	●					●	●	●					●	●		●			●			●						

Dimension F. Teaching expression																												
Varied pace appropriately	●						●	●	●				●				●			●							●	
Explain in a clear and standard language							●	●	●								●			●							●	
Varied modulation							●	●	●								●			●							●	
Varied tone							●	●									●			●							●	
Spoke with adequate volume							●	●									●			●							●	
Used speech fillers (um, ok, ah) rarely							●	●									●			●							●	
Dimension G. Teaching communication and interaction																												
Demonstrated confidence							●		●	●		●		●	●		●			●								
Demonstrated enthusiasm							●		●	●		●		●	●		●			●								
Established and maintained eye contact									●					●			●			●								
Maintained students’ attention	●						●		●			●		●			●			●								
Restated students’ questions or comments as necessary				●				●	●	●						●	●			●								
Teachers asked exploratory questions to help students to understand important concepts										●					●			●	●	●					●		●	
Guiding students to reflect on what they have learned		●	●				●			●		●		●	●							●	●		●	●		
Listened carefully to students’ questions				●				●			●			●		●	●			●					●		●	●
Responded appropriately to students’ puzzlement or boredom				●					●								●			●					●			●
Answered questions appropriately				●				●			●			●		●	●			●					●			
Engagement Techniques...																												
Teachers promote students to pay attention and think about the problem by asking questions								●		●	●	●			●	●	●	●	●						●			●
Discussion				●				●					●	●		●	●						●			●		

Small-group activities			●		●		●	●	●	●		●	●		●		●			●		
Student individual/panel presentations					●		●	●	●			●	●		●		●			●		
Active learning (e.g., think-pair-share)					●		●	●	●			●	●		●		●			●		
Role playing					●		●			●			●		●		●					
Demonstrations/skits					●					●			●		●		●					
Dimension H. Motivation for learning																						
Active participation of students was encouraged and valued					●	●	●			●	●			●	●		●		●			●
Encouraged students to answer difficult questions by providing cues or rephrasing					●		●	●		●	●		●		●		●			●	●	
Engaged students in solution-finding activities and comprehensive solution elaboration					●		●			●	●			●		●	●		●	●	●	
Encouraged students to judge or evaluate situations, problems, or issues		●		●						●	●			●			●		●	●	●	
Encouraged student synthesis or summary of information within or across disciplines					●		●				●			●			●		●	●	●	
Students were encouraged to generate conjectures, alternative solution strategies, and ways of interpreting evidence					●					●	●								●		●	●
Encouraged students' questions								●		●	●	●	●						●	●	●	
Asked probing questions								●		●			●	●								●
Demonstrated respect for students and their ideas/assertions	●					●	●			●	●	●	●		●		●		●	●	●	●
Combined with the actual students flexible use of effective ways and strategies to motivate students				●	●	●	●			●	●	●	●	●	●			●		●		●

●, the checklist included the item

Domain I: Teaching Design

(i) Teaching Objectives and Content

Teaching objectives and contents are an essential dimension of the classroom teaching observation form for "double-qualified" teachers in higher vocational colleges, which reflects the teachers' ability and level in planning, organizing, teaching, and evaluating teaching content. The teaching objectives of higher vocational colleges can be based on the three-dimensional objectives of primary education, i.e., knowledge and skills, process and methods, and emotional and attitudinal values, because these objectives are comprehensive and operable. The teaching content should be organized with relevance, foresight, systematization, and moderate depth and breadth, combined with the regional socio-economic development, the needs of the industry and enterprises, and the actuality of students and teachers, and the teaching materials and knowledge with high applicability and operability should be selected to keep up with the update of knowledge and technology in the field of this specialty, logic, and systematization[14]. For example, during the teaching process, introduce this course's content outline/teaching objectives so that students have an overall understanding and expectation. Divide the course content into sections or phases, each with clear learning objectives and tasks, and demonstrate the framework and logical relationships of the course so that students are clear about what they are going to learn, how they are going to learn it, and why they are going to learn it. Set appropriate instructional objectives to develop advanced cognitive skills, such as explanation, solution, transfer, synthesis, and evaluation, so that students can apply their knowledge to solve problems and improve their creative and critical thinking skills. Highlight and emphasize key concepts, priorities, and difficulties so that students can grasp the main content, clarify the knowledge structure, and eliminate doubts and confusion. Explains teaching content in a sequential and logical relationship so that students follow the ideas, understand connotations, and extensions, and grasp connections and distinctions. Express and explain the teaching content accurately, avoiding errors or ambiguities, so students receive the correct and precise information and increase trust and respect. Linking and integrating this teaching content with related knowledge points so that students see the position and role of the teaching content in the curriculum system and establish a systematic and complete knowledge structure; selecting and arranging suitable teaching content that meets the teaching objectives and students' level[33]. In terms of teacher quality, "double-qualified" teachers continue to learn and follow up on new technologies and knowledge in the industry, update teaching contents promptly, establish correct professional concepts and values, comply with professional ethics, norms, responsibilities, and other requirements, and guide and cultivate the professionalism of students.

(ii) Teaching Methods and Approaches

The theoretical teaching classroom of "double-qualified" teachers in higher vocational colleges should adopt flexible teaching methods and approaches to improve student's learning effect and ability. For example, students are asked to simulate actual work or life problems or situations and conduct activities such as analysis, discussion, and solutions to link theoretical knowledge to practical problems and improve application and innovation skills. Use practical experience in the industry to combine theory and practice, provide cases and demonstrations, and inspire students to generalize from one case to other situations to develop problem identification, analysis, and solution skills. Students are allowed to communicate, interact, collaborate, and share in groups to understand and master knowledge from multiple perspectives and levels and to improve communication and teamwork skills[34]. Teachers impart fundamental knowledge, principles, and laws to students through lectures so that they can obtain the necessary information and guidance to improve their cognitive abilities and

understanding[35]. Students are allowed to use the project as a vehicle for inquiry, design, implementation, and evaluation activities to identify problems, solve them, and create value in practice to improve their general and practical skills[15]. In addition, teachers can refer to a professional development program[36] to design and implement science teaching activities using the STEM-based 5E inquiry learning model. The project targets Chinese science teachers with the circuit theme. It uses training and coaching to help teachers master and apply the five stages of the model: engage, explore, explain, elaborate, and evaluate. Research has shown that the program can significantly improve teachers' understanding and use of the STEM-based 5E inquiry learning model and enhance teachers' content knowledge, instructional skills, and classroom management.

(iii) Teaching Resources Utilization

The utilization of teaching resources reflects the ability and level of "double-qualified" teachers in selecting and using teaching resources. It is an essential dimension in the classroom teaching observation of "double-qualified" teachers in higher vocational colleges, including three observation items: providing relevant materials, using various tools to present course content, and using relevant resources to help students understand and apply what they have learned[37]-[39]. When explaining, teachers should provide rich and precise information, such as literature, data, charts, and pictures, according to the teaching content and objectives to enable students to obtain information from multiple channels and perspectives, thus increasing the depth and breadth of learning. Also, teachers should use tools such as video, audio, and models to present course content intuitively, visually, and vividly to help students understand abstract or complex concepts more efficiently and improve the efficiency and quality of learning. In addition, teachers should also use teaching materials, cases, examples, and other relevant resources according to the teaching content and objectives to present knowledge in a concrete, practical and exciting way to help students better understand and apply what they have learned, thus increasing their interest and motivation to learn. These three aspects of teaching resource utilization are interrelated and can work synergistically to improve teaching effectiveness.

(iv) Use of IT-Supported Teaching Media

The information literacy of vocational education teachers focuses on teaching activities in vocational education courses[6]. The Digital Campus Specification for Vocational Institutions issued by the Ministry of Education proposes to provide advanced information technology tools and resources for "double-qualified" teachers to enhance their IT application and innovation capabilities[40]. The utilization of teaching media is one of the essential dimensions of classroom teaching for "double-qualified" teachers, which includes five different types of media: presentational, interactive, communicative, variable, and authoritative media[41]. Presentational media, such as PPT, Word, TV, projector, etc., can present what the teacher wants to convey; interactive media, such as an online library or online resources, etc. can engage students in interaction and improve learning; communication media, such as a forum, online meeting, etc. can help students to communicate and exchange; variable media such as lab, field trip, simulation program, etc. can allow students to participate personally and improve their practical skills; writings media such as writing essays, programming, making animation, modeling, etc. on a computer can help students to show their creativity and talents. In addition, teachers need to be proficient in debugging media supported by information technology to ensure the smooth implementation of classroom teaching. Teachers should flexibly use various teaching media according to specific teaching objectives and contents to improve the depth and breadth of students' learning and enhance teaching effectiveness.

DomainII: Teaching Implementation

(i) Classroom Organization and Management

Classroom organization and management ability is an essential ability that "double-qualified" teachers should have in the classroom teaching of higher vocational colleges. Teachers' classroom organization and management skills directly impact the effectiveness of classroom instruction and the quality of student learning. By clearly communicating expectations to students in various forms, teachers can promote positive behaviors that can contribute to classroom management and discipline[42]. Students in higher vocational colleges are highly autonomous and have different subject backgrounds. In classroom teaching, "double-qualified" teachers must have specific organizational and management skills to promote students' enthusiasm and participation to improve students' learning effect. Specifically, first, teachers should be able to start and end class on time, organize students into learning situations, and make the most of class time. Secondly, teachers should be able to maintain students' classroom discipline in various ways, provide timely guidance to students, and coordinate the handling of unexpected events. Finally, teachers should be able to make timely adjustments and solutions to problems encountered by students. In conclusion, only with good classroom organization and management skills can teachers enable students to truly benefit from classroom teaching and obtain good learning experiences and outcomes [43].

(ii)Teaching Expression

The ability of teaching expression is an essential quality that "double-qualified" teachers in higher vocational colleges must have in classroom teaching. In theory and practice teaching, teachers need to explain knowledge and skills, and good teaching expression can attract students' attention and help them better understand and master the teaching content. This dimension includes several aspects, such as speed of presentation, clarity of diction, infectiousness, loudness of voice, and fluency of language. First, teachers should control the speed of explanation, not too fast or too slow, in order to adapt to students of different levels. Secondly, teachers should pay attention to clear pronunciation and avoid vague or wrong pronunciation, which may affect students' understanding of the teaching content. Again, the teacher should have a certain degree of infectiousness and explain in an emotional and enthusiastic tone in order to stimulate students' interest and enthusiasm. Finally, teachers should use action expressions and other means to increase the class's variation and interest and improve teaching effectiveness. All these aspects are related to the rational approach to teaching language as communication proposed by Widdowson, who argues that teachers should focus on language use rather than just usage and that the content of teaching should be linked to the actual communicative needs of students[44].

(iii) Teaching Communication and Interaction

In order to carry out good teaching, "double-qualified" teachers in higher vocational colleges also need to have good teaching communication and interaction skills. This is not only an essential quality for teachers, but also an important guarantee to improve the effectiveness and quality of classroom teaching. Studies have shown that teachers' positive and effective interaction with students in the classroom can stimulate students' interest in learning, promote students' deeper thinking and understanding, and thus improve learning outcomes and performance[45]. Teaching communication and interaction skills cover a variety of observations of teachers communicating and interacting effectively with students in the classroom. Teachers should demonstrate confidence and enthusiasm, establish and maintain eye contact with students, and maintain their attention. Teachers should also be adept at asking probing questions that help students understand crucial concepts and allow them to reflect on what they have learned. During communication, teachers should respond appropriately to

students' lack of understanding or confusion, restate students' questions or comments when necessary, ask students to state their questions clearly, listen carefully to students' questions, answer questions appropriately, and facilitate students' attention and reflection on the issue. In addition, classroom interaction can take place in a variety of ways, such as discussions, group activities, individual/group student speeches or presentations, active learning (e.g., think-pair-share), and role plays to promote student engagement and communication[37][46]. Teachers should recognize the importance of teaching communication and interaction skills to improve the effectiveness of classroom teaching[45] and continuously optimize teaching methods and techniques to motivate better and engage students' motivation and initiative and promote deeper thinking and understanding. For example, a randomized controlled trial study showed that the Responsive Classroom Approach, an instructional approach based on teacher-student interaction, improved the quality of teacher-student interaction at different levels of implementation, but the higher the level of implementation, the better the results[47]. This illustrates how teacher-student interactions depend not only on the teachers' abilities and attitudes, but are also influenced by the educational system and environment. Therefore, the enhancement of teacher-student interaction needs to be accompanied by improvements in policies and conditions to support the development of teacher-student interaction.

(iv) Motivation for Learning

Motivational strategies for learning are a critical factor in student performance in the classroom and play an essential role in student academic achievement. Students' lives contain learning processes that can take place in both formal and informal contexts. In formal contexts, teachers must not only be able to know and master how to differentiate the types of student motivation but also be able to use learning strategies that match them to improve the quality of teaching and learning[48]. Motivating students to learn is an evaluation of whether the "double-qualified" teacher is good at using the right moment, taking into account the actual situation of students, starting from their needs, using effective methods and strategies to motivate students, inspiring their desire to learn and their interest in learning, and leading them to improve their motivation and initiative in learning. It covers a variety of items in which teachers use various methods and strategies to motivate and engage students in active learning in the classroom, specifically: students' active participation is encouraged and valued, students are encouraged to answer complex questions by providing prompts or changing the formulation of the problem, students are engaged in solution-finding activities and comprehensive solution elaboration, students are encouraged to judge or evaluate situations, problems or issues, the encouraging students to synthesize or summarize information within or across disciplines, encouraging students to generate conjectures, alternative solution strategies, and ways of interpreting evidence, encouraging students to ask questions, being asked probing questions, respecting students and their ideas claims, and using effective approaches and strategies flexibly to motivate students about their realities. All these approaches and strategies reflect teachers' emphasis on educational relevance, i.e., making learning content relevant to students' lives, interests, and cultural contexts, thus increasing motivation[49][50]. Teachers should also use tests as a facilitative rather than threatening tool to enhance students' expectations of future performance, provide specific goals, and encourage independent and meaningful learning[49].

4 Discussion

In this study, an observation checklist for theoretical classroom teaching of "double-qualified" teachers (OTCDQTs checklist) was developed to evaluate the teaching quality of theoretical classes of "double-qualified" teachers in higher vocational colleges. The OTCDQTs checklist contains 70 observation items in the domains of teaching design and

teaching organization (implementation), with high content validity and simple language, which are accessible for the observer to observe, record and evaluate, and for the observed to self-evaluate and reflect. It is also easy for self-evaluation and reflection. As Yao Chen [20] pointed out, observation lists are relatively straightforward and easy to use and analyze. However, this checklist fails to address the observation of "double-qualified" teacher training courses and lacks large-scale empirical testing. Future research plans are to develop this inventory into a teaching observation scale for theoretical classes for "double-qualified" teachers to provide quantitative evaluation data and analysis. The study also plans to develop a teaching observation checklist or scale for practical training classes for "double-qualified" teachers to supplement the checklist in the observation of practical training classes. In addition, modern technology, such as video recording and virtual reality, can be used to combine observation checklists or scales with instructional videos to improve the objectivity and scientific nature of evaluation. These more systematic teaching tools are expected to help teachers improve the quality of teaching, promote student learning outcomes, and facilitate the professional development of "double-qualified" teachers.

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Appendix A

A Checklist for Observing Theoretical Classes Taught by "Double-Qualified" Teachers in Chinese Higher Vocational Colleges

Instructor: _____

Observer:_____

Course/Room No.:_____

Class Topic:_____

Date:_____

PURPOSE: This checklist is designed as an observational tool to evaluate the teaching performance of individual teachers. It is intended to provide diagnostic information for instructional improvement.

DIRECTIONS: Based on the teacher's specific classroom behaviors, check (√) whether the classroom observation items listed in the checklist were observed, and you may indicate comments or suggestions in the comments column.

No.	Items	Whether is it observed		Comments:
		Yes	NO	
I.	Teaching Design			
A.	Teaching Objectives and Content			
1	Presented overview of class content/objectives			
2	Clear course structure with clear learning objectives and pathways for students			
3	Teaching objectives focused on advanced cognitive skills (explanation/solution/transfer/synthesis/evaluation)			
4	Teachers continue to learn and follow up on new technologies and knowledge in the industry, and update teaching contents			
5	Teachers had a clear understanding of professional ethics, professional norms, and professional responsibilities, and were able to infuse these concepts into their teaching to enhance students' professionalism			
6	Presented the key concepts of this teaching content, the important and difficult content			
7	Presented the content in an organized and logical manner			
8	Demonstrated accurate knowledge of content			
9	Teaching content was systematic			
10	Highly relevant teaching content			
11	The teaching content had practical value			
12	The curriculum content had appropriate distribution between theory and practice			
13	Used alternative explanations when necessary			
14	Covered class content / objectives			
B.	Teaching methods and approaches			
15	Used case method or situational simulation teaching			
16	Used small-group discussion			
17	Lecture			
18	Project-based teaching			
19	Teachers were able to incorporate practical industry experience into their teaching, and were able to teach by example			
20	Used relevant examples to explain major ideas			
21	The design of the board book was concise, beautiful and closely related to the teaching content			
C.	Teaching resources utilization			
22	Provided rich and clear materials related to the content of the lecture			
23	Used video, audio, models and other tools to demonstrate course content and effectively help students understand concepts			
24	Used textbooks, cases, examples, and other relevant resources to help students better understand and apply what they have learned			

D.	Use of IT-Supported teaching media			
25	Media that can present declarative content using modern educational technology, such as PPT, Word, TV, projector, etc.			
26	Media that can achieve interactive functions using modern educational technology, such as: online libraries, online resources, etc.			
27	Media that enable communication functions using modern educational technology, such as forums, online meetings, etc.			
28	Media capable of variable functions using modern educational technology, such as: laboratories, field trips, simulation programs, etc.			
29	The media that can realize the function of writings using modern educational technology, such as: writing essays on the computer, programming, making animations, making models, etc.			
30	Media debugging, teachers debug the media of information technology support in classroom teaching, such as: teachers switch the lecture content, connect the line, switch the projection equipment, etc.			
II.	Teaching Implementation			
E.	Classroom organization and management			
31	Started and ended class on time			
32	Organized students into learning effectively			
33	Strong classroom time management awareness and made efficient use of class time			
34	The teacher's instructions were clear and effective, and students maintained good classroom discipline			
35	Actions that the teacher instructed and gave instructions to students to do, such as the teacher said: please sit, please stand up, please come to the front for the presentation, please say something, the discussion begins, the experiment ends; the teacher instructed the students when the students could not answer the questions or the group discussion students encountered problems, etc.			
36	Effectively coordinated the handling of incidental events in the classroom			
37	Adjusted teaching strategies in response to new ideas generated occasionally in teaching			
F.	Teaching expression			
38	Varied pace appropriately			
39	Explain in a clear and standard language			
40	Varied modulation			
41	Varied tone			
42	Spoke with adequate volume			
43	Used speech fillers (um, ah) rarely			
G.	Teaching communication and interaction			
44	Demonstrated confidence			

45	Demonstrated enthusiasm			
46	Established and maintained eye contact			
47	Maintained students' attention			
48	Restated students' questions or comments as necessary			
49	Teachers asked exploratory questions to help students to understand important concepts			
50	Guiding students to reflect on what they have learned			
51	Listened carefully to students' questions			
52	Responded appropriately to students' puzzlement or boredom			
53	Answered questions appropriately			
	Engagement Techniques...			
54	Teachers promote students to pay attention and think about the problem by asking questions			
55	Discussion			
56	Small-group activities			
57	Student individual/panel presentations			
58	Active learning (e.g., think-pair-share)			
59	Role playing			
60	Demonstrations/skits			
H.	Motivation for learning			
61	Active participation of students was encouraged and valued			
62	Encouraged students to answer difficult questions by providing cues or rephrasing			
63	Engaged students in solution-finding activities and comprehensive solution articulation			
64	Encouraged students to judge or evaluate situations, problems, or issues			
65	Encouraged student synthesis or summary of information within or across disciplines.			
66	Students were encouraged to generate conjectures, alternative solution strategies, and ways of interpreting evidence			
67	Encouraged students' questions			
68	Asked probing questions			
69	Demonstrated respect for students and their thoughts /concerns			
70	Combined with the actual students flexible use of effective ways and strategies to motivate students			

Strengths: _____

Areas for Improvement: _____

Observer Signature _____