



# Research on Vocational Quality Education and Practice for College Students under the OBE Information-Based Education Model

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**Abstract.** With the development of modern digital economy, the vocational quality education for college students has features of informatization, intelligence and digitalization. Vocational quality encompasses the cultivation of information literacy knowledge and innovation ability, and is one of the important measures for nurturing innovative talents. This research is based on the OBE outcome-oriented and information-based education integration model, and explores the practical research paths in the field of vocational quality education for college students, providing reference and inspiration for the vocational quality education of college students.

**Keywords:** OBE, Information-based Education, Professional Competence, Practical Research

## 1 Introduction

Under the current situation of industrial upgrading in the new era, professional quality serves as the crucial link connecting the talent cultivation of universities and the job requirements of the industry. OBE is an educational mechanism oriented towards outcome production. Information-based education provides technical paths for the refined implementation and scientific evaluation of professional quality cultivation. Integrating OBE with information-based education to construct a new model of professional quality education that is concept-led, technology-enabled, precisely cultivated, and closed-loop improved, with the aim of cultivating high-quality skilled talents in the era of digital economy.

## **2 Analysis of the Current Situation of College Students' Vocational Quality Education**

Professional qualities are the main abilities and character traits that students should cultivate during their study period, including professional awareness, professional ethics, professional behavior and professional skills. Having good professional qualities is a necessary quality for students to enter the workplace. The current situation where graduates have difficulty finding jobs and employers struggle to find qualified talents is, in part, due to the lack of professional qualities among students themselves.

### **2.1 Insufficient Emphasis on Professional Ethics**

After entering university, students undergo a transformation from middle school students to university students. Due to the lack of education on professional qualities, some students have shown a lack of motivation and a passive attitude in their actions. Although they have the awareness of learning to enhance their professional skills, they lack understanding of professional qualities and are not clear about their importance. They habitually believe that obtaining a job position solely depends on professional skills, neglecting the learning of professional qualities such as professional attitude, dedication, and teamwork ability.[2] As a result, when entering the workplace, they exhibit behaviors like excessive confidence, poor dedication, and low work enthusiasm, which significantly hinders their personal development.

### **2.2 Insufficient Depth in Professional Ethics Education**

Influenced by traditional vocational education concepts, in teaching, only the cultivation of professional knowledge and professional skills is emphasized, while the depth of students' vocational education is overlooked. The main manifestations are as follows: The teaching content lacks strong relevance to students' vocational positions, and there is a lack of targeted vocational quality education content; In the teaching of vocational quality courses, there is a lack of information-based teaching content that combines with the development of the times for vocational quality education, and students' learning enthusiasm is not high, and the expected teaching effect has not been achieved.

## **3 OBE-Based Information-Based Education Model**

OBE (Outcome-based Education) is a teaching model that aims to enable students to achieve success in their studies and become competent individuals. It is a teaching approach that focuses on student-centered learning, with an emphasis on outcome-based and self-value creation[1]. In the teaching process, the student's dominant role is highlighted. Teachers play a leading role in teaching and pay attention to students' learning experiences and the satisfaction of their needs, thereby improving the quality of stu-

dents' learning and comprehensively enhancing their knowledge, abilities, and qualities, as well as developing practical abilities for lifelong learning and independent problem-solving.

Information-based Education is a new educational form that, under the guidance of modern educational thoughts and theories, digitizes the participating subjects, educational elements and educational behaviors. It optimizes the educational process, develops educational resources, and cultivates students' professional qualities through modern information technology. It can effectively promote the transformation and upgrading of education as well as its intelligent development. It is the deep integration of technology and education, and is in line with the educational goals for college students in the new era.

The integration model of OBE and information-based education can promote the transformation of college students' professional qualities from homogeneous cultivation to precise empowerment and closed-loop improvement. It can also facilitate the restructuring of professional quality education from separate teaching to full-course integration, enabling professional skills and professional qualities to resonate in harmony. This can achieve integrated cultivation of professional skills and professional qualities.

The OBE (Outcome-Based Education) information-based teaching model and the traditional teaching model differ in aspects such as the teaching process, teaching strategies, learning assessment, and teaching mode[8]. The comparison table between the two is as follows. As shown in Table 1.

**Table 1.** Comparison Table of OBE Teaching and Traditional Teaching

<b>Comparison project</b>	<b>OBE-based information-based education model</b>	<b>traditional teaching mode</b>
1.Teaching Process	Centered on students, place students at the core of the learning process and make them active and responsible learners.	With the teacher as the leader, the teacher determines the knowledge framework of the subject and the teaching direction, while the students passively receive the knowledge.
2 Teaching Strategies	Resource integration, collaborative teaching, teamwork among teachers, communication and exchange, forming a learning community	Working alone, emphasizing subject specialization, with clear boundaries for teachers' teaching, less cooperation and communication, competitive teaching, and less teamwork.
3.Learning Assessment	Based on the outcomes,the final learning achievements of students will be used as the sole criterion for evaluating effectiveness. Process-based achievements will only serve as a reference for the next stage of learning.	The final learning outcome of students can be evaluated based on the accumulated results of their stage-by-stage learning. If there is a poor performance at a certain stage of the process, it will affect the final learning outcome.
4 Teaching Mode	The ability-oriented teaching model focuses on what students have learned and what they can do, emphasizing the output and ability development. It encourages students to think, reason, comment, provide feedback and take action.	The knowledge-oriented teaching model emphasizes what the teacher teaches, and attaches importance to the input of knowledge, as well as the acquisition and organization of knowledge.

#### 4 Practical Application of OBE-Based Informationized Teaching Model in Professional Competence Education

In the highly competitive job market, possessing excellent professional qualities is the key to success in the workplace. Professional qualities represent the comprehensive manifestation of students' understanding and adaptability to their job positions. It is a comprehensive quality that integrates personal knowledge, skills, thinking, attitude, and psychology. Therefore, to achieve success in the workplace, not only do individuals need their professional knowledge and abilities, but they also need to possess excellent professional qualities. According to relevant research, people with good professional qualities have higher work efficiency than ordinary workers, with an efficiency increase of approximately 20-25%. Improved work efficiency is not only a concern for enterprises and institutions but also a criterion for evaluating candidates when recruiting staff.

This research will take the teaching practice of the "Construction Engineering Technology" course in the field of construction engineering as an example. It will analyze the course knowledge system using the OBE (Outcome-Based Education) information-based educational model, and provide learning support for students' vocational quality education through the cognitive hierarchy system (including six progressive cognitive dimensions: memory, understanding, application, analysis, evaluation, and creation)[3]. The design of vocational quality education according to the following OBE information-based educational model will be carried out. As shown in Fig. 1

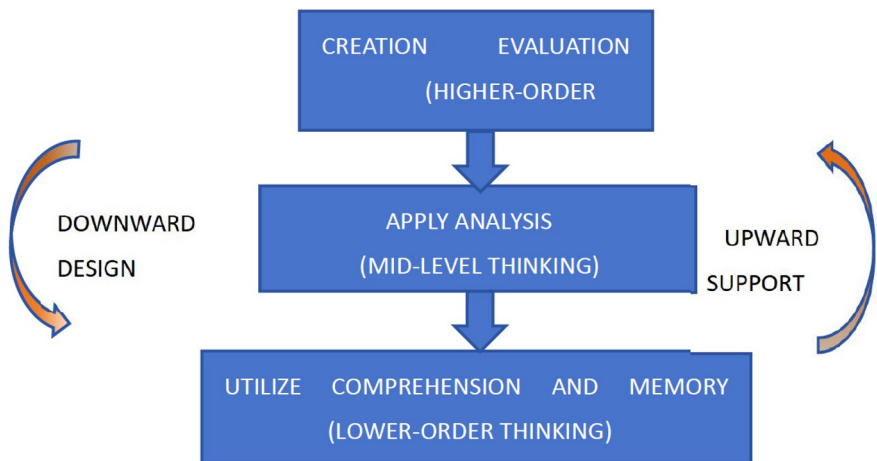


Fig. 1. The design concept of professional quality education in the OBE educational model

##### 4.1 Clarify the Vocational Quality Cultivation Goals of the OBE (Outcome-Based Education) Information-Based Education Model

The "Construction Engineering Construction Technology" course is a core course for the construction engineering major, featuring high requirements for basic theories and

high demands for practical expansion. The clear goal of cultivating vocational qualities through the OBE (Outcome-Based Education) information-based educational model is as follows: 1. By establishing the awareness of lifelong responsibility for project quality, cultivate students' professional belief and dedication. 2. Through virtual simulation and intelligent construction simulation, cultivate students' on-site practical job skills. 3. Through project-driven and diverse evaluation of learning outcomes, cultivate students' teamwork and communication collaboration abilities. 4. Through analysis of student situations and continuous improvement mechanisms, cultivate students' thinking habits for problem-solving solutions, and possess the sustainable development ability of simultaneous improvement of vocational qualities and professional capabilities.

## **4.2 OBE-Based Information-Based Education Model for Vocational Skills Training Practice**

This research is based on the teaching practice of the "Construction Engineering Construction Technology" course. The evaluation process of professional quality is carried out in a real and objective manner, that is, the evaluation indicators are selected by combining professional basic abilities, information learning and application abilities, and not based on subjective thinking for judgment and evaluation. A professional quality education evaluation system is constructed, integrating students' professional knowledge ability and professional quality into the same framework[7]. This enables the development of education and evaluation to proceed simultaneously, laying the foundation for subsequent visual analysis of students' professional quality education ability through the indicator system. At the same time, educational technology analysis tools are used to collect data on students' professional abilities and core qualities, achieving quantitative and qualitative evaluations of the intelligent and information-based teaching evaluation system for teachers.

### **4.2.1 Principles for Constructing the Evaluation Index System of Professional Competence in the OBE (Outcome-Based Education) Informationized Education Model.**

**Comprehensive Principle:** Shift from focusing solely on teaching quality to emphasizing the improvement of students' comprehensive qualities, highlighting the ability to solve and handle problems in critical situations. Through the entire process of classroom teaching, online teacher-student interaction, interpersonal communication, etc., construct an evaluation index system for students' professional qualities. Form a comprehensive evaluation result through data integration and distribution, in order to enhance the scientific and systematic nature of the evaluation system for college students' professional qualities.

**Process-oriented principle:** The evaluation of college students' professional qualities is not limited to outcome-oriented methods; it is more inclined towards process evaluation. The collection of professional quality data includes a large amount of process-related data such as cognitive processes, ideological concepts, and psychological characteristics, providing comprehensive indicator data for professional quality evaluation.

Additionally, the process-oriented principle is also reflected in the evaluation of teachers' professional quality teaching, highlighting the importance of process-oriented education in the evaluation of teachers' professional quality teaching, and achieving developmental evaluation of the teaching process.

#### 4.2.2 OBE-Based Informationized Education Model for Professional Competence Education Practice and Evaluation.

Based on the aforementioned evaluation index system construction principles, this study, in accordance with the setting standards for college students' vocational literacy education and the current development status of artificial intelligence education, has established an index system[6]. Using the analytic hierarchy process, the evaluation of college students' vocational literacy has been decomposed into different types of elements, and four primary indicators - data literacy, core literacy, information literacy, and AI ethics literacy - have been determined. Considering the numerous, wide-ranging, and long-range characteristics of college students' vocational literacy, 17 secondary indicators have been selected from the data knowledge level, data awareness level, data sensitivity level, and information technology cognition and application level. After expert opinions solicitation and feedback optimization of the indicators, the evaluation indicators and weights for college students' vocational literacy have been determined. The specific approach is that if more than 80% of the expert opinions agree with an indicator, it will be adopted; otherwise, it will be discarded. The selection of tertiary indicators also follows the same method. Finally, a 1-3 level index matrix is formed. The weight values of the primary indicators are assigned scores and rankings by the expert group based on the relative importance of the indicators. The weight values of each indicator can be calculated using the following formula:  $W_i$

$$W_i = g_i / \sum_{i=1}^n g_i$$

In the above formula,  $g_i$  represents the weight score of the  $i$ -th indicator in the index matrix. The weight scores of the secondary and tertiary indicators can also be calculated in the same way as mentioned above. Based on this, combined with the expert feedback and the results of the interviews with university teachers, an evaluation index system for college students' professional qualities consisting of 17 secondary indicators was formed. Using the above-mentioned constructed evaluation index system for college students' professional qualities, the specific evaluation score  $S$  is calculated by the following formula.

$$S = 100 \times \sum_{k=1}^i (q_k \times \sum_{j=1}^{m_k} (q_{ki} \times \sum_{j=1}^{n_{ki}} q_{kij} \times g(\frac{x_{kij}}{y_{kij}})))$$

In the formula,  $q_k$  represents the weight value of the  $k$ th primary indicator,  $q_{ki}$  represents the weight value of the  $i$ -th secondary indicator under the  $k$ th primary indicator, and  $q_{kij}$  is the weight value of the  $j$ -th tertiary indicator under the  $ki$ -th secondary

indicator. The value of the function  $g(x_{Kij}/Y_{Kij})$  is:  $When(x_{Kij} \leq Y_{Kij})$  takes the value of  $(x_{Kij}/Y_{Kij})$ ,  $When(x_{Kij} \geq Y_{Kij})$  takes the value of 1. Here,  $x_{kij}$  represents the actual weight value of the third-level indicator  $kij$ , and  $y_{kij}$  is the preset weight value of this third-level indicator. Through iterative calculation, the overall score  $S$  of the students' vocational literacy in universities is obtained. If  $S$  is less than 60, it indicates that the evaluation result of the students' vocational literacy in universities is unqualified; if  $60 \leq S < 90$ , the evaluation result is qualified; and if  $S \geq 90$ , it indicates an excellent evaluation result. As shown in Table. 2.

**Table 2.** OBE Education Model Professional Competence Education Evaluation Form

Primary Indicators and Weights	Secondary indicators and their weights	Third-level indicators	weight
Key Competence 0.2782	Intelligent digital learning capability 0.2161	Utilizing artificial intelligence to determine the number of personalized learning sessions for students (in units of "times")	0.1523
		The number of times students' potential is explored through artificial intelligence (in units of "times")	0.2431
		The number of comprehensive practice sessions conducted by students using artificial intelligence (times)	0.3163
		Utilize artificial intelligence to learn the number of times the space has been utilized.	0.1647
		The number of times using artificial intelligence for academic assessment (times)	0.1236
	Informationization practical ability 0.3126	Number of times of artificial intelligence information technology network searches	0.1586
		The number of practical learning experiences in information technology (in units of "times")	0.2671
		Utilization of information technology for retrieval, processing and storage (times)	0.4468
		Number of times using multimedia learning resources (times)	0.1275
	Information management capability 0.2132	Utilize information technology to manage the frequency of practice resources (times)	0.6236
		Utilize information technology to sort out the number of times (times) of logical organization of professional knowledge	0.3764
	Informationization evaluation for continuous improvement capability 0.2581	The number of times using information technology to evaluate comprehensive literacy skills	0.4571
		The number of times the evaluation results are fed back through information technology (in units of "times")	0.2863
		The number of times using information technology to improve learning content	0.2566
	Data literacy		Number of visits to secure websites (times)

0.3451	Mastering the data foundation 0.1312	Payment rate for visiting security websites (%)	0.2747
		Active Rate of Secure Websites (%)	0.3832
	Data utilization awareness 0.1204	The number of received and sent emails (messages)	0.1334
		Number of edited emails (pieces)	0.4275
		Clicks on the online learning resource website (times)	0.2148
		Conversion rate of high-quality online learning resources (%)	0.2243
	Data manipulation capability 0.2135	The number of effective search schemes compiled (units)	0.3871
		Collected target data (number)	0.2746
		The number of times (occurrences) for storing and updating the target data	0.3383
	Data analysis skill 0.1931	Be familiar with the proportion of the target data (%)	0.2004
		Analyze the frequency of target data (times)	0.4735
		The number of times the data analysis results of the target are studied (times)	0.3261
	Data evaluation capability 0.1138	The number of times the target data is evaluated (times)	0.4372
		Carry out evaluations of the learning process based on data (times)	0.3468
		The number of times the data is used to evaluate the results (times)	0.2160
	Data decision-making ability 0.1051	Through data analysis, the number of times the learning model has problems was identified.(times)	0.3352
		The number of times solutions were proposed based on data (times)	0.4231
		Adjust the number of learning method iterations based on the data.(times)	0.2417
		The number of times of recognizing data deviations(times)	0.4182
	Data sensitivity 0.1229	Frequency of data usage compliance (times)	0.5818
Through data analysis, the number of times the learning model has problems was identified.(times)		0.3352	
information literacy 0.1692	information cognitive capacity 0.1926	The perceived probability of online learning resources (%)	0.2512
		Probability of Judging Online Learning Resources (%)	0.3641
		Probability of Evaluation for Online Learning Resources (%)	0.2732
		The probability of reflection on online learning resources (%)	0.1115
	Information technology application ability	The number of virtual simulation practice projects involved in the construction (units)	0.5248
		Number of BIM design projects participated (items)	0.4752

	0.3725		
	Information technology acquisition ability 0.2542	Number of times participating in the construction of an information-based learning environment (times)	0.1452
		Use information technology to count the number of times professional learning content is reviewed.(times)	0.2982
		The number of times data is processed and filtered using information technology(times)	0.3217
		The number of correction and optimization processing carried out using information technology (times)	0.2349
	Information presentation and sharing capabilities 0.1807	Number of constructed information-based learning resource libraries (units)	0.5027
		Teamwork increases the quantity (number) of information technology applications.(units)	0.4973
AI logical literacy 0.2075	Algorithmic literacy 0.4954	The proportion of understanding regarding algorithm selection and decision-making (%)	0.2143
		The number of times for holding accountable for intellectual property rights violations related to online learning resources(times)	0.2031
		Number of times participating in the exchange and sharing of learning algorithm experience (times)	0.2680
		Number of times providing technical support for AI teaching algorithms (times)	0.3146
	Conformity awareness 0.5046	The number of entities involved in establishing the regulatory mechanism for AI learning (units))	0.5173
		Participate in the discussion on the number of times AI learning is protected (times)	0.4827

The above evaluation indicators were applied in the teaching practice of the course. Using the OBE (Outcome-Based Education) information-based education model, information was integrated into the entire process of vocational literacy teaching, including pre-class diagnosis (vocational literacy assessment), in-class teaching (virtual simulation scenarios), post-class practice (task-driven practice), and evaluation feedback (teaching effect evaluation), to achieve the transformation of the vocational literacy training goal from being vague to concrete. The overall score S of college students' vocational literacy corresponds to the evaluation result of "qualified". Among them, the secondary indicators of information-based practical ability, data manipulation ability, and information technology application ability need to be improved.

## 5 Conclusion

Enhancing students' professional qualities is a beneficial approach for universities to achieve the goal of cultivating high-quality and highly-skilled talents. Through the research on professional quality teaching practice, the strategies for enhancing students' professional qualities are as follows:

### **5.1 Optimize the Teaching Structure by Integrating the OBE and Information Technology Concepts**

The student-centered outcome-oriented education concept based on OBE, combined with information technology to implement the teaching process and evaluation loop, focuses on the cultivation of students' professional qualities and professional abilities, optimizes the course teaching structure[5], clarifies the development needs of society for talents, and combines students' existing knowledge levels to build a theoretical and practical framework for professional quality education. Teachers adhere to the student-centered teaching concept, strengthen students' self-exploration education, fully mobilize students' enthusiasm, enhance students' classroom participation and professional subject consciousness, thereby strengthening the understanding and practice of enhancing professional qualities.

### **5.2 OBE-Oriented and Information-Based Diversified Teaching Model**

In the process of setting teaching objectives, innovate teaching methods to enhance students' transformation towards self-realization, and improve their employment competitiveness and professional quality in the diversified education system. Set project tasks based on OBE job competency goals. Use information-based virtual simulation workplace scenarios to address the problems encountered by students in their employment and practical processes. Students conduct negotiation and in-depth discussions in practice to seek solutions to the problems, which is beneficial to improving the students' alignment with the employment scenarios and fully mobilizing their participation in practical activities, thereby achieving a deeper understanding of the importance of professional qualities.

### **5.3 Enhancing the Professional Quality Guidance Capabilities of Teachers and the Construction of the Teaching Staff**

In the teaching process of cultivating students' professional qualities, it is necessary to strengthen the professional training of the teaching staff[4]. Emphasize the periodicity and regularity of professional quality guidance work, provide scientific employment indicators and professional quality teaching methods, offer professional learning and communication opportunities for teachers, and strengthen the construction of the teaching staff. Build a corresponding information platform for student management, so that teachers can collect data on students' employment situations and professional quality status through the platform, ensuring that teachers can conduct in-depth research based on the actual circumstances of students and provide timely teaching guidance to students. Teachers should go deep into the employers, through communication and exchanges with the employers, understand the latest trends of positions and the professional competence requirements, and guide students' employment to achieve corresponding development in line with their majors.

Under the OBE (Outcome-Based Education) educational model, the professional qualities and abilities of college students will be effectively enhanced. By optimizing

the curriculum design and establishing a vocational experience and practice model, the students' professional participation and professional quality and ability will be improved. This enables them to gain more vocational experience opportunities in the classroom, enhance their employment competitiveness, and lay a foundation for their smooth entry into the workplace in the future.

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