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The Path of “Dual-Teacher” Teacher Cultivation in Applied Local Higher Teacher Colleges under the Background of Big Data

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Abstract

The cultivation path of the applied “dual-teacher” teacher team in this paper mainly relies on the qualification standard and evaluation system. Big data technology is used to collect data, deeply mine fragmented data, and further extract index factors that affect the quality of teachers. The multi-level fuzzy hierarchical evaluation model realizes the quantification of the decision-making process with less quantitative information, and determines the weights through the multi-level comparison of importance, to test and evaluate the teaching ability of “dual-teacher” teachers. The results show that, among the 166 survey respondents, 77 respondents belong to the “Dual-teacher” teachers, accounting for about 45.03%. The primary needs and ways for most of the teachers to participate in the training of “dual-teacher” teachers are to improve the practical ability of industry and enterprise positions (score 0.86) and the school-based training of dual-teacher teachers (0.93), which is centralized in the college. In evaluating “dual-teacher” teaching, the weight of industry-teaching integration is 0.3378, so the ability of industry-teaching integration is a more meaningful indicator. College students are satisfied with “dual-teacher teaching”, and the score shows that the essential satisfaction is more than half of the total number of samples, which is 343.

Keywords: Deep mining; Multi-layer fuzzy; Evaluation system; Dual-teaching.

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1 Introduction

With the continuous development of non-teaching majors in local higher education institutions, some problems have been revealed, such as the core competitiveness of teaching majors is not strong, the social recognition of non-teaching majors is not high, and the practice of non-teaching majors is insufficient, etc. [1-2]. Therefore, the construction of a “dual-teacher” teaching team with excellent business skills and the solution of existing problems have strong practical significance and guidance significance for the transformation and development of local universities and colleges and for the development of local economy and talent cultivation [3-5]. The so-called “dual-teacher” teachers mean that teachers not only have the basic cultural quality, professional theory level, superior teaching, and research capabilities but also have the professional qualification and technical certificate, and proficiency in the professional skills, production, management, innovation, promotion and other capabilities [6-7]. The construction of a “dual-teacher” teacher team in local tertiary institutions needs to pay attention to the introduction and cultivation of talents, strengthen the cooperation between schools and enterprises, and establish a scientific incentive mechanism so as to provide talent support for the school’s coherent and high-quality education and inject new vitality into the development of the local economy [8-10].

Literature [11] suggests that the psychoeducational content carried out when conducting teacher training should include civic competencies in the field of social justice and analyze the three dimensions of teachers’ social justice representations, beliefs, and orientations. The study shows that there are some gender differences in different stages of teacher training, while teachers’ beliefs about a just world and socially dominant orientations do not differ at the primary training stage, and the relationship between these three dimensions needs to be considered when conducting teacher training in order to realize the innovative development of teacher training. The literature [12] explores the fact that the training of teachers in specific teaching skills in Spanish universities has become an effective means of improving the quality of educational practices, using an ex post facto cross-sectional study to quantify the teacher skills training provided by Spanish universities. From the results, it was found that although teacher skills training can improve the quality of their teaching, the lack of practice orientation in teacher training rather fails to improve the quality of the training. Literature [13] gives a teacher training method based on the MOOC platform, which carries out teacher teaching skills training with teaching as the first principle and integrates ICT into teacher training, aiming to improve teachers’ mastery of information technology, promote the innovative development of teachers’ teaching methods, and provide a reference for the reform of teaching models. Literature [14] analyzes the factors that influence sustainable training through distance education training methods, mainly focusing on the effects of factors such as learning centers, gender, and economic status on students’ academic performance. Relying on distance education training makes teachers pay more attention to the online skills of students, while offline-related course learning is more neglected.

Literature [15] studied the teacher training framework based on the force field model in higher music education in South Africa, and the application of this framework in teacher training can enable teachers to change their teaching principles, effectively improve their professional teaching ability, promote teachers to find teaching methods in different cultures that are more compatible with the development of the students and enhance the quality of teaching in music education. Literature [16] applies virtual reality technology to teacher training, aiming to realize the innovation of traditional education and promote the sustainable development of teacher training. Relying on the virtual training platform, teachers can adopt an immersive experience to design teaching activities, which provides guidance for teachers to improve their teaching ability. Literature [17] addresses the learning migration of teachers in the process of distance technology teaching training, and this data is used to analyze the relevant technology, self-efficacy, and satisfaction with online training learned in the classroom by the Teachers’ College. From the results, it was found that the trained teachers cared

more about the design of the technology training during the learning transfer process, thus enhancing their practical application of teaching technology. Literature [18] used the pre-service training of 133 teachers as an example with the aim of analyzing the factors related to the sustainable development of teachers in the educational training process. From the research data, it is clear that social interaction can influence the sustainable development of teacher training, and it also provides a richer approach to pre-service teacher training.

Literature [19] analyzed the teacher training of two physical education teachers at different stages of teaching, and there were significant differences in the physical education teacher training under different stages of physical and motor skills. It shows that physical education teacher training at different stages needs to be targeted and carried out in a suitable way in order to enhance the physical education teaching skills of teachers. Literature [20] used the TPACK model as the basis for its application in pre-service teacher training, which aims to develop teachers' digital technology application skills. Changes in teacher training were analyzed through quantitative and TPACK-21 questionnaires, and the results validated the applicability of the framework in teacher digital competence training and provided guidance for enhancing pre-service teachers' digital technology application skills. Literature [21] argues that the use of ICT in education has allowed the development of teachers' digital competencies and is an educational challenge that teacher training must face. The assessment of the development of teachers' digital competence in Spain has shown that the lack of digital application skills is the main reason for the underground quality of teachers' teaching and that there is a need to increase the development of digital competence in teacher training in order to promote innovation in teaching methods. Literature [22] discusses the responsibilities that teachers of specific English courses have in the teaching process and the need for more diverse knowledge and skills in order to be able to perform this job effectively. Teaching training for teachers of specific English courses can help teachers enrich their knowledge and skills and help them overcome difficulties in teaching.

This paper uses multi-level fuzzy hierarchical analysis to construct the evaluation model of teachers' vocational competence and, on the basis of the preliminary selection of the index system, adopts the affiliation analysis and correlation analysis method to implement two rounds of empirical screening of the theoretically selected indexes of vocational competence. In the process of determining the weights, the multilevel fuzzy hierarchical evaluation model is used to refine the vocational competence into a number of evaluation indexes, classify them in accordance with the degree of closeness between them, and form a well-organized and logical hierarchical system. Secondly, we compare the importance of the indicators at the same level and obtain the relative importance of each indicator. The order of influence of each indicator compared to the evaluation objectives is determined by combining and totaling scores within the same level.

2 Technical route and evaluation of applied “dual-teacher” cultivation

The technical route for the construction of the applied “dual-teacher” training program in colleges and universities is shown in Figure 1. It mainly undertakes the teaching task in school, focusing on theoretical teaching and basic skills training, supplemented by practical teaching, but due to the characteristics of the type of education, it is also necessary to master the production technology and be familiar with the production process. Part-time enterprise “dual-teacher” teachers are mainly responsible for practical teaching, guiding students to “learn by doing,” and teaching the necessary technical and theoretical knowledge in the workplace in a targeted manner. This definition meets the needs of the implementation of modern apprenticeship, drawing on the German teacher training experience, and can break the “dual-teacher” teachers have been demanding, the embarrassment of

the form that is more scientific. The issue of “dual-teacher” teacher training studied in this project is aimed at full-time “dual-teacher” teachers in colleges and universities.

Qualification standards are a prerequisite for the training of “dual-teacher” teachers. At the practical level, to cultivate dual-teacher teachers and establish a dual-teacher team, most institutions have established school-based qualification standards. In view of this, academics have focused on the construction path of “dual-teacher” teacher qualification standards. The value orientation, logical base, and path of the construction of “double-high program,” “university,” and “double-teacher” teacher qualification standards were studied. It is proposed that the qualification standards be improved by clarifying the qualification conditions, standardizing the qualification process, and improving the management mechanism.

Certain standards can be used to evaluate and measure the development of anything. Similarly, the quality and effect of the development of the teaching ability of “dual-teacher” teachers in colleges and universities can also be evaluated scientifically by certain standards and methods. Through the evaluation of the development of teachers’ teaching ability, on the one hand, teachers can be more aware of the shortcomings and defects in the development of their own teaching ability, and at the same time, it is also convenient for teaching leaders and managers to provide scientific guidance and management for “dual-teacher” teachers, and the ultimate goal is to promote the improvement of “dual-teacher” teachers’ teaching ability. The ultimate goal is to promote the improvement of “dual-teacher” teachers’ teaching ability, good professional development, and cultivate more and better practical talents. From the perspective of the action learning process, evaluation, improvement, and promotion are also the last steps of the process. By designing an evaluation system to test and assess the teaching ability of “dual-teacher” teachers, if it is successful, it can be promoted within the organization. If problems are found during dissemination, the process returns to the first step, and corrections are made again until the problems are solved. In a certain sense, the action learning process coincides with the “practice-knowledge-repeat-repeat-knowledge” cycle proposed by dialectical materialism.

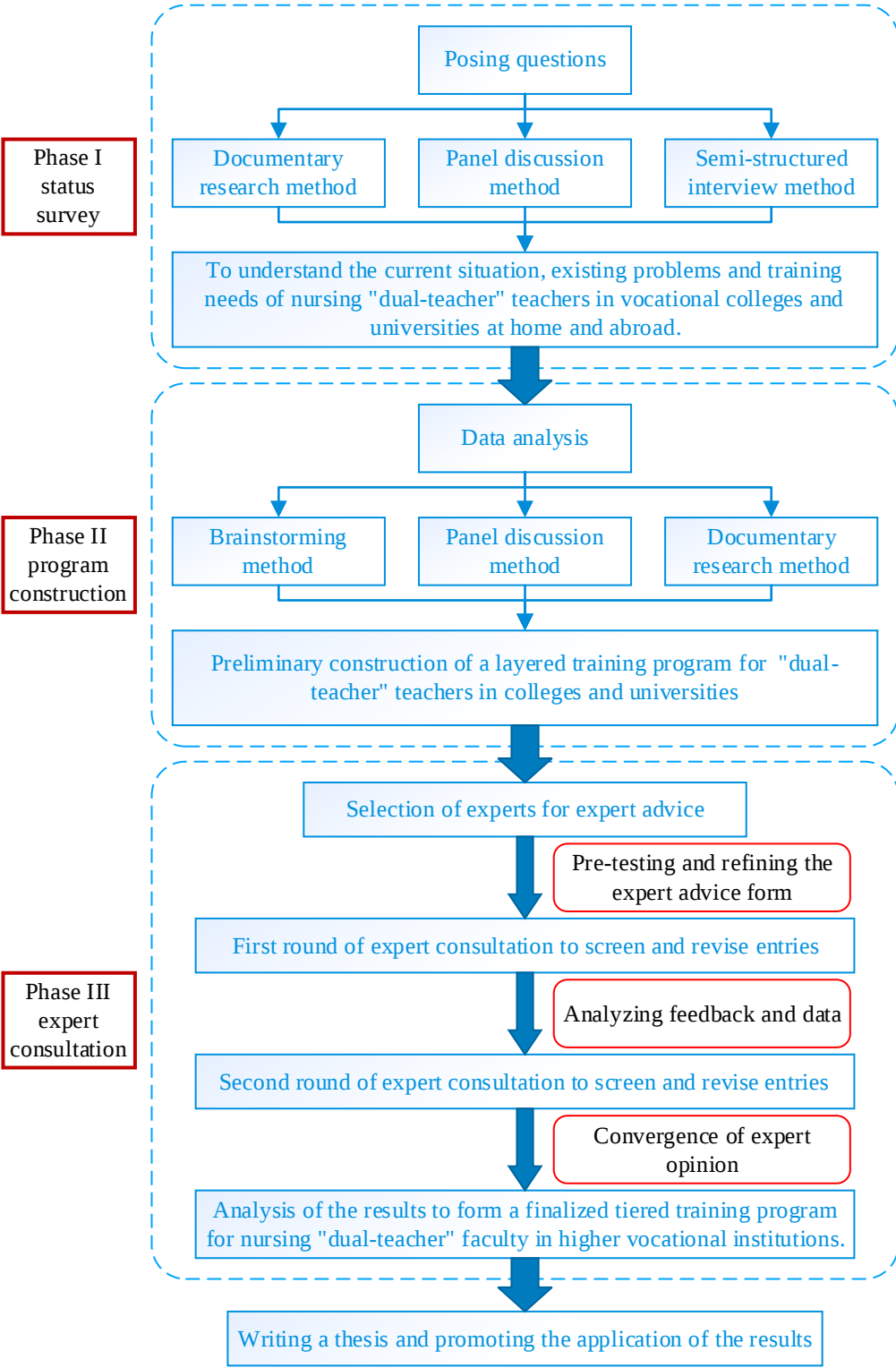


Figure 1. The “two-master” culture plan builds the technology roadmap

3 Evaluation system for the professional competence of “dual-teacher” teachers

3.1 Empirical screening of evaluation indicators

The preliminary selection of the indicator system contains more comprehensive implementation indicators; however, too many indicators will definitely cause information overload, so the importance of the key indicators cannot be revealed, which also brings a lot of inconvenience to the actual operation. Two rounds of empirical screening of the selection indicators of occupational competence theory were conducted using affiliation analysis and correlation analysis.

3.1.1 Affiliation analysis

Affiliation analysis is based on the statistical results of the expert consultation form, designing the expert consultation form in accordance with the theoretical selection indicators, completing the consultation form through electronic transmission, paper mailing, and field visits, and selecting the most important 40 evaluation indicators in accordance with the criteria of systematicity, operability, validity, comparability, and dynamism of the design of the consultation form, taking into account our own knowledge and experience.

Considering the professional competence of young teachers in colleges and universities as a fuzzy set, and each indicator as an element, the affiliation degree analysis is carried out for each indicator. Assuming that the total number of experts' choices on the i th indicator D_i is M_i , that is, M_i experts think that D_i is an important indicator for evaluating professional competence, and the affiliation degree of this indicator is:

$$R_i = \frac{M_i}{103} (i = 1, 2, \dots, 65) \quad (1)$$

The larger the value of R_i , the more critical indicator D_i is and should be retained. The opposite is true for exclusion. When $\alpha = 0.01$, the critical value of the number of experts is selected:

$$M = \mu + \frac{S}{\sqrt{N}} t_{0.01} = 38 + \frac{26.47}{\sqrt{103 \times 40}} \times 2.368 \approx 39 \quad (2)$$

Where μ is the expected value of the number of experts' choices, S is the standard deviation of the number of experts' choices, N is the total number of choices by all experts, and $t_{0.01}$ is the T -test value when $\alpha = 0.01$. When $M = 39$, the degree of affiliation is 37.9%, i.e., there is no statistically significant difference in indicators with an affiliation lower than 37.9%. Excluding the analysis of teaching objects (D_4), the use of educational technology (D_9), the reform of the teaching model (D_{15}), the approval of the results (D_{26}), the social impact of the results (D_{27}), the highest rank ever held in social work (D_{31}), the desire for professional achievement (D_{62})⁷ evaluation indicators.

3.1.2 Correlation analysis

The correlation analysis aims to exclude indicators with large correlation coefficients and avoid duplication of information among indicators, which can reduce the reliability of the vocational competence measurement results. The analysis of indicator correlation involves the following steps:

- 1) Indicator value standardization, set D_i as the indicator value, S_i as the standard deviation, Z_i as the standardized processing value, then:

$$Z_i = \frac{D_i - \bar{D}}{S_i} \quad (3)$$

- 2) Calculate the simple correlation coefficient R_{ij} between the indicators, Eq:

$$R_{ij} = \sum_{k=1}^n (Z_{ki} - \bar{Z}_i)(Z_{kj} - \bar{Z}_j) / \sqrt{\sum_{k=1}^n (Z_{ki} - \bar{Z}_i)^2 (Z_{kj} - \bar{Z}_j)^2} \quad (4)$$

- 3) Provide for a threshold value of M ($0 < M < 1$), and if $R_{ij} > M$, remove one of D_i and D_j , and conversely retain both.

3.2 Multi-level fuzzy hierarchical evaluation model construction

3.2.1 Comparison judgment matrix

When the stepwise matrix is formed, the affiliation between different levels of evaluation factors is also established, assuming that the impact level of n evaluation factor $X = \{X_1, X_2, \dots, X_n\}$ on the vocational ability of young teachers is judged, and the importance of each evaluation factor in the total evaluation system is obtained. In the process of comparative judgment, the experts of the assessment team and the supervisors and leaders in charge will combine the evaluation objectives of the professional competence and give a score based on their personal knowledge and experience as to who is more important in the indicators X_i and X_j , with specific reference to the scale of 1-9, which can be scored according to the level of influence of the indicators respectively.

With regard to the appraisal objectives, the n executive indicators form a matrix for sequential comparison and judgment:

$$\tilde{A} = (a_{ij})_{n \times n} \quad (5)$$

a_{ij} is a scale of proportionality of the importance of assessment criteria X_i compared to X_j , with the following range of values and relationships:

$$a_{ij} > 0, a_{ij} = 1/a_{ji}, a_{ii} = 1 \quad (6)$$

It can be seen that $\tilde{A}$ belongs to the matrix type in the positive definite type, that is, the judgment matrix of the $n \times n$ order is not necessary to give all the two two comparisons of the scale, as long as the corresponding matrix elements in the upper or lower triangle can be obtained, the number of

operations of the two two comparisons is $n(n-1)/2$, which is a better way to circumvent the amplification effect of the error generated by the human subjective judgment.

3.2.2 Calculation of indicator weight vectors

Considering the continuous operation of “dual-teacher” teachers in applied colleges and universities in the later stage, this paper chooses the method of characteristic root to get the weights and maximum characteristic root of evaluation indexes at each level.

The product of the evaluation index values in each row of judgment matrix $\tilde{A}$ is obtained to get a set of new vectors:

$$n_i = \prod_{j=1}^n a_{ij}, i = 1, 2, \dots, n \quad (7)$$

Finding the root of the n th power for the above vector n_i yields:

$$\bar{n}_i = \sqrt[n]{n_i} \quad (8)$$

The scores were found by unifying them into the range $[0,1]$ and normalizing them:

$$w_i = \bar{n}_i / \sum_{i=1}^n \bar{n}_i \quad (9)$$

The eigenvector is found to be $W = (w_1, w_2, \dots, w_n)^T$ and its largest eigenroot is denoted as:

$$\lambda_{\max} = \sum_{i=1}^n \frac{(AW)_i}{nw_i}, i = 1, 2, \dots, n \quad (10)$$

3.2.3 Judgment matrix consistency test

Assuming that the judgment matrix $\tilde{A}$ cannot achieve perfect consistency, the confidence of the weight vector obtained by this method will be affected, so it is necessary to perform a consistency test for $\tilde{A}$. The consistency index C.I. is calculated by the following formula:

$$C.I. = \frac{\lambda_{\max} - n}{n - 1} \quad (11)$$

$\tilde{A}$ within the 11th order range, the average stochastic consistency index R.I. can be found, and finally the consistency ratio C.R. is calculated:

$$C.R. = \frac{C.I.}{R.I.} \quad (12)$$

When $C.R. < 0.1$, then the consistency of $\tilde{A}$ is within acceptable limits. If $C.R. > 0.1$, then the relevant elements of the judgment matrix $\tilde{A}$ must be rechecked and refined until their consistency meets acceptable conditions.

The steps of the evaluation modeling operation broadly include the following five steps:

- 1) Invite relevant experts and competent leaders to form an expert evaluation panel.
- 2) Determine the system evaluation index set $U = \{u_1, u_2, \dots, u_n\}$ and establish the evaluation scale set $V = \{V_1, V_2, \dots, V_m\}$ according to the discussion of the evaluation panel.
- 3) According to the AHP method to find the relative importance of each indicator w . w belongs to a fuzzy subset of the set of systematic evaluation indicators, w_i value can be used to reflect the importance of a single factor U_i in the overall evaluation, and from another point of view, it can also be expressed with reference to a single factor U_i given the level of the evaluation grade, usually the weighting coefficients of the indicators.

Find the judgment matrix R :

$$U \times V \rightarrow [0,1], r_{ij} = R(u_i, v_j) \quad (13)$$

Where, R is a fuzzy relationship of the indicator set U attributed to the determination scale V . r_{ij} is a single factor U_i attributed to the evaluation scale V_i of the degree of affiliation.

- 4) Comprehensive measurements to find the comprehensive evaluation vector B_k of young teacher A_k . Based on the clarity of B and w , the fuzzy transformation formula (14) is utilized to find the comprehensive rating of vocational ability $B_k = (b_1^k, b_2^k, \dots, b_m^k)$ of young teacher A_k :

$$B_k = w \circ R \quad (14)$$

Where the operator “ $\circ$ ” is a synthetic operation formed according to any of the fuzzy operators, and the Zadeh operator $(\wedge, \vee)$ is generally chosen.

- 5) Find the combined occupational competency rating value p_k for Alternative A_k :

$$p_k = B_k \square V^T \quad (15)$$

The comprehensive evaluation value of vocational ability p_k can fully reflect the valuable information contained in the comprehensive evaluation vector B_k , which reflects the level score parameter of evaluation scale V . Therefore, the combination of p_k can rank the vocational competence of the participating young teachers in local universities, and provide the improvement direction and implementation focus for the cultivation of young teachers' individual vocational competence as well as the construction of local universities' teaching staff.

4 Training and evaluation of “dual-teacher” teachers

4.1 Distribution and perception of “dual-teacher” teachers

In order to determine the proportion of “dual-teacher” teachers among the research subjects, a survey was conducted among 166 teachers working in 12 colleges of a university, including the College of Electronic and Information Engineering and the College of Science. The survey was conducted to find out whether the in-service teachers were “dual-teacher” teachers or not. The results of the survey are shown in Table 1. Of the 166 survey respondents, 77 survey respondents belong to the “dual-teacher” teachers, accounting for about 45.03%, a college “dual-teacher” teachers to be introduced to strengthen. Since the Ministry of Education has not yet made explicit provisions on the criteria for recognizing “dual-teacher” teachers, most teachers are in the position of “roughly understanding” and “not quite understanding” the criteria of the Ministry of Education for recognizing “dual-teacher” teachers. Therefore, most teachers have a vague definition of the Ministry of Education’s criteria for recognizing “dual-teacher” teachers as “roughly understood” and “not quite understood.” On the evaluation of whether the current assessment standards for “dual-teacher” teachers in China are reasonable, 40.96% of the teachers think that the assessment standards lack rationality, cannot be applied across the board, and still need to be further revised, clarified, and improved. In addition, in terms of their understanding of their school’s “dual-teacher” teacher recognition and cultivation rules, most of the teachers were clear about the content of the policy documents issued by their schools, as the schools had issued policy documents on the recognition standards of “dual-teacher” teachers and the related cultivation rules. The school’s policy documents are more well-known to the majority of teachers.

Table 1. The number of teachers and the standard details of the “double teacher”

Name	Options	Frequency	Percentage
Whether it’s a “double teacher”Teacher	Yes	72	43.37
	No	94	56.63
Total		166	100
Whether or not the ministry of education is clear The identification criteria of the teacher	Very well	11	6.63
	Probably know	99	59.64
	Out of line	56	33.73
Whether the teacher’s evaluation standard is reasonable	Reasonableness	46	27.71
	Out of line	68	40.96
	Don’t know the situation	52	31.33
Do you know the “double teacher” teaching of your university Teacher’s identification and training rules	Understand	68	40.96
	General understanding	72	43.37
	Out of line	26	15.66
Total		166	100

4.2 Ways and means of training “dual-teacher” teachers

The training paths numbered from 1 to 13 are, respectively, other, curriculum development ability, education, and teaching ability, theoretical knowledge, application technology development ability, practical operation ability, professional theory and practice knowledge, qualification certificate acquisition, cooperation with enterprises to develop the ability, project approval, industry and

enterprise on-the-job practice, school-based training for teachers, and participation in teacher training courses organized by education authorities. As shown in Figure 2, the demand for full-time teachers on campus for participating in “dual-teacher” teacher training is mainly reflected in the three aspects of cultivating and improving the practical operation ability of industry and enterprise positions (score 0.86), professional theory and practice knowledge (0.74) and education and teaching ability (0.75), which also accounted for the demand for training of these contents. Also, it accounts for the majority of the number of full-time teachers on campus. This may also be related to the composition of the college’s faculty, as the majority of on-campus full-time teachers come from talents trained by general colleges and universities, and the practical ability of professional positions and knowledge and ability in vocational education may be generally lacking, so the demand in these areas is a bit more concentrated. Due to the different abilities and qualities of each teacher, the demand is relatively decentralized in other aspects. The college carries out the “dual-teacher” teacher training for full-time teachers on campus through various ways and means, but in practice, most of the full-time teachers on campus participate in the “dual-teacher” teacher training mainly in the college’s school-based training program. However, in practice, the main ways for most full-time teachers on campus to participate in “dual-teacher” teacher training are still focused on the school-based training for dual-teacher teachers (0.93), the top-ranking practice in industrial enterprises (0.72) and the teacher training courses organized by the education authorities (0.65).

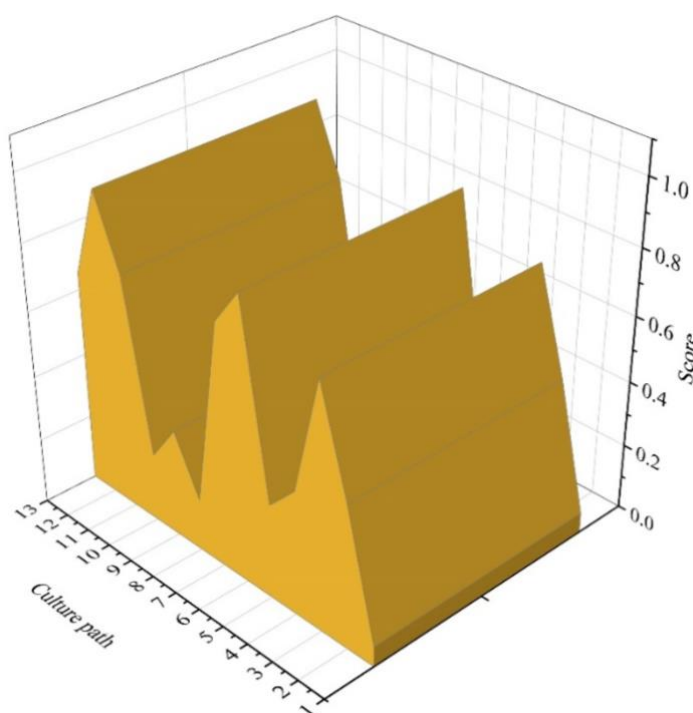


Figure 2. The way teachers cultivate teachers

4.3 Determination of weights for evaluating the competence of “dual-teacher” teachers

Calculating the weights of the primary and secondary indicators in the index system is done using MATLAB software. Finalize the weight distribution of the evaluation index system for teacher quality of “dual-teacher.” The degree of inconsistency in the judgment matrix is within the tolerance range, and the weights can be adjusted accordingly. Finally, the weight of the domain layer is multiplied by the weight of each indicator in its domain, and the weight of each indicator relative to the target layer is calculated, as shown in Table 2. It is worth mentioning that this study does not set weights for the indicators of “teacher ethics” according to the requirements of the “one-vote veto system for teacher

ethics” stipulated by the Ministry of Education. In education and teaching, the highest weight of the integration of industry and education is 0.2584, so the ability of integration of industry and education is a more important indicator in the evaluation of the quality of “dual-teacher” teachers.

Table 2. The weight of each target’s relative target layer

The “double teacher” teacher quality evaluation index system	Primary indicator	Secondary indicator	Tertiary index	Tertiary index weight	The three-level index is relative to the target layer
	Master teacher	Political stance	Strong belief	-	-
			Policy theory appraisal	-	-
		Occupational ethics	Occupational ethics education	-	-
			Clean teaching	-	-
		Academic morality	Preciseness	-	-
			Academic norms	-	-
	Intellectual quality (0.315)	Industry qualification (0.0.3333)	Degree	0.3333	0.0350
			Occupational certification	0.3333	0.0350
			Professional technical title	0.3333	0.0350
		Knowledge of discipline (0.3333)	Knowledge of subject matter	0.5	0.0525
			Knowledge of the frontiers of discipline	0.5	0.0525
		Knowledge of industry enterprises (0.3333)	Knowledge of the frontier knowledge of industry enterprises	0.5	0.0525
			The development of industry enterprises is aware of the situation	0.5	0.0525
	Education teaching (0.685)	Curriculum thinking Force (0.2322)	The course is a question of winning the prize	1	0.1528
		Teaching performance (0.1512)	Workload	0.3427	0.0341
			Material printing	0.2184	0.0217
			Graduation design	0.2241	0.0223
			Graduation internship	0.2333	0.0232
		Teaching reform energy Force (0.1843)	Working with enterprises to develop the ability of teaching materials	0.1522	0.0087
			Curriculum reform ability	0.1523	0.0185
			Practical reform ability	0.2011	0.0244
			Classroom teaching reform ability	0.1574	0.0191
			Professional construction reform ability	0.1535	0.0186
			Focus on industry and industrial demand to build talent training System ability	0.3357	0.0407
		Ability to produce and teach (0.2584)	The United States joint project has been approved	0.2645	0.0468
			The level and length of the cooperation of the school enterprises	0.2756	0.0488
			The ability of industry results to be applied to classroom teaching	0.2263	0.00401
			Ability to guide students’ practical work	0.2336	0.0413
		Teaching effect (0.1739)	Satisfaction	0.3007	0.00358
			The degree of satisfaction of the employer to the students	0.3021	0.0340
			Achievements of teaching achievements	0.2382	0.0284

4.4 Student Learning Satisfaction

Based on the above proposed “dual-teacher” teacher training pathway, the teaching feedback analysis of “dual-teacher” teachers was carried out. In the “dual-teacher” education and teaching environment, six variables were selected as students’ evaluation feedback, namely, image effect (I.E.), student expectation (S.E.), perceived quality (P.Q.), perceived value (P.V.), learning satisfaction (L.S.), and learning loyalty (L.L.), and the correlation analysis of the different variables is shown in Table 3. *** stands for P significant at the 0.01 level, and the diagonal line represents the extracted AVE mean-variance variance. The correlation coefficients between latent variables are represented by lower triangle values. The upper triangle represents the squared correlation coefficient between the latent variables. This study shows that the dimensions of the model questionnaire are correlated but distinct from each other. Therefore, it also proves that the differentiation validity of the model questionnaire of secondary school students’ learning satisfaction in the “dual-teacher teaching” environment in this study is ideal.

Table 3. Difference validity test results

	IE	SE	PQ	PV	LS	LL
IE	0.598	0.273	0.427	0.487	0.445	0.368
SE	0.526***	0.522	0.259	0.241	0.231	0.212
PQ	0.664***	0.523***	0.586	0.432	0.495	0.536
PV	0.697***	0.489***	0.657***	0.665	0.578	0.396
LS	0.669***	0.478***	0.702***	0.774***	0.632	0.558
LL	0.608***	0.452***	0.726***	0.654***	0.745***	0.703

The number and percentage of secondary school students in different segments indicate the overall satisfaction of the study participants with the “dual-teacher teaching” environment. The segmentation criteria for learning satisfaction (L.S.) are also divided into five segments: the first segment is 0-8 points, representing very dissatisfied. Dissatisfaction is represented by 8-15 points in the second segment. The average for the third segment is 15-20 points. The fourth sub-section represents satisfaction with 20-27 points. The fifth segment is 27-35 points, which indicates very satisfied. The number of samples and scores of each segment is shown in Table 4: 4 for 0-8 points, 17 for 8-15 points, 116 for 15-20 points, 254 for 20-27 points, and 89 for 27-35 points, which shows that the practice of “dual-teacher teaching” is basically presented by the college students. It can be seen that college students are basically satisfied with the practice of “dual-teacher teaching,” and from the score, the basic satisfaction is more than half of the total number of samples, which is 343.

Table 4. Descriptive statistics of object satisfaction scores

Section	Sample size	Score
0-8	4	0.0083
8-15	17	0.035
15-20	116	0.242
20-27	254	0.529
27-35	89	0.185

5 Conclusion

This paper proposes a dual-teacher training program that is primarily responsible for teaching tasks in the school and emphasizes both theoretical and basic skills training, with practical teaching being supplemented. Using multi-level fuzzy hierarchical analysis to evaluate the vocational abilities of young teachers in colleges and universities, the following conclusions can be drawn:

- 1) The proportion of “dual-teacher” teachers was investigated, and 77 out of 166 survey respondents belonged to the “dual-teacher” teacher colleges. Introduced to strengthen the “dual-teacher” teacher assessment standards, they need to be further revised, clarified, and improved.
- 2) The demand for full-time teachers on campus to participate in “dual-teacher” teacher training is mainly reflected in the three aspects of cultivating and upgrading the practical operation ability of industry and enterprise positions, professional theory and practice knowledge, and education and teaching ability. The college’s school-based training for dual-teacher teachers is the main focus of most of the teachers’ training.
- 3) In the evaluation of the quality of “dual-teacher” teachers, the ability of industry-teaching integration is a more important indicator.
- 4) From the score, college students are basically satisfied with the practice of “dual-teacher teaching,” and the basic satisfaction is more than half of the total number of samples.

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