Recruitment and Selection of Dual-qualification Nursing Teachers: A Fuzzy Analytic Hierarchy Process Approach

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ABSTRACT: Dual-qualification nursing teachers are nurses who both teach and practice. However, it is still an unresolved issue to recruit and select a high-quality dual-qualification nursing teacher. This paper sets up a comprehensive assessment system model for dual-qualification nursing teacher recruitment, which was built by analytic hierarchy process (AHP). The model includes four sides such as biographical analysis, theoretical knowledge examination, clinical nursing skills assessment, and interview and lecture. Then the weight coefficients of indexes are determined by AHP. It provides a quantitative analyzing method for dualqualification nursing teacher recruitment.

KEYWORD: Dual-qualification nursing teacher; Recruitment; Quantitative analyzing method; Analytic hierarchy process

1 INTRODUCTION

Over the last three decades, nursing education has developed rapidly alongside world economic expansion. Many countries have experienced considerable reform within nursing education systems. In the People's Republic of China, the National Health and Family Planning Commission (NHFPC) raised to build the dual-qualification nursing teacher team in nursing education reform and development plan.[1] Dual-qualification nursing teacher was defined as nurse who both teach and practice. Dual-qualification nursing teacher perform a critical function in helping students to bridge the gap between theory and practice.[2] Dualqualification nursing teacher is very important in nursing career education. However, there is an insufficient number of Dual-qualification nursing teacher with adequate qualifications. And, How to recruit a qualified Dual-qualification nursing teacher is still an unresolved issue.

The analytic hierarchy process (AHP) is a multicriteria decision-making approach combining qualitative and quantitative analysis, based on mathematics and psychology. It was put forward by Thomas L. Saaty - a famous America operational in the 1970s. The method resolves the decision problem into different levels of structure model according to target strata, criterion strata and index strata, then compares indexes of each level and formats comparative matrixes. It has particular application in a wide variety of decision situations, in fields such as government, business, industry, healthcare, and education.[3]

In this paper, we are trying to use AHP to set up a comprehensive assessment system model for dualqualification nursing teacher recruitment.

2 RECRUITMENT OF DUAL-QUALIFICATION NURSING TEACHER DECISION MODEL BY AHP

2.1 Establishment of index system

There are some basic principles followed when establish a system of evaluation index, such as concise and easy to operation, correlation and accuracy, hierarchy and aggregation. Based on the above aims and principles, the paper decomposes the factors of comprehensive assessment for dualqualification nursing teacher recruitment into 3 hierarchies: goal layer, criterion layer and index layer. The goal layer is the evaluation of dualqualification nursing teacher ability. The criterion layer (first grade index) includes biographical analysis, theoretical knowledge examination, clinical nursing skills assessment, and interview and lecture. The index layer (second index) includes educational background, academic achievement, professional

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knowledge, educational theory, research capacity, assessment capacity, intervention capacity, morphology and appearance, expression skills, and teaching skills. The assessment index system was shown in table 1.

Goal: A	Criterion Layer: B	Index layer: C				
	B1	C11 Educational background				
	Biographical analysis	C12 Academic achievement				
		C21 Professional knowledge				
	B2 Theoretical knowledge examination	C22 Educational theory				
Recruitment of dual-qualification nursing		C23 Research capacity				
teachers decision model	В3	C31 Assessment capacity				
	Clinical nursing skills assessment	C32 Intervention capacity				
		C41 Morphology and appearance				
	B4 Interview and lecture	C42 Expression skills				
	interview and recture	C43 Teaching skills				

2.2 Calculation of index weight

According to the hierarchical structure of the evaluation index system of dual-qualification nursing teacher recruitment, we can construct the judgment matrix by Yaahp software (version 7.5. http://www.yaahp.cn/). The experts construct comparative matrix by 1-9 scale method.[4] If i and j are equally important and is rated at 1; if i is extremely important than j is valued at 9 (table 2).

Valuation of C_{ij}	Definition
1	i and j are equally important
3	i is a little importance than j
5	i is obvious important than j
7	i is strong important than j
9	i is extremely important than j
2,4,6,8	intermediate value of adjacent judgments
Reciprocals of above	j has the reciprocal value when compared with i

Table 2. Meaning of 1-9 scale method

The comparative matrix of criterion layer compared with goal layer was shown in table 3.

Table 3 Pairwise comparative matrix of the main criteria with respect to A-B (consistency test, CR=0.0227, < 0.10)

A-B	B1	B2	B3	B4	wi
B1	1/1	2	2	1/2	0.2792
B2	1/2	1/1	1/1	1/2	0.1646
B3	1/2	1/1	1/1	1/2	0.1646
B4	2/1	2/1	2/1	1/1	0.3917

The relative weight of vectors was given directly by Yaahp software. The wi values are 0.2792, 0.1646, 0.1646, and 0.3917, respectively. Similarly, the comparative matrix of index layer compared with criterion layer was shown in table 4.

The wi values are 0.3333, 0.6667; 0.3338, 0.1416, 0.5247; 0.1667, 0.8333; 0.1638, 0.5390, 0.2973, respectively. And the wz values of the whole model are 0.0931, 0.1861, 0.0549, 0.0233, 0.0864, 0.0274, 0.1372, 0.0641, 0.2111, and 0.1164, respectively.

Table 4 Pairwise comparative matrix of the main criteria with respect to B-C (consistency test, B1-C CR=0.0000, < 0.10; B2-C CR=0.0517, < 0.10; B3-C CR=0.0000, < 0.10; B4-C CR=0.0089, < 0.10)

B1-C	C11	C12		w1	WZ
C11	1/1	1/2		0.3333	0.0931
C12	2/1	1/1		0.6667	0.1861
B2-C	C21	C22	C23	w2	
C21	1/1	3/1	1/2	0.3338	0.0549
C22	1/3	1/1	1/3	0.1416	0.0233
C23	2/1	3/1	1/1	0.5247	0.0864
B3-C	C31	C32		w3	
C31	1/1	1/5		0.1667	0.0274
C32	5/1	1/1		0.8333	0.1372
B4-C	C41	C42	C43	w4	
C41	1/1	1/3	1/2	0.1638	0.0641
C42	3/1	1/1	2/1	0.5390	0.2111
C43	2/1	1/2	1/1	0.2973	0.1164

2.3 Consistency validation

In order to guarantee the conclusion reasonable by applying AHP, we use Consistency Ratio (CR) as indicator to measure the deviation consistency of judgment matrix. If the CR is greater than 0.1, the judgments are untrustworthy because they are too close for comfort to randomness and the exercise is valueless or must be repeated.[5]

The Yaahp software also gives the CR directly. The CR value of criterion layer compared with goal layer is 0.0227<0.10, which indicate good consistency. The CR values of index layer compared with criterion layer are 0.0000, 0.0517, 0.0000, and 0.0089, respectively. They all less than 0.10, and indicate good consistency.

3 EMPIRICAL STUDY

To recruit a dual-qualification nursing teacher, there are three candidates participate in the recruitment. We used the above AHP and fuzzy comprehensive evaluation method for quantitative evaluation of the three candidates. The model was shown in figure 1.

Five experts assessed three candidates alone by the model. The scores of three candidates were listed in the table 5.



Figure. 1 Recruitment of dual-qualification nursing teachers decision model

В	C	Candidate 1					Candidate 2					Candidate 3							
		E1	E2	E3	E4	E5	Mean	E1	E2	E3	E4	E5	Mean	E1	E2	E3	E4	E5	Mean
D 1	C11	5	5	4	4	5	4.6	3	4	3	4	4	3.6	4	3	4	4	5	4
DI	C12	5	5	4	5	5	4.8	3	3	3	3	3	3	4	3	3	4	3	3.4
B2 C21 C23	C21	4	5	5	4	3	4.2	4	3	4	3	4	3.6	3	4	4	4	3	3.6
	C22	4	5	5	4	4	4.4	3	4	5	4	4	4	3	4	3	4	4	3.6
	C23	5	5	4	5	4	4.6	3	4	5	4	4	4	4	5	5	4	5	4.6
D2	C31	4	5	4	4	4	4.2	5	4	5	5	5	4.8	3	4	4	4	3	3.6
В3	C32	4	5	5	5	5	4.8	4	5	4	5	4	4.4	5	5	4	4	4	4.4
	C41	5	5	5	5	5	5	3	3	4	3	4	3.4	3	4	4	4	5	4
B4	C42	5	5	5	5	5	5	5	4	4	3	4	4	3	4	4	4	4	3.8
	C43	4	5	5	5	4	4.6	5	4	4	4	4	4.2	4	3	3	4	3	3.4

Table 5 Scores of three candidates by 5 experts (E)

Five experts assessed three candidates alone by the model. The scores of three candidates were listed in the table 5. The mean scores (H) of candidate 1 were 4.6, 4.8, 4.2, 4.4, 4.6, 4.2, 4.8, 5, 5, and 4.6, respectively. According to the formula (z=H*w), we calculated the score was 4.73716. Similarly, we

calculated the scores for candidate 2 and candidate 3 were 3.81632and 3.84076, respectively. Candidate 1 received the highest score of the three candidates.

So, candidate 1 was recruited as a dualqualification nursing teacher.

4 CONCLUSION

This paper sets up a comprehensive assessment system model for dual-qualification nursing teacher recruitment determined by AHP. The model provides a quantitative analyzing method for dualqualification nursing teacher recruitment.

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