Analysis of the Factors Influencing the Quality of Railway Operation Courses in Higher Vocational Education

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Abstract: In the new era, to achieve high-quality development of vocational colleges' majors, curriculum is the key support point, and an objective and scientific evaluation system for professional curriculum quality will greatly affect the quality of the curriculum. This article uses a structural equation model to construct an evaluation index system for the quality of vocational railway operation courses, which includes 4 first level indicators and 15 second level indicators. The evaluation of the quality of vocational railway operation courses in Hunan Province was conducted, with a score of 7.72. Corresponding countermeasures were proposed to address the problems that exist in the influencing factors of course quality.

1. Introduction

Entering the new era, China's railways still maintain a high-speed development trend, and the extensive application of advanced railway operation technology and equipment has greatly promoted the development of the railway industry. Railway operation majors have also become key majors for the development of railway vocational colleges. However, in the practical process of cultivating vocational talents, it has been found that students do not have comprehensive knowledge, are not proficient in practical skills, and their learning content does not match the actual situation on the railway site, which reflects the problem of low quality of some core courses[1,2]. Therefore, studying the current situation of curriculum quality in higher vocational railway operation majors, exploring the factors that affect curriculum quality, and proposing corresponding countermeasures are of great significance for the healthy development of the railway transportation industry.

In recent years, relevant educational experts, scholars, and front-line educators at home and abroad have conducted a large amount of research on curriculum quality, and have also proposed many mature concepts based on their respective research fields. However, there is no unified opinion on the specific definition and related connotation of curriculum quality. According to Yang Tongyi's research on higher education and teaching, the quality of higher education and teaching is largely influenced by the quality of courses in relevant majors and disciplines, and the quality of courses is the most basic requirement for achieving high-quality higher education[3]. Scholar Feng Xiaoyun has conducted relevant research on curriculum quality based on his own work experience, and elaborated on ways to improve curriculum quality from four aspects: teaching content, teaching methods, teaching evaluation, and teaching improvement[4]. Through investigation and research on college students, Huang Zhaoxin and other scholars have proposed the key points that need to be paid attention to in improving the quality of courses, mainly including the mode of curriculum implementation, the quality of the teaching staff, and student training mechanisms[5]. Yang Dongxiao's research on the improvement of curriculum quality indicates that the improvement of professional curriculum quality in colleges and universities depends on whether a sound teacher evaluation and incentive mechanism is established, whether students are taken as the main body of teaching in curriculum design, and whether strong support is provided to encourage excellent courses and excellent teachers[6]. Research by scholars such as Hao Li has shown that the main way to improve the quality of courses should be to establish a sound and complete teaching

mechanism, which should be comprehensively improved in theoretical learning, teacher development, and teaching structure. At the same time, the high quality level of courses should also maintain continuity[7].

In summary, currently in China, research on curriculum quality, especially on the influencing factors of curriculum quality, is mostly conducted using qualitative research methods by experts and scholars. There are few studies using quantitative research methods to find ways to improve curriculum quality, and the combination of the two methods to study curriculum quality is even rarer. At the same time, it is not difficult to find that there are few achievements in the research of curriculum quality in vocational railway majors, targeting a certain region or school. This article aims to use structural equation models to construct an evaluation index system for the quality of vocational railway operation courses in this specific field. At the same time, it verifies the evaluation system and identifies existing problems based on the current situation of this major in Hunan Province, Provide corresponding countermeasures to further improve the quality of the course.

2. Construction of Curriculum Quality Evaluation Index System and Questionnaire Design Analysis for Railway Operation Majors in Higher Vocational Education

2.1. Evaluation Index System for Curriculum Quality of Railway Operation Major in Higher Vocational Education

This article first clarifies the connotation of the research subject, and based on a large number of literature and research conclusions, determines the definition of curriculum quality. It believes that the core of curriculum quality is curriculum, and curriculum is the basic unit for education and teaching in related majors or disciplines. It is currently the main carrier for students and teachers to participate in teaching activities and complete educational tasks, The quality in curriculum quality refers to the ability representation of teachers or students to achieve explicit or implicit goals when completing teaching activities[8]. In summary, this article defines curriculum quality as the performance ability of teachers or students to achieve talent cultivation goals based on curriculum in educational and teaching activities.

This paper takes "the quality of railway operation courses in higher vocational colleges" as the overall target layer in the newly established evaluation index system. Through consulting the relevant research conclusions of predecessors and adopting the qualitative research method (interviewing enterprise experts and colleagues in the railway operation major in higher vocational colleges), after revising the model for four times, the quality evaluation index system of railway operation courses in higher vocational colleges is formed. The first level indicators are mainly divided into teaching staff, teaching implementation effect There are four aspects to the teaching method and curriculum setting of the course[9]. At the same time, 15 secondary indicators have been established, including teacher ethics and professional conduct, teacher professional background, curriculum setting method, and student employment situation. The specific indicator system is shown in Table 1, and the following assumptions are made:

H1: The more comprehensive the teaching staff, the higher the quality of the railway operation courses in vocational colleges;

H2: The more reasonable the curriculum, the higher the quality of the railway operation courses in vocational colleges;

H3: The more appropriate the course teaching, the higher the quality of the railway operation courses in vocational colleges;

H4: The better the implementation effect, the higher the quality of vocational railway operation courses.

Table 1 Evaluation Index System for Curriculum Quality of Railway Operation Major in Higher Vocational Education

Primary indicators	Secondary indicators	Code name
Faculty SZDW	Does the teacher have a certain professional background	SZDW1
	Does the teacher have good professional ethics and conduct	SZDW2
	Whether the teacher has good teaching ability	SZDW3
	Is the training and assessment system for teachers perfect	SZDW4
Curriculum Setup KCSZ	Whether the curriculum training plan is set reasonably	KCSZ1
	Whether the course content meets the teaching objectives	KCSZ2
	Whether the course assessment standards, methods, and content are reasonable	KCSZ3
	Whether the course proportion is set reasonably	KCSZ4
Course Teaching KCJX	Is the teacher's teaching attitude correct during the course of teaching	KCJX1
	Whether the teacher adopts appropriate teaching methods	KCJX2
	Whether the teaching resources are reasonably used	KCJX3
	Do you have good classroom organization skills	KCJX4
Implementation effect SSXG	Whether there is a good curriculum evaluation system	SSXG1
	Is the student learning well	SSXG2
	Whether students have good social adaptability	SSXG3

2.2. Data Sources

This article designs a relevant survey questionnaire based on the quality evaluation index system in vocational railway operation courses. Teachers, railway station and depot employees, and outstanding graduates from this major are invited to conduct a questionnaire survey. The questionnaire results are collected through electronic questionnaires and interview interviews. The questionnaire is rated using the Likert five level scale method, with 1 point representing the lowest correlation of the relevant problem and 5 points representing the highest correlation of the relevant problem. A total of 300 questionnaires were distributed this time, and 295 valid questionnaires were collected.

2.3. Reliability and Validity Analysis

Based on SPSS22.0, the reliability and validity of the samples in the questionnaire were tested. Through analysis, the Cronbach coefficient of the questionnaire was 0.855, indicating that the reliability of the questionnaire was good; The KMO value is 0.858, indicating that the factors in this questionnaire are suitable for factor analysis. The Bartlett spherical test coefficient is significant, and the correlation between the factors is high. The value of the CITC coefficient between populations in the tested questionnaire is between 0.35 and 0.5, indicating that it has passed the reliability test. The Clonbach coefficient between the four secondary indicators is greater than 0.7, which is within the acceptable range[10]. Next, conduct structural equation model testing.

3. Analysis of Course Quality Evaluation for Railway Operation Majors in Higher Vocational Education Based on SEM

This article uses AMOS22.0 to establish a structural equation model of the curriculum quality evaluation system for higher vocational railway operation majors, and uses the maximum likelihood method to estimate the parameters of the structural equation model for curriculum quality evaluation. The data collected in the previous article are substituted into the structural equation model to analyze the correlation between the four primary indicators, while analyzing the load values of 15 secondary indicators, and finally determining the fitting degree of the curriculum

quality evaluation model for higher vocational railway operation majors, The structural equation model of the evaluation index system is shown in Figure 1.
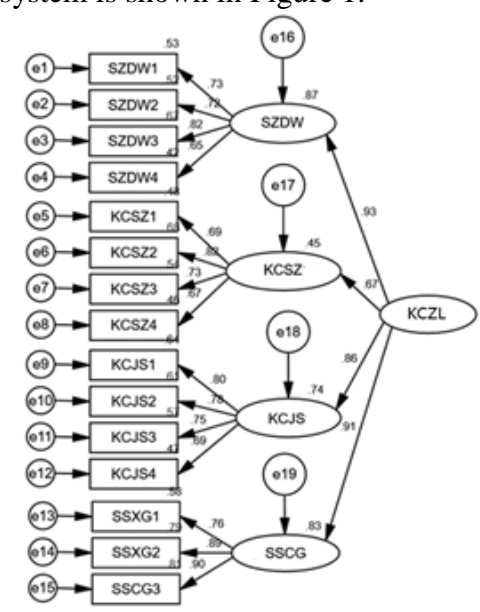

Figure 1 Course Quality Analysis of Railway Operation Major in Higher Vocational Education Based on SEM

Table 2 Parameter Estimation for Course Quality Analysis of Railway Operation Major in Higher Vocational Education Based on SEM

Path coefficient	Estimate	Standardization Estimated value	S.E.	C.R.	P
SZDW<-KCZL	.989	.933	.072	13.832	***
KCSZ<-KCZL	.594	.673	.064	9.285	***
KCJX<-KCZL	.764	.862	.064	11.921	***
SSXG<-KCZL	1.000	.910			
SSXG3<-SSXG	1.000	.902			
SSXG2<-SSXG	.953	.887	.044	21.446	***
SSXG1<-SSXG	.872	.762	.053	16.356	***
SZDW3<-SZDW	1.000	.819			
SZDW2<-SZDW	.833	.719	.064	13.042	***
SZDW1<-SZDW	.844	.726	.064	13.214	***
KCSZ3<-KCSZ	1.000	.732			
KCSZ2<-KCSZ	1.211	.823	.097	12.530	***
KCSZ1<-KCSZ	1.039	.695	.095	10.910	***
SZDW4<-SZDW	.860	.651	.074	11.550	***
KCSZ4<-KCSZ	.955	.675	.090	10.607	***
KCJS3<-KCJX	1.000	.753			
KCJS2<-KCJX	1.103	.783	.084	13.116	***
KCJS1<-KCJX	1.093	.797	.082	13.351	***
KCJS4<-KCJX	.887	.688	.077	11.461	***

Note: * represents significant at the 0.05 level, * * represents significant at the 0.01 level, and * * represents significant at the 0.001 level.

Through analysis, it can be concluded that the various indicators of the structural equation model perform well, and the model has a high degree of fit. Among them, the model's RMSEA value is 0.08, <0.10; The GFI value of the model is 0.89, close to 0.9; The CFI value of the model is 0.766, <0.9; The AGFI value of the model is 0.847, close to 0.9. The parameter estimates for each primary and secondary index of the structural equation model are shown in Table 2.

From the data in the table above, it can be seen that the P values of various indicators in the curriculum quality evaluation model for higher vocational railway operation specialty constructed in this article have reached a significant level. The weight of various indicators in the model in the curriculum quality evaluation system for higher vocational railway operation specialty has been calculated, and the results are shown in Table 3.

Table 3 Weights of first and second level indicators for the quality evaluation of railway operation courses in vocational colleges

Primary indicators	Route coefficient	Index weight	Secondary indicators	Code name	Index load	Index weight
Faculty SZDW	0.93	0.276	Does the teacher have a certain professional background	SZDW1	0.73	0.250
			Does the teacher have good professional ethics and conduct	SZDW2	0.72	0.246
			Whether the teacher has good teaching ability	SZDW3	0.82	0.280
			Is the training and assessment system for teachers perfect	SZDW4	0.65	0.223
Curriculum Setup KCSZ	0.67	0.199	Whether the curriculum training plan is set reasonably	KCSZ1	0.69	0.237
			Whether the course content meets the teaching objectives	KCSZ2	0.82	0.282
			Whether the course assessment standards, methods, and content are reasonable	KCSZ3	0.73	0.251
			Whether the course proportion is set reasonably	KCSZ4	0.67	0.230
Course Teaching KCJX	0.86	0.255	Is the teacher's teaching attitude correct during the course of teaching	KCJX1	0.80	0.265
			Whether the teacher adopts appropriate teaching methods	KCJX2	0.78	0.258
			Whether the teaching resources are reasonably used	KCJX3	0.75	0.248
			Do you have good classroom organization skills	KCJX4	0.69	0.228
Implementation effect SSXG	0.91	0.270	Whether there is a good curriculum evaluation system	SSXG1	0.76	0.298
			Is the student learning well	SSXG2	0.89	0.349
			Whether students have good social adaptability	SSXG3	0.90	0.353

4. Case Analysis

At present, three vocational colleges in Hunan Province offer railway operation majors, namely Hunan Railway Science and Technology Vocational and Technical College, Hunan High Speed Railway Vocational and Technical College, and Hunan Railway Vocational and Technical College. The railway operation majors of the three vocational colleges all involve professional courses such as railway lines and yards, receiving and dispatching train work, station shunting work, station operation planning and statistics, The professional courses mainly cultivate the ability of graduates to hold positions related to train operation, passenger transportation, and freight transportation in

railway transportation enterprises, and they need to master specific operational skills of railway transportation grassroots station equipment.

We are currently evaluating the quality of the curriculum for the railway operation major in Hunan Province. This article invites 15 professionals from the railway industry, teachers from vocational colleges, outstanding graduates of this major, and student representatives to evaluate and score the questionnaire content based on the actual quality of the curriculum according to the evaluation system for the railway operation major in Hunan Province. Those who are most satisfied are scored 10 points, and then their scores are reduced in sequence until they are least satisfied, The final score is based on the average score of the 15 participants in the survey, and the weights of each indicator are calculated using a linear equation system. The formula for the linear equation system is as follows:

Score of course quality evaluation for Hunan Higher Vocational Railway Operation Major=0.276 × Teaching staff+0.199 × Curriculum+0.255 × Course teaching+0.27 × Implementation effect;

Teaching staff=SZDW1 * 0.250+SZDW2 * 0.246+SZDW3 * 0.280+SZDW4 * 0.223

Course setting=KCSZ1 * 0.237+KCSZ2 * 0.282+KCSZ3 * 0.251+KCSZ4 * 0.230

Course teaching=KCJX1 * 0.265+KCJX2 * 0.258+KCJX3 * 0.248+KCJX4 * 0.228

Implementation effect=SSXG1 * 0.298+SSXG2 * 0.349+SSXG3 * 0.353

Based on the average score of 15 questionnaire respondents, the scores of each primary and secondary indicator, as well as the scores of the curriculum quality of Hunan Province's vocational railway operation major, can be obtained. The results are shown in Table 4 below:

Table 4 Score of Course Quality for Railway Operation Major in Higher Vocational Education in Hunan Province

Primary indicators	Secondary indicators	Level2 Index Score	Level1 Index Score	Course Quality Score
Faculty SZDW	Does the teacher have a certain professional background	6.12	7.02	7.72
	Does the teacher have good professional ethics and conduct	7.41		
	Whether the teacher has good teaching ability	7.32		
	Is the training and assessment system for teachers perfect	7.23		
Curriculum Setup KCSZ	Whether the curriculum training plan is set reasonably	6.54	7.65	
	Whether the course content meets the teaching objectives	7.35		
	Whether the course assessment standards, methods, and content are reasonable	8.52		
	Whether the course proportion is set reasonably	8.23		
Course Teaching KCJX	Is the teacher's teaching attitude correct during the course of teaching	8.83	7.98	
	Whether the teacher adopts appropriate teaching methods	7.33		
	Whether the teaching resources are reasonably used	7.47		
	Do you have good classroom organization skills	8.32		
Implementation effect SSXG	Whether there is a good curriculum evaluation system	8.45	8.24	
	Is the student learning well	8.33		
	Whether students have good social adaptability	7.98		

According to the above formula, the overall score of the course quality of Hunan Province's higher vocational railway operation major is 7.72 points. According to the five level classification method, it can be concluded that the quality level of Hunan Province's higher vocational railway

operation major course is moderate. Among them, the calculation results show that the scores of the teaching staff, curriculum design, curriculum teaching, and implementation effectiveness in the curriculum quality of the railway operation major in Hunan Province are 7.02 points, 7.65 points, 7.98 points, and 8.24 points, all of which are above the average level. Therefore, the following suggestions are proposed for the teaching staff, curriculum design, curriculum teaching, and implementation effectiveness in the curriculum quality of this major in Hunan Province.

(1) In terms of the school's teaching staff. The goal is to cultivate a professional teaching team with high professional quality, rich theoretical knowledge, strong social practice ability, and outstanding organizational and coordination ability. Through various training, talent introduction, and external recruitment, the construction of the vocational college teaching team should be strengthened. Vocational colleges should continue to explore curriculum teaching methods, continuously encourage teachers to innovate teaching, and take "teaching as the foundation" to further improve the quality of curriculum teaching and the output rate of teaching results, At the same time, it is necessary to strengthen the assessment and rewards of teachers' practical teaching abilities, relying on the cultivation of double qualified teachers, promoting a rich reserve of practical skill based knowledge for teachers, and actively playing the role of external teachers hired by various enterprises or related majors, further improving the overall structure of the teaching staff.

(2) In terms of course design. Based on the continuous optimization of the quality system of railway operation professional courses, highlighting the importance of training equipment, strengthening investment in training equipment, and improving students' practical abilities in train operation command and passenger and freight transportation organization through training classrooms. At the same time, vocational colleges should combine their own advantages, strengthen cooperation between schools and enterprises and the integration of industry and education, actively cooperate with major railway bureaus and subordinate stations, jointly build industry academia research platforms, strive for funds to establish training bases, improve training equipment, and ensure that students' practical courses can proceed smoothly.

(3) In terms of course teaching. Unlike undergraduate teaching methods, curriculum teaching in vocational colleges should pay more attention to the improvement of practical abilities, rather than focusing on the teaching of theoretical knowledge. This emphasizes the need to pay attention to the reasonable application of teaching concepts and methods in the curriculum teaching process, and truly achieve the organic combination of "teaching and doing". The training objectives for students should be based on the improvement of practical abilities. The importance of "dual certificates" can be continuously emphasized to students majoring in railway operations, and the concept of "semi military" railway management can be used to cultivate students' professional literacy. Students in this major should be aware of the importance of obtaining professional skills certificates such as "assistant duty officer, passenger transport officer, and freight forwarder" before graduation, Schools can also make "dual certificate integration" a mandatory requirement for graduation based on actual conditions, providing specific directions for students' curriculum learning.

(4) In terms of implementation effectiveness. The evaluation of the quality of railway operation courses in higher vocational colleges should no longer adopt the traditional evaluation method. It is necessary to abandon the use of test paper scores as the sole criterion for evaluating students' participation in courses or the quality of courses. A more scientific, comprehensive, and objective evaluation standard system should be established based on the talent needs of railway operation related enterprises, and should be combined with the key points in daily course teaching, such as performance in collective discussions In practical training, the ability to deal with emergencies under abnormal circumstances and the frequency of asking questions to enterprise experts are discussed. At the same time, an objective and scientific academic performance evaluation system is constructed based on the training requirements of various professional courses, which in turn promotes the continuous improvement and improvement of the quality of professional courses.

5. Conclusions

Based on the research on the factors affecting the quality of railway operation courses in

vocational colleges, it can be seen that in order to improve the quality of professional courses, the goal must be to cultivate high-quality technical and skilled talents, strengthen cooperation between schools and enterprises, focus on cultivating students' practical abilities, achieve the integration of engineering and learning, continuously innovate the teaching mode of railway operation courses, and highlight the importance of vocational colleges, schools, teachers Only by taking into account the characteristics of different subjects such as students and their respective growth and development can we provide stronger talent support for the development of the railway industry. This article only focuses on the quality of railway operation courses in vocational colleges in Hunan Province as the main research object, and the ability is limited, which does not well reflect the key factors of the course quality of this major. In future research, we will continue to increase research in this field, providing strong support for the high-quality development of this major and also providing strong support for the high-quality development of China's railway industry.

Acknowledgement

References

[1] Gao, S. (2022) The Dilemma and Strategies of Implementing Vocational Training in Higher Vocational Talent Cultivation. Education and Teaching Forum, 41, 133-136.

[2] He, Z. (2013) Analysis of Issues and Promoting Policies in the Cooperation between Vocational Education Schools and Enterprises. Research on Chinese Higher Education, 01, 90-93.

[3] Yang, T.Y. (2014) Reflections on the Purpose and Perspective of University Curriculum Construction. Shandong Higher Education, 10, 53-61.

[4] Feng, X.Y., Hao, L. (2018) Exploring the Construction of a Curriculum Quality System Centered on Student Learning and Development. Chinese University Teaching Xue, 04, 71-75-52.

[5] Huang, Z.X, Du, J.C. (2020) A Study on the Satisfaction of College Students with the Quality of Innovation and Entrepreneurship Courses in the Construction of "Double First Class" Universities. Journal of East China Normal University (Education Science Edition), 38 (12), 33-41.

[6] Yang, D.X. (2020) Research on Strategies for Improving the Quality of Graduate Curriculum from the Perspective of Curriculum Subject Motivation. Degree and Graduate Education, 01, 43-47.

[7] Hao, L., D, N., Z, Z.W., L, C.H. (2019) Applying Learning Organization Theory to Construct a Mechanism for Improving the Quality of Higher Education Curriculum. China Higher Education Research, 08, 87-93.

[8] Ding, C.C., Chen, B.G. (2017) Diagnosis and Improvement Strategies for Curriculum Quality in Vocational Colleges. Vocational and Technical Education, 38 (08), 55-58.

[9] Y, Y.H. (2015) Research and Construction of a Curriculum Evaluation Index System in Universities.4 (1), 70.

[10] Zhang, Y., Zhou, P.H. (2015) Statistics and Analysis of Quantitative Data in Educational Research - Application Case Analysis Based on SPSS. Beijing: Peking University Press, 6, 264-265.