

The Network Structure Characteristics of Primary School Physical Education Teachers' Core Competence under the Background of Teacher Certification

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Abstract: Through the methods of literature, questionnaire, interview, mathematical statistics and social network analysis, this paper analyzes the data related to the core competence of primary school physical education teachers in Dazhou by using the statistical analysis of Spss and Pajek. Research purpose: on this basis, determine the index composition of primary school physical education teachers' core competence, and build a core competence network. Research conclusion: The network indicators of primary school physical education teachers' core competence mainly include eight categories and 23 indicators. Each indicator represents a node in the network. Through calculation, determine whether there is "edge" between nodes, draw a matrix of "edge", and build the network of primary school physical education teachers' core competence. The research analyzed the relevant statistical indicators (degree, degree distribution, average path length) and found that it is a scale-free network with the characteristics of small-world network. In the process of its evolution and upgrading, robustness and vulnerability appear. The research suggests that its core nodes are subject quality (professional ability), class management (class and group activities), comprehensive ability (knowledge of education, sports and cultural heritage), learning to reflect (professional planning), and communication and cooperation (communication and exchange).

1. Introduction

Teachers are the primary resource for educational development, and the level of their teaching abilities directly affects the process of educational modernization. However, the ability and quality of teachers in the current compulsory education stage are difficult to meet the needs of talent cultivation in the new era. In 2017, in order to implement the spirit of the 19th National Congress of the Communist Party of China, cultivate a high-quality teaching team, in accordance with the requirements of the 13th Five Year Plan for the development of national education, promote the construction of a quality assurance system for teacher education, and improve the quality of teacher training professionals, the Ministry of Education of China issued the "Implementation Measures for Teacher Education Professional Certification in Ordinary Higher Education Institutions (Provisional)" Teacher [2017] No. 13, Decided to carry out the certification work for teacher training majors in ordinary higher education institutions. In October 2017, the Ministry of Education officially issued the "Implementation Measures for the Certification of Normal Majors in Ordinary Higher Education Institutions (Provisional)", which comprehensively carried out three-level certification work for undergraduate and vocational majors in five categories: preschool education, primary education, secondary education, vocational and technical teacher education, and special education. The background of teacher professional certification promotes the integrated development of teachers' pre service and post service. Therefore, in the context of teacher professional certification, the cultivation and improvement of core competencies of primary school physical education teachers can be compared with core competencies for new teachers, qualified teachers, and expert teachers to improve the quality level of teachers in a short period of time, in order to enhance the essential character, innovation ability, cooperation ability, and exploration ability of students.

2. Empirical Study on the Selection of Core Competence Network Nodes for Primary School Physical Education Teachers

2.1 Preparation of the Initial Questionnaire on Core Competencies of Primary School Physical Education Teachers

The research refers to the results of various domestic policies at all levels based on the professional certification of teachers, the standards of physical education teachers' qualification certificates, and the research literature on the professional ability of physical education teachers. In combination with several experts engaged in the field of physical education teacher education, primary and secondary school physical education teachers, and interns, the experts were interviewed. The questionnaire was in the form of a five level Likert scale.

During the anonymous period from January 2023 to February 2023, we consulted research experts on physical education teachers in Sichuan Province, including Huang and Qing; Staff of the Cultural, Sports and Tourism Bureau: Yao and Wu; Teacher of Tongchuan Primary School: Wang and Zhou; Teacher managers of Tongchuan Eighth Primary School: Wang and Yin; Opinions of intern teachers Hu and Huang from Lianhu Primary School. On the basis of providing relevant materials and oral explanations, after scoring, the relative importance of the indicators will be scored based on personal opinions, without considering personal authority. For the convenience of scoring, reference points for each level will be provided. As shown in Table 1, after scoring, calculate the importance M_j (average score), dispersion S_j (variance), and coefficient of variation V_j (dispersion S_j /importance M_j) of each evaluation indicator. This study mainly evaluates the indicators of core competencies of primary school physical education teachers under the background of teacher certification. The first round of indicators are: teacher ethics standards, professional sentiment, subject literacy, teaching literacy, class management, comprehensive ability, learning to reflect, and communication and cooperation.

Table 1 List of Importance, Dispersion, and Coefficient of Variation of First Level Indicators in the First Round of Expert Questionnaire

Primary indicators	Importance M_j	Discreteness S_j	Coefficient of variation V_j
Professional ethics standards	4.6	0.4899	0.1065
Professional sentiment	4.6	0.4899	0.1065
Discipline literacy	4.2	0.7483	0.1782
Teaching literacy	4.5	0.5000	0.1111
Class management	4.4	0.6633	0.1508
Comprehensive ability	4.4	0.4899	0.1113
Learn to reflect	4.5	0.6708	0.1491
Communication and cooperation	4.5	0.5000	0.1111

For the first level indicators, according to the scoring statistics of experts on the core competence indicator system of primary school physical education teachers, as shown in Table 1, it can be seen that experts believe that the importance level M_j of the eight indicators, namely “teacher ethics standards”, “professional sentiment”, “subject literacy”, “teaching literacy”, “class management”, “comprehensive ability”, “learning to reflect”, and “communication and cooperation”, is higher than 4.0, indicating a high level of importance, And the obtained coefficient of variation reflects the high degree of coordination among experts on these eight indicators. Therefore, the study chose to retain the next round of scoring for these eight indicators.

Among them, the 24 secondary indicators are shown in Table 2 based on the results of the second round of expert survey.

For the secondary indicators, it can be seen from the scoring statistics of the secondary indicators in the core competence indicator system of primary school physical education teachers by experts, as shown in Table 2.

Table 2 List of Importance, Dispersion, and Coefficient of Variation of Secondary Indicators in the Second Round of Expert Questionnaire

Number	Secondary indicators	Importance Mj	Discreteness Sj	Coefficient of variation Vj
1	Teacher's Ethics Cognition	4.6	0.4899	0.1065
2	Teacher's moral behavior	4.9	0.3000	0.0612
3	Professional Identity	4.6	0.4899	0.1065
4	self-cultivation	4.7	0.4583	0.0975
5	Professional responsibility	4.5	0.5000	0.1111
6	basic literacy	4.3	0.6403	0.1489
7	Capability	3.8	0.4000	0.1053
8	Professional competence	4.4	0.4899	0.1113
9	Application improvement	4.6	0.4899	0.1065
10	Teaching philosophy	4.5	0.5000	0.1111
11	pedagogical content knowledge	4.7	0.4583	0.0975
12	Instructional design	4.6	0.6633	0.1442
13	Moral consciousness	4.3	0.6403	0.1489
14	Management Experience	4.4	0.6633	0.1508
15	Class and group activities	4.5	0.5000	0.1111
16	Education knowledge	4.4	0.4899	0.1113
17	As a sportsman	4.5	0.5000	0.1111
18	Cultural heritage	4.5	0.5000	0.1111
19	Professional development	4.6	0.4899	0.1065
20	specialized planning	4.6	0.4899	0.1065
21	Reflection and improvement	4.5	0.6708	0.1491
22	Collaborative Experience	4.7	0.4583	0.0975
23	team spirit	4.7	0.4583	0.0975
24	communication	4.4	0.6633	0.1508

In terms of teacher ethics norms, experts believe that the importance level Mj of the two indicators of “teacher ethics cognition” and “teacher ethics behavior” is higher than 4.0, indicating high importance. Moreover, the obtained coefficient of variation reflects the high degree of coordination of experts' opinions on these two indicators.

In terms of professional sentiment, experts believe that the importance level Mj of the three indicators of “professional identity”, “self cultivation”, and “professional responsibility” is higher than 4.0, indicating high importance. Moreover, the obtained coefficient of variation reflects the high degree of coordination among experts on these three indicators.

In terms of disciplinary literacy, experts believe that the importance level Mj of the three indicators of “basic literacy”, “professional ability”, and “application improvement” is higher than 4.0, indicating high importance. Moreover, the obtained coefficient of variation reflects the high coordination of experts' opinions on these three indicators. For the indicator of “basic ability”, $M_j < 4.0$ indicates that the importance of this indicator is relatively low, and based on the obtained coefficient of variation $V_j < 3.0$, it reflects the high degree of coordination among experts on this indicator.

In terms of teaching literacy, experts believe that the importance level Mj of the three indicators of “teaching philosophy”, “teaching knowledge”, and “teaching design” is higher than 4.0, indicating high importance. Moreover, the obtained coefficient of variation reflects the high coordination of experts' opinions on these three indicators.

In terms of class management, experts believe that the importance level Mj of the three indicators of “moral education awareness”, “management experience”, and “class group activities” is higher than 4.0, indicating high importance. Moreover, the obtained coefficient of variation reflects the high degree of coordination of experts' opinions on these three indicators.

In terms of comprehensive ability, experts believe that the importance level Mj of the three indicators of “education knowledge”, “sports education”, and “cultural inheritance” is higher than

4.0, indicating high importance. Moreover, the obtained coefficient of variation reflects the high coordination of experts' opinions on these three indicators.

In terms of learning to reflect, experts believe that the importance level M_j of the three indicators of “professional development”, “professional planning”, and “reflective improvement” is higher than 4.0, indicating high importance. Moreover, the obtained coefficient of variation reflects the high coordination of experts' opinions on these three indicators.

In terms of communication and cooperation, experts believe that the importance level M_j of the three indicators of “cooperation experience”, “team spirit”, and “communication and exchange” is higher than 4.0, indicating high importance. The coefficient of variation obtained reflects the high degree of coordination of experts' opinions on these three indicators.

Based on the results of the first and second rounds of expert scoring surveys, analyze and compare the results. The core competencies of primary school physical education teachers are determined as follows: teacher ethics norms (teacher ethics cognition, teacher ethics behavior), professional sentiment (professional identity, self-cultivation, and professional responsibility), subject literacy (basic literacy, professional ability, application improvement), teaching literacy (teaching philosophy, teaching knowledge, teaching design), class management (moral awareness, management experience, class activities) Comprehensive ability (education knowledge, sports skills, cultural inheritance), learning to reflect (professional development, professional planning, reflection and improvement), communication and cooperation (cooperative experience, teamwork spirit, communication and exchange). An analysis will be conducted below.

2.2 Empirical Exploration and Verification of the Core Competence Measurement Questionnaire for Primary School Physical Education Teachers

Based on the results of expert interviews and literature review, an initial questionnaire was prepared and a preliminary survey was conducted. After revising the questionnaire, it was distributed again. A convenient sampling online questionnaire survey was conducted on 20 in-service physical education teachers and 13 physical education internship teachers from 6 local primary schools in Dazhou City (Lianhu No.1 Primary School, Tongchuan No.1 Primary School, Tongchuan No.2 Primary School, Dachuan District Experimental Primary School, Jinshan Primary School, and Fengbei Primary School). 33 questionnaires were distributed, 33 questionnaires were collected, and 33 valid questionnaires were collected, with an effective recovery rate of 100%. The reliability of the questionnaire was tested using the half way method. The value of the half way coefficient is equal to 0.845, and the reliability coefficient is greater than 0.8, indicating that the internal stability of the questionnaire is good. After further reliability and validity tests, it was determined that the core competency network nodes of primary school physical education teachers mainly include eight categories: teacher ethics norms (teacher ethics cognition, teacher ethics behavior), professional sentiment (professional identity, self-cultivation, and professional responsibility), subject literacy (basic literacy, professional ability, application improvement), teaching literacy (teaching philosophy, teaching knowledge, and teaching design) Class management (moral education awareness, management experience, class and group activities), comprehensive abilities (education knowledge, sports education, cultural inheritance), learning to reflect (professional development, professional planning, reflection and improvement), communication and cooperation (cooperative experience, team spirit, communication and exchange). An analysis will be conducted below.

2.3 Determination of Core Competence Network Edge for Primary School Physical Education Teachers

For the drawing of the core competency network diagram of primary school physical education teachers, the edges between core competency nodes are determined by the interrelationships between core competency nodes, which are generally determined through correlation. In the process of serving as a primary school physical education teacher, whether their ability to regulate their professional ethics is related to their class management ability, and whether their comprehensive ability will also affect their communication and cooperation ability. These similar questions can be

described by the correlation coefficient between variables.

After using SPSS software to calculate the correlation coefficients between each node, according to the Pearson result ($P < 0.05$) recognized by most statisticians, it is considered that there is a linear correlation between the two variables, indicating the existence of an “edge” between the two nodes. See Figure 1.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	1	0.304	0.194	.353*	0.297	.349*	0.225	.388*	0.292	0.289	.419*	0.21	0.148	.425*	.415*	0.152	.410*	0.185	0.268	0.114	0.33	0.23	0.304
2	0.304	1	.505**	.461**	0.134	.437*	0.33	.462**	0.343	0.329	.488**	.417*	.401*	.440*	.360*	0.283	.550**	.368*	.577**	0.264	0.286	0.045	.372*
3	0.194	.505**	1	.535**	0.165	.440*	.509**	.490**	.388*	0.246	0.3	.529**	.423*	.460**	.385*	.374*	.357*	.466**	.424*	0.294	0.122	0.179	.392*
4	.353*	.461**	.535**	1	.512**	.554**	0.34	.524**	0.332	0.188	0.232	0.168	0.254	.491**	.432*	.399*	0.286	0.319	.366*	0.149	0.253	0.239	.332
5	0.297	0.134	0.165	.512**	1	.434*	0.343	.421*	0.295	0.33	0.126	0.153	0.224	.466**	.445**	.457**	.399*	0.325	.377*	0.149	.353*	.458**	.421*
6	.349*	.437*	.440*	.554**	.434*	1	.638**	.407*	.698**	0.195	.484**	.526**	0.293	.636**	.612**	.710**	.568**	.584**	.451**	0.203	0.232	0.321	.475**
7	0.225	0.33	.509**	0.34	0.343	.638**	1	.649**	.509**	.602**	.445**	.629**	0.33	.741**	.416*	.743**	.754**	.676**	.490**	.449**	0.33	.520**	.443**
8	.388*	.462**	.490**	.524**	.421*	.407*	.649**	1	0.282	.662**	0.327	.577**	.394*	.753**	.475**	.574**	.546**	.508**	.614**	.410*	.443**	.532**	.436*
9	0.292	0.343	.388*	0.332	0.295	.698**	.509**	0.282	1	0.161	.605**	.551**	.484**	.499**	.669**	.486**	.596**	.486**	.567**	.388*	0.296	.502**	.700**
10	0.289	0.329	0.246	0.188	0.33	0.195	.602**	.662**	0.161	1	0.246	.514**	.387*	.550**	.379*	.591**	.472**	.385*	.548**	.552**	.585**	.440*	.511**
11	.419*	.488**	0.3	0.232	0.126	.484**	.445**	0.327	.605**	0.246	1	.529**	.353*	.427*	.523**	0.318	.650**	.530**	.444**	.392*	.483**	0.293	.399*
12	0.21	.417*	.529**	0.168	0.153	.526**	.629**	.577**	.551**	.514**	.529**	1	0.315	.536**	.678**	.562**	.458**	.373*	.476**	.492**	.379*	0.321	.434*
13	0.148	.401*	.423*	0.254	0.224	0.293	0.33	.394*	.484**	.387*	.353*	0.315	1	.431*	.602**	.402*	.589**	.480**	.392*	.483**	.491**	.851**	
14	.425*	.440*	.460**	.491**	.466**	.636**	.741**	.753**	.499**	.550**	.427*	.536**	.431*	1	.518**	.668**	.657**	.472**	.580**	.521**	.543**	.659**	.541**
15	.415*	.360*	.385*	.432*	.445**	.612**	.416*	.475**	.669**	.379*	.523**	.478**	.602**	.518**	1	.488**	.516**	.643**	.765**	.520**	.562**	.390*	.807**
16	0.152	0.283	.374*	.399*	.457**	.710**	.743**	.574**	.486**	.591**	0.318	.562**	.402*	.668**	.488**	1	.534**	.674**	.548**	.366*	.513**	.640**	.574**
17	.410*	.550**	.357*	0.286	.399*	.568**	.754**	.546**	.596**	.472**	.650**	.458**	.589**	.657**	.516**	.534**	1	.609**	.592**	.455**	.482**	.515**	.623**
18	0.185	.368*	.466**	0.319	0.325	.584**	.676**	.508**	.486**	.385*	.530**	.373*	.480**	.472**	.643**	.674**	.609**	1	.733**	.371*	.432**	.420*	.571**
19	0.268	.577**	.424*	.366*	.377*	.451**	.490**	.614**	.567**	.548**	.444**	.476**	.738**	.580**	.765**	.548**	.592**	.733**	1	.582**	.543**	.485**	.825**
20	0.114	0.264	0.294	0.149	0.149	0.203	.449**	.410*	.388*	.552**	.392*	.492**	.595**	.521**	.520**	.366*	.455**	.371*	.582**	1	.677**	.392*	.622**
21	0.33	0.286	0.122	0.253	.353*	0.232	0.33	.443**	0.296	.585**	.483**	.379*	.478**	.543**	.562**	.513**	.482**	0.334	.542**	.677**	1	.526**	.575**
22	0.23	0.045	0.179	0.239	.458**	0.321	.520**	.532**	.502**	.440*	0.293	0.321	.491**	.659**	.390*	.640**	.515**	.420*	.485**	.392*	.526**	1	.609**
23	0.304	.372*	.392*	0.332	.421*	.475**	.443**	.436*	.700**	.511**	.399*	.434*	.851**	.541**	.807**	.574**	.623**	.571**	.825**	.622**	.575**	.609**	1

* Correlation is significant at the 0.05 level (2-tailed).
 ** Correlation is significant at the 0.01 level (2-tailed).

Fig.1 Screenshot of the Correlation Coefficient Matrix

After obtaining the correlation coefficient, the Pearson coefficient is used to determine the existence of the “edge” in the network structure of primary school sports core abilities. Among them, 1 represents the existence of an edge between the nodes in this row and column, and 0 represents the absence of an edge between the two, as shown in Figure 2. It was calculated that there are a total of 373 edges.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	1	0	0	1	0	1	0	1	0	0	1	0	0	1	1	0	1	0	0	0	0	0	0
2	0	1	1	1	0	1	0	1	0	0	1	1	1	1	1	0	1	1	1	0	0	0	1
3	0	1	1	1	0	1	1	1	1	0	0	1	1	1	1	1	1	1	1	0	0	0	1
4	1	1	1	1	1	1	0	1	0	0	0	0	0	1	1	1	0	0	1	0	0	0	1
5	0	0	0	1	0	1	0	1	0	0	0	0	0	1	1	1	1	0	1	0	1	0	1
6	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	0	0	0	1
7	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1
8	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1
9	0	0	1	0	0	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1
10	0	0	0	0	0	0	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1
11	1	1	0	0	0	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	1	0	1
12	0	1	1	0	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0
13	0	1	1	0	0	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
15	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
16	0	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1
17	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
18	0	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1
19	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
20	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
21	0	0	0	0	1	0	0	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1
22	0	0	0	0	1	0	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1
23	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Fig.2 Screenshot of Spss Program Calculation While Running Results

3. Framework Construction of Core Competence Network Structure for Primary School Physical Education Teachers

3.1 Topological Diagram of the Overall Network Structure of Primary School Physical Education Teachers' Core Competencies

Based on the matrix of “edges” obtained above, convert it into net format and use Pajek drawing software to draw a topology map of the network structure of primary school physical education teachers' core abilities (hereinafter referred to as the topology map), as shown in Figure 3. Each point in the graph represents a secondary indicator of a primary school physical education teacher's core competencies, and the connection between each two nodes represents the edges of the network

structure topology. The overall network structure topology of primary school physical education teachers' core competencies mainly includes 23 nodes and 373 edges.

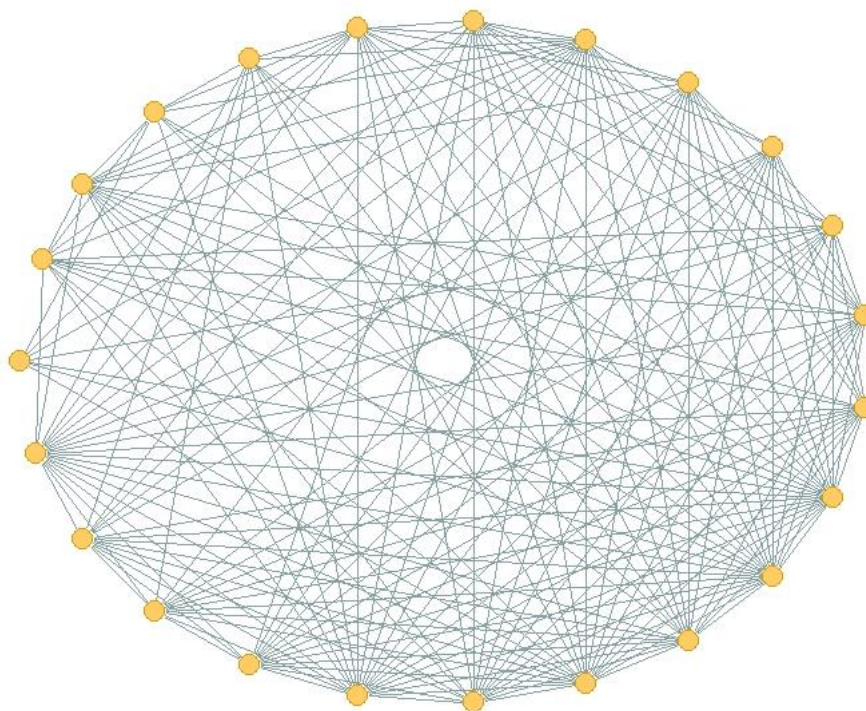


Fig.3 Topological Diagram of the Core Competence Network Structure of Primary School Physical Education Teachers

3.2 Characteristics of the Overall Network Structure of Core Competencies of Primary School Physical Education Teachers

3.2.1 The “Degree” of the Overall Network Structure of the Core Competencies of Primary School Physical Education Teachers

Degree represents the number of connections between node 1 and other nodes, denoted as K_1 [1]. In the overall network topology of primary school physical education teachers' core competencies, it represents the number of edges connected between node 1 and other nodes. The higher the K value, the more important the node is. In the topology diagram, there are a total of 373 edges in 23 nodes, and $P(K)$ (average degree) is equal to 16.2. This indicates that each node in the core competence of primary school physical education teachers is closely related to the other 16.2 nodes, which to some extent reflects the rationality of the nodes selected in the study.

By running the degree level in Pajek to obtain the degree values of each node, organizing and statistically classifying them, it was found that the ranking of the proportion of “edges” owned by the eight major nodes in the entire network is:

Table 3 List of Overall Network Nodes and Sides of Core Competences of Primary School Physical Education Teachers

category	Edges	proportion
Professional ethics standards	20	5%
Professional sentiment	35	9%
Discipline literacy	53	14%
Teaching literacy	44	12%
Class management	55	15%
Comprehensive ability	62	17%
Learn to reflect	55	15%
Communication and cooperation	49	13%

As shown in Table 3, the average number of “edges” owned by the eight types of nodes in the

entire network is ranked as comprehensive ability, class management, learning to reflect, subject literacy, communication and cooperation, teaching literacy, professional sentiment, and teacher ethics. That is to say, comprehensive ability, class management, and learning to reflect are important components of the core competencies of primary school physical education teachers.

3.2.2 “Degree Distribution” of the Overall Network Structure of the Core Competence of Primary School Physical Education Teachers

The Degree distribution represents the moderate distribution of network nodes $P(K)$ ^[1]. See Table 4 for the distribution of 373 edges in the core competence network structure of primary school PE teachers. From Table 4, it can be seen that in the network structure of primary school physical education teachers' core abilities, there are fewer nodes with high values, and there are 7 nodes with degree values above 20. Most nodes have moderate degree values, mainly concentrated in the degree values of 16, 17, and 20, reaching 61% of the total nodes. The degree of nodes follows a power-law distribution. This phenomenon is in line with the characteristic that most of the nodes in the scale-free network have fewer connections, while a few important nodes have more connections. Therefore, it is determined that the core competence network structure of primary school physical education teachers has scale-free characteristics.

Table 4 Distribution of The Overall Network Degree of Core Competences of Primary School Physical Education Teachers

linear measure	8	11	14	15	16	17	18	19	≥ 20
Nodes	1	2	1	2	4	3	2	1	7

3.2.3 The “Average Path Length” of the Overall Network Structure of Primary School Physical Education Teachers' Core Competencies

The distance d between two nodes in a network represents the number of edges on the shortest path between the two nodes, while the average path length L represents the average distance between any two nodes ^[1]. By running Pajek, the average path length of the network $L=1.26087$ is obtained, which means that in the core network of primary school physical education teachers, a correlation can be established between any two nodes through one node, and the average path length is relatively small.

3.2.4 The “Robustness” and “Fragility” of the Overall Network Structure of the Core Competence of Primary School Physical Education Teachers

Scale-free network has both “robustness” and “vulnerability”. Due to the existence of hub nodes, scale-free network has strong fault tolerance capability for random failures ^[2]. Because if errors occur randomly, the number of hub nodes is small and almost unaffected, and deleting other nodes has little impact on the network structure. However, if the hub node is sabotage, the network structure is easy to be destroyed, becoming discrete and fragmented, so it is necessary to focus on the development and protection of “core nodes”.

4. Conclusion

The core competency network indicators for primary school physical education teachers mainly include eight categories and 23 indicators. Each indicator represents a node in the network. Through calculation, it is determined whether there is an “edge” between nodes, and a matrix of “edges” is obtained to construct the core competency network for primary school physical education teachers. The research analyzes the relevant statistical indicators (degree, Degree distribution, average path length) and finds that it is a scale-free network with small world network characteristics. In the process of its evolution and upgrading, robustness and fragility have emerged. Its core nodes are subject literacy (professional ability), class management (class and group activities), comprehensive ability (knowledge education, sports, cultural inheritance), learning to reflect (professional planning), and communication and cooperation (communication and exchange).

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References

- [1] Li Fang. Research on the Characteristics of Core Competence Network Structure of Students majoring in Physical Education [D]. Shanghai Institute of Physical Education, 2016.
- [2] Jiang Nan. Research on Media Communication Characteristics Based on Social Network Analysis [D]. Nanjing University of Posts and Telecommunications, 2017.