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Research on the Evaluation of Physical Education Academic Influence in Higher Vocational Colleges of Shandong Province from the Perspective of Bibliometrics

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Abstract*— *[Research Objective] *This research evaluates the physical education academic influence of higher vocational colleges of Shandong province through the bibliometric analysis of the papers published by the P.E teachers, in order to fully understand and accurately grasp its influence of the status quo and development trends for the overall improvement of their academic level and scientific research strength to provide reference.* ***[Research Method]*** *By methods of literature reviews, bibliometric analysis, mathematical statistics, this paper makes a comparative analysis of the overall influence of higher vocational colleges in Shandong Province, the academic influence of different types of schools, the academic influence of various higher vocational colleges and the academic influence of P.E teachers from the aspects of the quantitative score of paper published, cited frequency, H index, P index, etc..* ***[Research Result]*** *The quantity of high-quality physical education research papers in higher vocational colleges in Shandong Province is less, the journals hierarchy of the papers published is not high, the total cited frequency is smaller, the H index is in a lower range, and the overall academic influence is weaker .There are great differences in academic influence among different types of schools, and the state key schools and their P.E teachers have obvious advantages in academic influence. The higher vocational colleges in Shandong Province lack of scientific research backbone with outstanding academic achievements, and there is no true leader in the field of physical education with great influence and academic attainments.*

***Keywords*—** *bibliometrics ; Shandong Province ; higher vocational colleges ; academic influence ; evaluation.*

I. INTRODUCTION

Academic papers as the main carrier of scientific research achievements, its evaluation of academic influence has been concerned by the academic community, and it is also an important part of the whole academic evaluation system. At present, there are two main methods to evaluate the influence of academic papers, one is quantitative evaluation method based on citation analysis, the other is qualitative evaluation method represented by peer review. As a quantitative method in scientific evaluation, citation analysis has established a bibliometrics index system to evaluate the quality and academic influence of papers [1]. In this study, the quantity of papers published and the journals hierarchy, the total cited frequency, the H index and the P index will be used as the evaluation indexes, this paper makes a comparative analysis of the academic influence of different types of higher vocational colleges, various higher vocational colleges and P.E teachers in Shandong Province, in order to fully understand and accurately grasp the academic influence of higher vocational colleges in Shandong Province, it provides the reference basis for improving their academic level and scientific research strength.

II. THE OBJECT AND METHODS OF RESEARCH

A. The Object of Research

In June 2019, the Shandong Provincial Department of Education published a list of general schools with higher education qualifications, including 56 state-run higher vocational Colleges (excluding general specialties), this research takes the of physical education academic influence of these 56 schools as the research object.

In the course of the rapid development of China's higher vocational education, the state has launched three rounds of key higher vocational college construction. The first round is the construction of "national model and key" higher vocational colleges in 2006, and the second round is the construction of "national high-quality" higher vocational colleges in 2015, the third round is the "high-level vocational school and specialty construction program with Chinese characteristics", or we called "double-high program" , which started in 2019, 17 schools in Shandong Province were shortlisted in the three rounds of construction ,we call these schools as "state key schools"(Abbreviated as sks). At the same time, Shandong Province has also implemented the skill-based talent training characteristic famous schools and high-quality higher vocational colleges project construction, in addition to 17 state key schools, 20 schools have obtained these two construction projects, we call "the province famous excellent schools" (Abbreviated as pfes) . There are also 19 schools that have not been approved for the construction project, which we call "ordinary schools" (Abbreviated as os).(see Table 1)

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TABLE 1. Statistical Table of Different Types of Higher Vocational Colleges in Shandong Province

Type of schools	Quantity of schools	School name (abbreviations of some school names)
State key schools (sks)	17	Shandong Institute of Commerce Technology(Shandong Commerce) 、Rizhao Polytechnic（Rizhao）、Qingdao Technical College(Qingdao)、Weihai Vocational College（Weihai）、Yantai Vocational College(Yantai)、Binzhou Polytechnic（Binzhou）、Shandong Vocational College of Science and Technology 、Zibo Vocational Institute(Zibo)、Jinan Vocational College、Shandong Polytechnic、Weifang Vocational College、Dongying Vocational Institute（Dongying）、Shandong Vocational Animal Science and Veterinary College、Shandong Transport Vocational College、Shandong Foreign Trade Vocational College、Qingdao Vocational and Technical College of Hotel Management（Qingdao Hotel）、Qingdao Harbour Vocational & Technical College
Province famous excellent schools (pfes)	20	Shandong Labor Vocational and Technical College、Laiwu Vocational and Technical College（Laiwu）、Jining Polytechnic、Liaocheng Vocational and Technical College(Liaocheng) 、Shandong Water Polytechnic、Shandong College of Economics and Business、Shandong Vocational College of Industry、Dezhou Vocational and Technical College(Dezhou)、Jinan Engineering Polytechnic(Jinan Engineering)、Shandong College Of Electronic Technology、Shandong College of Tourism and Hospitality、Taishan Polytechnic、shandong drug and food vocational college、Shandong Business Institute、Shandong Urban Construction Vocational College、Yantai Automobile Engineering Professional College、Zaozhuang vocational college、Shandong Polytechnic College(Shandong Polytechnic), Qingdao Ocean Shipping Mariners College、Weifang Engineering Vocational College
Ordinary schools (os)	19	Shandong Vocational Institute of Clothing Technology、Shandong College Of Information Technology、Shandong Shengli Vocational College、Shandong Chemical Engineering & Vocational College、Yantai Engineering & Technology College、ZaoZhuang Vocational College of Science and Technology、Shandong Aluminum Vocational College、Shandong Vocational College of Light Industry、Shandong Judicial Police Vocational College(Shandong Judicial)、Heze Domestic Professional College 、Shandong Communication & Media College、Linyi Vocational College、Jinan Vocational College of nursing、Taishan vocational college of nursing、Weifang Nursing Vocational College、Heze Vocational College、Weihai Ocean Vocational College、Shandong Vocational College of Special Education、Qingdao Engineering Vocational College

B. The Methods of Research

1) The method of literature reviews

⑴Through the China National Knowledge Infrastructure (CNKI),we had searched and downloaded the academic influence, literature measurement, P.E teachers, such as the construction of the literature.

⑵ From December 14 to 20,2019, we searched the academic papers published by P.E teachers in higher vocational colleges of Shandong Provincial from 2001 to 2018 as the first author in CNKI, due to the special situation that physical education has the dual attributes of natural science and social science, the paper retrieval is divided into two times. For the first time, “Subject =physical education ” + “published from 2001 to 2018” + “the author's unit =name of school” was used to carry out the index, the first author of the paper is selected as the physical education teacher of the school. The second time, the teacher's name retrieved in the first search plus the name of the school will be used, the paper of "the subject is not physical education" was supplemented, and 1665 academic papers published by P.E teachers in Shandong higher vocational colleges as the first author were retrieved twice.

2) The method of bibliometric analysis

According to the quantitative characteristics of the elements of literature, by means of mathematical and statistical methods, this paper discovers the inherent regularity from the change of the quantity in order to reveal the present situation and development trend of the academic influence of physical education in higher vocational colleges in Shandong Province.

3) The method of mathematical statistics

The fields of “title” , “first author” , “first author unit” , “paper source” , “cited frequency” and so on in the retrieval paper are imported or entered into the EXCEL table, and the data are processed by using the statistical function of Excel, get the relevant statistics. A total of 55 out of the top 30 teachers selected for their quantitative scores, total cited frequency, H index, P index, etc., we used the non-integral rank sum ratio method to transform the various evaluation indexes of schools and individual teachers, and obtain the dimensionless statistic RSR, which is used to rank the evaluation objects in order of magnitude.

III. Research Results and Analysis

A. The Classification of Journals Hierarchy and Assign Points Standard of P.E Teachers' Papers Published in Higher Vocational Colleges in Shandong Province

The quantity of papers published represents the level of scientific research activity and academic output of the scholars, while the level of the journals hierarchy t can, to a certain extent, represent the quality of the papers, papers published by scholars in core journals can reflect their scientific research level and academic influence, especially in CSSCI journals is an affirmation of academic circles. In this study, journals are classified into three levels: Chinese core journals, undergraduate journals and ordinary journals, the core journals are based on Peking University's General Catalogue of Chinese core journals. In addition, the papers included in the journal of China Social Sciences Citation Index (CSSCI) of Nanjing University were counted as an auxiliary. An undergraduate journal is a part of a non-chinese Core Journal of an undergraduate university journal. A ordinary Journal is a journal other than a core journal or an undergraduate journal, it mainly includes a vocational school journal and a general Journal. Because the selection of core journals and CSSCI journals is dynamic, we define the retrieved papers according to the release time of each edition and the catalogue of each edition.

In order to better reflect the academic influence of the

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papers and make the statistics of the papers published more reasonable, we reasonably distribute the weight of the papers of journals hierarchy at different levels while counting the quantity of papers published by schools and teachers, according to the level of the journals hierarchy, the specific criteria are 2 points per core journal, 1 point per undergraduate journal, 0.5 points per ordinary journal, 1 point added by CSSCI source journal and 0.5 points added by CSSCI extended journal, the quantity and quality of papers were evaluated comprehensively, and the quantitative scores of papers published by schools and individual teachers were calculated.

B. Overall Analysis of the Academic Influence of Physical Education in Higher Vocational Colleges in Shandong Province

Journal papers are the main presentation of scientific research achievements and the crystallization of scientific research work. Statistical Analysis of journal papers can reflect the status of scientific research and academic influence of institutions or individuals from a side [2]. Table 1 shows that from 2001 to 2018, P.E teachers of higher vocational colleges in Shandong Province published 152 papers in core journals, accounting for 9.13%, including 26 core journals of physical education, accounting for 1.56%, 126 other core journals, accounting for 7.57%. 80 undergraduate journals, accounting for 4.80%. 1433 papers (86.07%) were published in ordinary journals, and the quantity of papers published in journals at different levels was highly concentrated and unbalanced. CSSCI only had 20 papers (1.20%). The total cited frequency was 3235, the average cited frequency was 1.94, and the overall H index was 19. Dai Peiyun and other scholars made statistics on the papers published by teachers of 61 Higher Vocational Colleges in Shandong Province from 2013 to 2017, the total of 21,740 papers were published, of which 3006 were core journals, accounting for 13.83% . The total cited frequency was 24,841, and the average cited frequency was 1.14. Compared with the relevant data of higher vocational colleges in Shandong Province, the proportion of P.E teachers publishing papers in core journals is lower than the average level of higher vocational colleges in Shandong Province by 4.7 percentage points, and they lag behind in high-level scientific research. The main reason is that P.E is a public course, P.E teachers have no professional support, lack of necessary research foundation and platform, and the relative lack of scientific research is unavoidable. The average cited frequency is higher than the province's average level of 0.8, which indicates that the paper quality of P.E teachers is better than the province's average level of higher vocational colleges.

TABLE 2. Statistical Table of Published Papers by P.E Teachers of Different Types of Higher Vocational Colleges in Shandong Province Unit: Chapter

Type of schools	sks	pfes	os	total	Proportion (%)
Quantity of schools	17	20	19	56	
Quantity of core journals	107	32	13	152	9.13
Quantity of undergraduate journals	36	37	7	80	4.8
Quantity of ordinary journals	693	506	234	1433	86.07
Total of papers published	836	575	254	1665	100.00
Quantitative score of papers published	608.5	357	150.5	1116	
Quantity of CSSCI source journal	9	2	0	11	0.66
Quantity of CSSCI extended journal	6	2	1	9	0.54
Total of CSSCI	15	4	1	20	1.2
Total Cited frequency	1841	1031	363	3235	
Average cited frequency	2.2	2.27	1.42	1.94	
H index	17	13	10	19	

In a word, the ordinary journals are the main carrier for the P.E teachers to publish research results, the journals that publish papers are on the low level, and the papers published in the authoritative core journals of higher academic level are less, the proportion of core journals is lower than the average level of higher vocational colleges in the province, and the overall academic influence is relatively small.

C. Comparative Analysis on the Academic Influence of Different Types Higher Vocational Colleges in Shandong Province

Table 2 shows that 17 state key schools have published 836 papers, accounting for more than half of all, including 107 papers in core journals, accounting for 70.39% of all core papers, 15 papers in CSSCI, accounting for 75%, the total cited frequency was 1,841, accounting for 56.91% . The total quantity of papers published, core papers, CSSCI papers and total cited frequency all reached over 50% of the total number in the province, it shows that the state key schools not only publish a large number of papers and high-level journals hierarchy, but also have a high cited frequency and a high H index. They are in the core position in the physical education scientific research of Shandong higher vocational colleges, especially in the high-level physical education scientific research, play a leading role. It is basically consistent with the conclusion put forward by Liu Hong and other scholars in the analysis of the data of scientific research achievements of national higher vocational colleges in 2019 that "the activity of scientific research, the quantity of high-level papers, and the scientific research strength show an obvious positive correlation with the strength of vocational colleges" [4]. From the comparison of all kinds of data, the decreasing trend of each index data of the three types of schools is very obvious. After the papers quantity and journal hierarchy of the three types of schools are tested by X^2, the result is 0.000022, $p < 0.01$, there are significant differences in the quantity and

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quality of the papers published by the three types of schools in the statistical sense. It can be seen that the academic influence of the state key schools is obviously higher than that of the province famous excellent schools, and the academic influence of the province famous excellent schools is obviously higher than that of the ordinary schools. Physical education scientific research is an integral part of the school's scientific research, which fully reflects the positive role of the construction of national model schools, key schools and high-quality schools in promoting the overall strength of the school's scientific research and improving the level of the teaching staff, it also reflects the obvious gap between the state key schools and province famous excellent schools and ordinary schools.

D. Comparative Analysis of the Academic Influence of Physical Education in Higher Vocational Colleges in Shandong Province

1) Quantitative Score Analysis of Papers Published in Different Schools

Scientific Research is finally published in the form of scientific papers, scientific reports, patents and monographs. Therefore, the overall quantitative analysis of the scientific research achievements of an institution is an important indicator of its academic influence in this field, as well as an important indicator of its scientific research ability, academic level and comprehensive strength. [5]

According to the statistics of the quantity of papers, the level of journal hierarchy and the quantitative score in various schools, the state key schools, such as the Dongying Vocational Institute and the Binzhou Polytechnic, are far ahead, not only publishing a large number of papers, but also having a high level of journals hierarchy, far more than other higher vocational colleges, it is in an absolute core position and is the vanguard of physical education scientific research in Shandong higher vocational colleges, especially Binzhou Polytechnics, the quantity of physical education core papers, the total quantity of core papers and the quantity of CSSCI papers all ranked first in Shandong Province, fully demonstrating the strength of its high-level physical education scientific research. Binzhou Polytechnic was selected three times in the state key school construction plan, it is one of the higher vocational colleges with strong school-running strength in Shandong Province. Among the top 10 schools ranked by RSR value, eight are the state key schools, and the province famous excellent schools only Laiwu Vocational and Technical College and Dezhou Vocational and Technical College are ranked sixth and tenth respectively. These schools are the first phalanx of physical education scientific research in higher vocational colleges in our province with higher academic influence. Laiwu Vocational and Technical College is one of the earlier higher vocational colleges in our province. The school attaches great importance to scientific research work. Since 2002, it has set up an academic committee of the school and set up a scientific research fund for teachers and students to support them in scientific research, material rewards are given to them for their achievements in scientific research, and the majority of teachers actively carry out scientific research and have obtained a large number of research results, which has promoted the improvement of the quality of teaching and the quality of personnel training in schools, although missed several state key school selection, but in Shandong Province skill-based talent training characteristic famous schools and high-quality higher vocational colleges are among the top, is the leader of the second echelon of Shandong higher vocational colleges. These ten schools published 103 papers in the core journals, accounting for 67.76% of all the papers in the core journals, 16 papers in CSSCI, accounting for 80% of all CSSCI papers. This shows that these schools attach importance to scientific research work, have good scientific research systems and incentive policies, it has formed a good academic atmosphere, can mobilize the enthusiasm of the majority of teachers in scientific research, fully reflects the outstanding institutions in scientific research in the role of demonstration and leadership.

TABLE 3. Top 10 Higher Vocational Colleges of Quantitative Score of Papers Published in Shandong Province

Order	School	Type	P.E core	Other core	Core total	Papers total	CSSCI source	CSSCI extended	CSSCI total	Papers score	Score RSR
1	Dongying	sks		28	28	132			0	108	1
2	Binzhou	sks	8	24	32	75	8		8	93.5	0.87
3	Rizhao	sks	1	5	6	131		2	2	77	0.71
4	Zibo	sks	3	8	11	64	1	3	4	51.5	0.48
5	Weihai	sks		1	1	95			0	49.5	0.46
6	Laiwu	pfes	3	4	7	50	2		2	45.5	0.42
7	Yantai	sks		4	4	43				38.5	0.36
8	Qingdao Hotel	sks		11	11	39			0	37.5	0.35
9	Qingdao	sks		1	1	66			0	35	0.33
10	Dezhou	pfes		2	2	61			0	34.5	0.32
total			15	88	103	756	11	5	16		
Proportion(%)			1.98	11.64	13.62	100.00	1.46	0.66	2.12		

2) Citation Analysis of Papers Published from Different Schools

The academic influence of an institution is not only in the quantity of papers it publishes, but also, more importantly, in the quantity of papers it publishes that are cited in other literature, the quantity of citations is a better indicator of an institution's academic influence than the quantity of papers it publishes.[6]By analyzing the academic influence of the school from the point of view of the cited papers, we can understand the situation that the scientific research achievements of the

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schools have been approved by the academic circles and used for reference by the Peer Scholars, to help us from the perspective of institutional research to measure and examine the performance of scientific research and scientific research strength of a school, select a strong school of scientific research strength. Cited frequency is an absolute quantity index, which refers to the total quantity of citations from the publication of a journal, institution or scholar to a specific statistical time. In order to evaluate academic influence, the index of cited frequency includes total cited frequency, maximum cited frequency, average cited frequency, H index, P index, etc.

The total cited frequency, which is the sum of the cited frequency of all the papers published by all the researchers in the institution, is one of the main index reflecting their overall academic level and influence. If the total cited frequency is high, it shows that the researcher of the institution has a high academic status in the corresponding research field. A high quantity of papers published does not necessarily mean a high cited frequency, nor does a high total cited frequency mean a high cited frequency per article, while the H index combines the quantity of citations with the cited frequency per article for evaluation, the H index is characterized by not only a high quantity of publications, but also a number of papers with a high cited frequency, reflecting the quantity of high-quality papers, therefore, the H index can more objectively and comprehensively evaluate the academic level and influence of institutions or researchers [7]. The H index is simple in content and widely used in academic fields, but it also has some shortcomings, such as it is not sensitive to highly cited papers, and the specific number of papers with the maximum cited frequency, cannot be represented by the H index, it neglects the contribution of highly cited papers to the academic influence and fails to reflect the academic value of the most influential representative research achievements of scientific researchers. In 2010, on the basis of summarizing the research of other scholars, PRATHAPG put forward the P index, as prestige index or outstanding index, which has higher fitting ability with H index and richer connotation than H index. The formula of the P index is $P=(C^2/N)^{1/3}$, "C" is the total cited frequency, "N" is the quantity of papers. From the formula of the P index, it is related to the total cited frequency and the average cited frequency, while the maximum cited frequency, has a greater contribution to the total cited frequency and the average cited frequency. Therefore, the P index can reflect the academic value and contribution of the papers with the maximum cited frequency,. P index is a useful supplement to H index, which can further distinguish and evaluate the academic influence of institutions or individuals with the same H index.

Compared with the top 10 of the quantitative score of paper published, Binzhou Polytechnic and Dongying Vocational Institute have swapped positions and come in first place. Although the quantity of papers published by Binzhou Polytechnic is 57 fewer than that of Dongying Vocational Institute, however, the quantity of physical education core, the total quantity of core, the quantity of CSSCI papers, and the total cited frequency all exceeded that of the Dongying Vocational Institute. While the Laiwu Vocational and Technical College surpassed Rizhao Vocational College from the sixth to the third place, although the total quantity of papers was no more than that of Rizhao Vocational College, the total cited frequency is similar, but the average cited frequency is 2.24 times that of Rizhao Vocational College, and both the H index and the P index are not less than Rizhao Vocational College. Yantai Vocational College has become the fifth from the seventh, and Weihai Vocational College has been pushed out of the top 10, although Weihai Vocational College has published 95 papers, there are few high-level papers, the overall quality of the papers is not high, and the total cited frequency is only 90 times. Qingdao Technical College rose from 9th to 6th.Jinan Engineering Polytechnic, 13 were cited of the 17 papers, and the H index reached 6, ranking seventh in the top 10. Zibo Vocational Institute fell from the fourth to the eighth, mainly due to the low cited frequency, and P index is small. Qingdao Vocational and Technical College of Hotel Management was pushed out of the top ten due to the low cited frequency and H index small. Shandong Judicial Police Vocational College is in the ninth place, although the total quantity of papers published by this school is not much, but the quantity of core papers, the average cited frequency, H index, P index are among the top 10 in the province. Dezhou Vocational and Technical College ranked 10th twice, and it is also the leader of the second echelon of higher vocational colleges in Shandong Province. On the whole, there are not many highly cited papers in higher vocational colleges in Shandong Province, only 19 of them have been cited more than 20 times. The total cited frequency is low, the maximum is 422 times in Binzhou Polytechnics, only four schools have been cited more than 200 times. The maximum of H index is 9, overall in the lower range, the quantity value is small, academic influence is relatively weak.

TABLE 4. Top 10 Higher Vocational Colleges of RSR of Papers Cited in Shandong Province

Order	School	Type	Papers total	Papers sited total	Total cited frequency	RSR	H index	RSR	P index	RSR	Mean RSR
1	Binzhou	sks	75	43	422	1	8	0.88	13.34	1	0.96
2	Dongying	sks	132	73	346	0.82	9	1	9.68	0.71	0.84
3	Laiwu	pfes	50	38	256	0.61	9	1	10.94	0.81	0.81
4	Rizhao	sks	131	79	299	0.71	9	1	8.8	0.64	0.78
5	Yantai	sks	43	30	159	0.38	7	0.75	8.38	0.6	0.58
6	Qingdao	sks	66	34	122	0.3	6	0.63	6.09	0.42	0.45
7	Jinan Engineering	pfes	17	13	72	0.18	6	0.63	6.73	0.47	0.43
8	Zibo	sks	64	32	129	0.31	5	0.51	6.38	0.44	0.42
9	Shandong Judicial	os	21	14	77	0.19	5	0.51	6.56	0.45	0.38
10	Dezhou	pfes	61	34	100	0.24	5	0.51	5.47	0.37	0.37

Aining Li, Shiwei Zhang, and Zhanbin Feng, "Research on the Evaluation of Physical Education Academic Influence in Higher Vocational Colleges of Shandong Province from the perspective of Bibliometrics," *International Research Journal of Advanced Engineering and Science*, Volume 6, Issue 3, pp. 272-279, 2021.

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3) RSR comprehensive ranking analysis of academic influence of different schools

TABLE 5. Top 10 Higher Vocational Colleges of RSR of Academic Influence in Shandong Province

Order	School	Type	Papers total	Papers score	RSR	Papers Sited total	Total cited frequency	RSR	H index	H RSR	P index	P RSR	Mean RSR
1	Binzhou	sks	75	93.5	0.87	43	422	1.00	8	0.88	13.34	1.00	0.92
2	Dongying	sks	132	108	1.00	73	346	0.82	9	1.00	9.68	0.71	0.91
3	Rizhao	sks	131	77	0.71	79	299	0.71	9	1.00	8.80	0.64	0.78
4	Laiwu	pfes	50	45.5	0.42	38	256	0.61	9	1.00	10.94	0.81	0.71
5	Yantai	sks	43	38.5	0.36	30	159	0.38	7	0.75	8.38	0.60	0.53
6	Zibo	sks	64	51.5	0.48	32	129	0.31	5	0.51	6.38	0.44	0.45
7	Qingdao	sks	66	35	0.33	34	122	0.30	6	0.63	6.09	0.42	0.43
8	Dezhou	pfes	61	34.5	0.32	34	100	0.24	5	0.51	5.47	0.37	0.37
9	Weihai	sks	95	49.5	0.46	36	90	0.22	4	0.39	4.40	0.28	0.35
10	Jinan Engineering	pfes	17	10.5	0.10	13	72	0.18	6	0.63	6.73	0.47	0.35

For the comprehensive ranking of schools and teachers, we calculate the RSR by the weighted mean of the evaluation index of academic influence, in which the quantitative score of papers published is 30%, the total cited frequency is 20%, H index is 30%, P index is 20%. Compared to the ranking of quantitative score of papers published and RSR of papers cited, RSR comprehensive top eight schools, Binzhou Polytechnic, Dongying Vocational Institute, Rizhao Vocational College, Laiwu Vocational and Technical College, Yantai Vocational College, Zibo Vocational Institute, Qingdao Technical College, Dezhou Vocational and Technical College and other schools are among the top 10 in quantitative score of papers published and RSR of papers cited, the 9th Weihai Vocational College is the 5th of the quantitative score of papers published the 10th Jinan Engineering Polytechnic is the 7th of the RSR of papers cited, the ranking has a strong stability. From the top 10 schools' various index, to improve the overall academic influence of the school, either the quantity of papers, high-level journals hierarchy, or the quantity of papers cited, high frequency, or both. Among the top ten schools, there are seven state key schools and three provincial famous and excellent schools. These ten schools are the ones with strong academic influence in our province, at the same time, it also shows that the State and Shandong school quality improvement project has a greater role in promoting teachers' scientific research ability and can effectively improve teachers' scientific research level.

E. Analysis on Academic Influence of P.E Teachers in Higher VocationalColleges in Shandong Province

According to the RSR comprehensive ranking data on the academic influence of P.E teachers, the top seven teachers, including Haifeng Yue, Lili Zhang, Lizhen Xu, Jianming Wei, Lanxia Pang, Shiwei Zhang and Cuihua Zhang, all ranked in the top 20 in the four influencing factors, these teachers not only publish a large quantity of papers, but also have a relatively high level of journal hierarchy.

TABLE 6. Top 20 in RSR of Academic Influence of P.E Teachers in Vocational Colleges of Shandong Province

Order	Name and school	Papers score (rank)	Papers number (core)	CSSCI number	Cited number	Max cited	Total cited (rank)	H index (rank)	P index (rank)	RSR mean
1	Haifeng Yue (Dongying)	20.0（1）	28(4)		16	29	91(2)	7(1)	6.66(17)	0.83
2	Lili Zhang(Binzhou)	14.0（2）	11(5)	1	9	121	149(1)	4(2)	12.64(1)	0.78
3	Lizhen Xu(Binzhou)	12.5（3）	7(4)	3	6	30	65(5)	4(2)	8.45(6)	0.58
4	Jianming Wei(Rizhao)	9.5（9）	6(3)	2	5	24	72(4)	4(2)	9.52(4)	0.57
5	Lanxia Pang(Dongying)	12.5（4）	10(5)		8	16	61(6)	4(2)	7.19(12)	0.56
6	Shiwei Zhang(Laiwu)	12.0（5）	10(2)	2	9	24	60(7)	4(2)	7.11(13)	0.55
7	Cuihua Zhang(Yantai)	10.0（7）	8(2)		8	29	53(9)	4(2)	7.05(15)	0.51
8	Yulian Gao(Binzhou)	5.0	4(2)		2	70	76(3)	2(19)	11.30(3)	0.45
9	ShuleiYue (Shandong Judicial)	10.5（6）	10(3)		6	20	44(10)	3(8)	5.78(21)	0.44
10	Yongshun Qi(Laiwu)	6.0	6(1)		6	20	41(12)	3(8)	6.54(18)	0.38
11	Jingpei Wei(Laiwu)	1.5	2(0)		2	53	57(8)	2(19)	11.76(2)	0.38
12	Kai Liu(Dongying)	7.5（18）	9(2)		5	17	30(18)	3(8)	4.64	0.36
13	Fang liu(Yantai)	8.5（12）	8(1)		5	10	23	3(8)	4.04	0.36
14	Hongyan Li(Binzhou)	5.5	3(2)	1	2	35	37(13)	2(19)	7.7(7)	0.35
15	Qiang Jin(Dongying)	7.5（17）	9(2)		6	10	24(25)	3(8)	4.00	0.34
16	Meili Wu(Binzhou)	6.0	2(2)	2	2	18	28(22)	2(19)	7.32(11)	0.34
17	Xiaofeng Ren(Dezhou)	6.5	10(1)		8	10	27(23)	3(8)	4.18	0.34
18	Xiuyun Liu (Shandong polytechnic)	8.0（13）	5(3)	2	3	6	15	3(8)	3.56	0.33
19	Yanan Liu (Shandong Judicial)	8.0（14）	7(3)		6	14	29(20)	2(19)	4.93(29)	0.33
20	Xiqiang Xing (Liaocheng)	5.5	5(2)		4	13	24(25)	3(8)	4.87(30)	0.33

Aining Li, Shiwei Zhang, and Zhanbin Feng, “Research on the Evaluation of Physical Education Academic Influence in Higher Vocational Colleges of Shandong Province from the perspective of Bibliometrics,” *International Research Journal of Advanced Engineering and Science*, Volume 6, Issue 3, pp. 272-279, 2021.

They had published at least 2 or more papers in the core journals, and have relatively high quantity of cited papers, maximum cited frequency and total cited frequency, it shows that these seven teachers have higher academic level and stronger scientific research strength, and are teachers with greater academic influence in higher vocational colleges in Shandong Province, they reach or approach the high-influence author range (authors with an H index of no less than 5 are defined as high-influence authors).they are the representative of high-level physical education scientific research in higher vocational colleges of our province, and the leader of physical education in their respective schools. The relevant data of these teachers show that in order to become a researcher with high academic influence, not only will there be many published papers and high-level journal hierarchy, but also a relatively high frequency of being cited, and the results will be noticed, referenced and cited by the majority of peers, can provide beneficial help for other scholars' research.

Judging from the total of papers published and core journals papers by the top 20 teachers, although the maximum quantity of papers published by Haifeng Yue is 28, there are only 4 papers in the core, and they are all non-professional physical education core journals, the average cited frequency is not high, only 3.25. Binzhou Vocational College Lili Zhang and Dongying Vocational College Lanxia Pang, the maximum quantity of core journal papers is 5, other staff core journal papers are less than 5.The quantity of core journals, especially CSSCI journals is less, there are few high-quality papers with great academic influence, lack of scientific research backbone with outstanding academic achievements, and have not formed the true leader in the field of physical education with great influence and academic attainments. The distribution of the top 20 teachers is five in Binzhou Vocational College, four in Dongying Vocational College, three in Laiwu Vocational College, two in Yantai Vocational College and Shandong Judicial Police Vocational College, one in Rizhao Vocational College, one in Liaocheng Vocational and Technical College, one in Dezhou Vocational and Technical College and one in Shandong polytechnic College, it is basically consistent with the comprehensive ranking of the influence of the school, which shows that excellent scientific research talents play an important role in the overall academic influence of the institution, and that the development of disciplines or specialties cannot be separated from the support of excellent scientific research talents, the quantity of it can be regarded as an important token of the academic influence of physical education in higher vocational colleges.

IV. Conclusions and Recommendations

The quantity of papers published by P.E teachers in higher vocational colleges in Shandong Province is not balanced in different journal hierarchy , the papers are mainly concentrated in the lower-level ordinary journals, and the proportion of papers published in core journals is lower than the average level of higher vocational colleges in Shandong Province. The total cited frequency in each school is smaller, the Hh index is in the low range, the quantity of papers with high academic level and high citations is less, and the academic quality of the papers is not high, the strength of scientific research is not strong, the overall academic influence is weaker. Therefore, the higher vocational colleges in Shandong Province should take effective measures to continuously improve the incentive mechanism for scientific research, increase the incentive for high-level academic journals, guide teachers to strive to improve the quality of scientific research and raise the level of journal hierarchy, strengthening the academic influence of physical education.

The state key schools such as Binzhou Polytechnic, Dongying Vocational Institute, Rizhao Vocational College, Yantai Vocational College, Zibo Vocational Institute, Qingdao Technical College, Weihai Vocational College, and the province famous excellent schools such as Laiwu Vocational and Technical College, Dezhou Vocational and Technical College, JJinan Engineering Polytechnic, are10 higher vocational colleges with stronger academic influence of physical education r in our province .On the whole, the overall academic influence of state key schools is obviously higher than that of the province famous excellent schools and ordinary schools, fully reflecting the positive role of the construction of national model schools, key schools and high-quality schools in promoting the overall strength of scientific research and improving the construction level of the teaching staff, therefore, the province famous excellent schools and ordinary schools should increase their scientific research efforts, fully mobilize the enthusiasm of the majority of P.E teachers, encourage teachers to produce more and better results, and reduce as soon as possible the scientific research gap with the state key schools, improving the overall level of physical education scientific research in higher vocational colleges of our province.

Teachers such as Haifeng Yue, Lili Zhang, Lizhen Xu, Jianming Wei, Lanxia Pang, Shiwei Zhang and Cuihua Zhang are P.E teachers with high academic influence in higher vocational colleges of our province, these excellent teachers have promoted the development of physical education scientific research in their respective schools, and have played an important role in enhancing the academic influence of school physical education , and complement the development of the schools, reflect the outstanding schools must have outstanding scientific research personnel as a support. However, it should not be ignored that at present, Shandong higher vocational colleges are short of scientific research backbone with outstanding academic achievements, and there are no true leaders in the field of physical education with great influence and academic attainments. Therefore, higher vocational colleges in Shandong Province should carry out the training and introduction of high-level physical education talents in a planned way, and strengthen the selection and training of the existing scientific research backbone and subject leaders, to give priority to scientific research funds, welfare benefits, etc. . Higher vocational colleges in Shandong Province should adopt full-time, external, part-time and other forms to introduce high-level talents of physical education

Aining Li, Shiwei Zhang, and Zhanbin Feng, “Research on the Evaluation of Physical Education Academic Influence in Higher Vocational Colleges of Shandong Province from the perspective of Bibliometrics,” *International Research Journal of Advanced Engineering and Science*, Volume 6, Issue 3, pp. 272-279, 2021.

specialty and give full play to their academic leading role, to promote the further improvement of scientific research strength and academic level of P.E Teachers in higher vocational colleges.

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