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Research on the construction and practice of the evaluation system of postgraduate supervision

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ABSTRACT

In recent years, with the rapid development and expansion of postgraduate education in China, the cultivation quality has become increasingly prominent. In graduate education activities, there are many factors that affect the quality of cultivation, among which the tutor's guiding ability is undoubtedly the key factor that affects the quality of graduate students' cultivation. In the 2020 National Graduate Education Conference, one of its topics is how to objectively quantify the guiding ability of supervisors based on which the teaching resources can be optimally allocated. Taking Hangzhou Dianzi University as an example, this paper investigates the index systems to evaluate the guiding ability of graduate students' supervisors including 6 first-level indicators and 19 second-level indicators in order to further improve the cultivation performance of graduate students.

KEYWORDS

Postgraduate students; Supervisor; Guiding ability; Evaluation index systems

1 Introduction

Graduate education is the main channel to achieve high-level talents training, and its core work is to improve the quality of graduate training. In July 2020, General Secretary Xi Jinping made important instructions on graduate education, emphasizing that graduate education plays an important role in cultivating innovative talents, improving innovation capabilities, serving economic and social development, and promoting the modernization of national governance systems and governance capabilities. Simultaneously, we should pay close attention to the Professional adjustment, level of the advisor team, and the talent training system, and speed up the training of high-level talents urgently needed by the country. Subsequently, the Ministry of Education pointed out in the "Code of Conduct for Graduate Advisors" that the graduate advisor is the first responsible person for graduate training. What guiding abilities advisors need in the process of graduate training (Bao & Yang, 2021) and how to formulate a scientific evaluation system to evaluate the performance of graduate advisor

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training objectively, justly, accurately and effectively are important issues that need to be solved urgently in graduate education. In response to this problem, some graduate training units and scholars have conducted relevant research. For example, Wang (2016) summarizes the problems existing in the advisor's guidance of graduates through a questionnaire survey, and puts forward corresponding countermeasures and suggestions to improve the quality of advisor guidance from the levels of advisors, colleges and education administration. Shi et al. (2013) explored the construction of an advisor performance evaluation system oriented by the quality of graduate training earlier; proposed the three-level evaluation index system and weight by means of expert consultation and questionnaires, and set up indicator scoring criteria based on the diagnosis-aided evaluation concept. Wang (2019) systematically studies the constituent elements and evaluation index system of the advisor's guiding ability, and conducts an empirical analysis on the advisor's guiding ability through the evaluation questionnaire. Gu et al. (2017) studied the relationship between the advisor's guidance style and the creativity of graduate students, and believed that there was a positive correlation between the advisor's guidance and the quality of graduate students.

In general, there are few systematic studies on the quantitative evaluation of graduate advisors' guidance ability. Most of the studies only focus on the exploration and establishment of the evaluation index system, and fail to analyze and support the actual data of the training unit. In order to fully implement the spirit of the National Education Conference and the National Graduate Education Conference, strengthen the construction of the graduate advisor team, improve the guidance ability of graduate advisors, practice the morality education of graduate advisors, and continuously improve the quality of graduate talent training, Hangzhou Dianzi University (HDU) comprehensively sorts out the difficulties in the process of graduate talent training, then makes full use of the school's electronic information characteristics, and further explores a model that can motivate advisors to educate talents and promote the high-quality development of graduate education in the new era, so as to realize the standardization of graduate training concepts, the systematization of management, the digitization of advisor evaluation, and the concrete connotation of advisors' morality and cultivation. Taking HDU as an example, this paper constructs a scientific, fair, equitable and open evaluation index system and develops an evaluation system both for the advisors' guidance abilities in order to form a set of harmonious guidance mechanism that follows the graduate cultivation rules and stimulates supervisors' vitality.

2 The Evaluation Index System

Constructing the evaluation system for the graduate advisors' guidance ability, the evaluation indicators, the weight of the indicators, and the basis for the evaluation of indicators are three key issues that need to be solved. The following is an analysis of the set evaluation indicators, weights, and scoring basis in two levels, and summarizes the characteristics and innovations of this evaluation system.

2.1 First–level evaluation index system and weight

In March 2021, HDU revised the "Administrative Measures for Graduate Advisors (Trial)", which standardized and constrained the training of graduate advisors in terms of job responsibilities, post rights, post conditions, and assessment methods; its core idea is that realize the transition progressively from the evaluation based on the academic ability of the graduate advisors to the guidance ability of the graduates. The advisor's guiding ability mainly as-

sesses the level of the advisor's guidance of graduates. Taking the high-quality achievements of graduates as the observation index, combined with HDU education concept "home and country feelings, international vision, innovative spirit, and practical ability" of cultivating senior professionals, the advisor's guiding ability evaluation index sets five positive indicators and one negative indicator, namely the quality of the dissertation, the scientific and technological achievements of the graduate student as the first constructor, the honorary title, the scientific research practice, the internationalization, and the academic and behavioral norms of the graduate student. What's more, implement a one-vote veto system for the indicator of academic code of conduct. The first-level indicators are shown in the first column of Table 1, and the corresponding weights of the first-level indicators are shown in the fourth column.

2.2 Secondary evaluation index system and score

The primary link of quality control of graduate training is to ensure the quality of dissertation. Formally, the practice of the dissertation needs to go through multiple links such as the opening report, mid-term inspection, submission for review and defense. From the content point of view, the dissertation is the arrangement and summary of the scientific research work throughout the whole graduate study. In terms of quality, it needs to meet certain requirements for innovation and workload. This first-level indicator consists of four secondary indicators, namely dissertation blind review results, defense results, provincial dissertation sampling results, select as provincial (society) excellent papers/excellent professional practice cases.

Table 1 The evaluation index system of advisors' guidance ability in Hangzhou Dianzi University

First–level indices	Second–level indices	Score	Weight
Dissertation quality	blind review results（average）	A=5, B=3, C=0, D=–2	30%
	defense results（average）	Excellent=5，Good=3，Fair=0，Fail=–2	
	provincial dissertation sampling results,	Excellent=5，Scores between 85 and 89=3，Scores lower than the average=–3，	
	provincial (society) excellent papers/excellent professional practice cases	Outstanding dissertation=5，Excellent professional practice case =5	
Research outputs first–authored by graduate students	academic papers	Natural science: SCI indexed journal and state –class core journal papers =3，EI Indexed Journal and CSCD core journal papers=2，HDU core journal papers=0.8，EI indexed journal papers =0.5，other international journal papers=0.2； Social science: SSCI indexed journal papers=5，CSSCI indexed journal papers=2，other core journal papers=0.8；	25%
	patent（invention、utility model）	Invention patent=2，utility model patent=0.5	
	Academic monographs, textbooks	3	

First–level indices	Second–level indices	Score	Weight
Honorary titles	National scholarship	5	15%
	Social scholarship	4	
	Academic year scholarship	First prize=3, second prize=2, third prize=1	
	Outstanding graduates	Provincial = 5, University=3	
	“Youth HDU”	Outstanding student=3	
Research practice	National postgraduate innovation practice series competition award	First prize=5, second prize=4, third prize=3	15%
	Research fund from Zhejiang Department of Education	1	
	HDU graduate innovation fund	0.5	
Globalization	Attending international conference	2	15%
	International academic exchange (Co–cultivation)	3	
Academic norms and code of conduct	Law–abiding	Cheating and other violations of discipline	–100%
	Academic norms	academic dishonorable behavior	

The second first-level indicator, "Scientific and Technological Achievements of Graduates as The First Constructor", consists of three second-level indicators, including academic paper publication, patent authorization, and compilation of textbooks and monographs. According to the newly released "Regulations on the Participation of Graduates in Scientific and Technological Work of HDU (Trial)", graduates of HDU who are studying for a doctoral or master's degree must participate in scientific and technological activities and obtain corresponding results before they can apply for a degree, and for the first time, the requirements for scientific and technological work results of academic and professional graduate students are distinguished.

The third first-level indicator "Graduate Honorary Title" includes national scholarships, various corporate scholarships, academic scholarships, provincial excellent graduates, school excellent graduates and the honorary title of "Youth HDU". Different from specific indicators such as dissertation and technological achievements, this first-level indicator reflects the comprehensive quality and performance of graduates at a higher level. For example, the Interim Measures for the Administration of National Scholarships for Graduates of HDU. stipulates that the applicant's morality, academic performance, research results, ongoing research work and expected results should be evaluated.

The fourth first-level indicator, "Graduate Research Practice", includes three secondary indicators, including the award of the National Graduate Innovation Practice Series Competition, the establishment of scientific research projects of the Education Department, the establishment of the school's graduate student innovation fund and the establishment of the school's outstanding graduate dissertation cultivation fund, which reflect the innovative ability and level of graduate students. It is usually possible to select outstanding graduate groups with good research foundation and academic potential who are expected to cultivate excellent academic achievements.

The fifth first-level indicator is "internationalization". This indicator is to implement the requirements of the Ministry of Education on "enhancing the international competitiveness of my country's higher education talent training and accelerating the cultivation of high-level internationalized talents with a global perspective". It includes two secondary indicators of graduate international academic exchanges (joint training) and participation in international academic conferences.

The sixth first-level indicator is "Academic and Code of Conduct", which aims to implement the spirit of "taking the effectiveness of building morality and cultivating people as the fundamental standard for testing all the work of the school", which mainly includes the daily compliance with discipline and law and the compliance with academic ethics and norms in academic activities of graduates.

The specific scores corresponding to each secondary indicator are shown in the third column of Table 1.

2.3 Characteristics and innovations of the index system

Different from higher education theory research, which focuses on the consistency of the evaluation index system, the evaluation index system of advisor guidance ability established in this paper has the following characteristics and innovations based on the actual situation of HDU graduate training.

Firstly, it highlights quantitative evaluation and put the ideas "evaluates the advisor's guiding ability completely based on the students' achievements" into practice. First of all, because the advisor is the first responsible person for graduate training, this evaluation system evaluates the advisor's guiding ability completely based on the students' achievements, instead of the advisor's own scientific research ability. The second point is that the establishment of this evaluation index system is not limited to the study of educational theory, but to serve the fundamental purpose of improving the quality of graduate training. Therefore, it cannot rely on traditional questionnaire surveys or satisfaction surveys for students (Deng et al., 2021). Instead, it needs to be based on objective data to develop a system for evaluating the guidance ability of graduate advisors, and finally forms a harmonious guidance mechanism that follows the rules of graduate training and stimulates the work vitality of advisors.

Secondly, it highlights the "four modernizations" of standardizing the concept of educating people, clarifying the connotation of advisors' morality and cultivating people, systematizing graduate education management, and digitizing advisor evaluation. This indicator system adheres to the student achievement-oriented graduate education concept and the educational spirit of "taking the effectiveness of moral cultivation as the standard for testing all the work of the school", strictly abides by academic norms and moral standard. Through the coordination of multiple departments within the school, the systematization of graduate achievement data management is realized. With the support of complete evaluation data, the formation of automatic evaluation table based on statistics of data indicators is helpful to the quantitative evaluation of the advisor's guidance ability.

3 Empirical Analysis by the Evaluation Index System

Based on the evaluation indicators and weights of advisor guidance ability established in Table 1, with the Graduate School taking the lead, in conjunction with the University's Research Institute, International Office, Network Data Center and other departments, considering the data including the 2019 HDU graduate dissertation, scientific and technological

achievements of graduates as the first constructor, honorary titles, scientific research practice, internationalization, etc., it conducts quantitative statistical evaluation on the guidance ability of graduate advisors. There was no violation of the sixth indicator "academic and behavioral norms" in the graduate education work of HDU in 2019, so this indicator will not be considered in the following empirical analysis.

3.1 Overall analysis

Below we perform the overall analysis on the advisor's individual guiding ability and the college advisor's comprehensive guiding ability

According to the corresponding relationship between the graduate and his advisor, each advisor can get the average score of each first-level indicator, and each first-level indicator is weighted according to the corresponding weight to comprehensively calculate the advisor's guidance ability value P_{index} ; The specific formula is as follows.

$$P_{index}=\sum_{i=1}^{5}\alpha_i\left\{\frac{1}{Ni}\sum_{ni=1}^{N}\sum_{j=1}^{k}x_{ij}^{ni}\right\} \quad (1)$$

Here i is the subscript of the first-level index. When i=1, ni evaluates the number of graduate students mentored by y; when i =1, 2, 3, 4, and 5, the total number of graduate students mentored by y that year. j is the subscript of the corresponding secondary indicator that needs to be calculated per student, and ni is the subscript of the number of advisor's students under the corresponding primary indicator.

According to the calculation method of formula (1), the guidance ability value of the 655 advisors in that year was calculated, and the top 30 advisors in Science and Engineering & Humanities and Social Sciences were selected according to their scores from high to low, as shown in Table 2. Since this article only involves policy and institutional research, the teacher ID and full name of the relevant graduate advisors are omitted, and only their sequence numbers are used.

On the basis of the advisor's guiding ability, the indicator system defines the comprehensive guiding ability index (C_{index}) of the college advisor, which is the embodiment of the average guiding ability value of all advisors in the college. The specific calculation formula is as follows:

$$C_{index}=\frac{1}{N}\sum_{i=1}^{i=N}P_{index} \quad (2)$$

According to the formula (2) and the index system established in Table 1, the comprehensive guiding ability of the advisors of each graduate training college of HDU, is counted, as shown in Figure 1. It can be seen from this that the School of Communication Engineering, the School of Science, and the School of Environmental and Materials Science and Engineering are ranked among the top three in the colleges of humanities and social sciences. According to the currently set index system, it can be found that the overall indicators of science and engineering colleges are better than that of humanities and social science colleges. On the one hand, it is related to the relatively obvious characteristics of electronic information and the distribution of advantageous disciplines. On the other hand, there are more related to science and engineering majors than humanities majors in graduate research practice, international exchanges, etc. it is related to graduate research practice, international exchanges. Therefore, this indicator system implements a proportional classification and ranking of science and engineering and humanities.

Table 2 Top 30 advisors in HDU according to the evaluation index system

ranking	natural sciences	score	ranking	humanities and social sciences	score
advisor 1	Sch. Electronics & Information Engineering	4.29	advisor1	School of Economics	4.03
advisor2	Sch. Sciences	3.79	advisor2	School of Foreign Languages and Literatures	2.8
advisor3	Sch. Automation	3.63	advisor3	School of Management	2.75
advisor4	Sch. Materials & Environmental Engineering	3.52	advisor4	Sch. Foreign Languages & Literatures	2.63
advisor5	Sch. Computer Science	3.47	advisor5	Sch. Management	2.51
advisor6	Sch. Communication Engineering	3.43	advisor6	Sch. Management	2.49
advisor7	Sch. Automation	3.42	advisor7	Sch. Marxism	2.48
advisor8	Sch. Materials & Environmental Engineering	3.35	advisor8	Sch. Marxism	2.34
advisor9	Sch. Computer Science	3.35	advisor9	Sch. Marxism	2.29
advisor10	Sch. Automation	3.35	advisor10	Sch. Economics	2.29
advisor11	Sch. Electronics & Information Engineering	3.29	advisor11	Sch. Foreign Languages & Literatures	2.2
advisor12	Sch. Automation	3.27	advisor12	Sch. Foreign Languages & Literatures	2.18
advisor13	Sch. Computer Science	3.24	advisor13	Sch. Law	2.18
advisor14	Sch. Sciences	3.19	advisor14	Sch. Management	2.15
advisor15	Sch. Automation	3.15	advisor15	Sch. Management	2.14
advisor16	Sch. Sciences	3.12	advisor16	Sch. Foreign Languages & Literatures	2.1
advisor17	Sch. Automation	3.11	advisor17	Sch. Marxism	2.1
advisor18	Sch. Materials & Environmental Engineering	3.1	advisor18	Sch. Marxism	2.1
advisor19	Sch. Communication Engineering	3.05	advisor19	Sch. Media & Design	2.09
advisor20	Sch. Electronics & Information Engineering	3.04	advisor20	Sch. Marxism	2.06
advisor21	Sch. Automation	3.02	advisor21	Sch. Economics	2.05
advisor22	Sch. Automation	3.01	advisor22	Sch. Economics	2.04
advisor23	Sch. Communication Engineering	3.01	advisor23	Sch. Management	2.03
advisor24	Sch. Communication Engineering	3	advisor24	Sch. Management	2.03
advisor25	Sch. Communication Engineering	2.98	advisor25	Sch. Management	2.03
advisor26	Sch. Automation	2.97	advisor26	Sch. Accounting	1.99
advisor27	Sch. Computer Science	2.97	advisor27	Sch. Foreign Languages & Literatures	1.98
advisor28	Sch. Mechanical Engineering	2.95	advisor28	Sch. Accounting	1.96
advisor29	Sch. Electronics & Information Engineering	2.94	advisor29	Sch. Management	1.95
advisor30	Sch. Automation	2.91	advisor30	Sch. Marxism	1.95

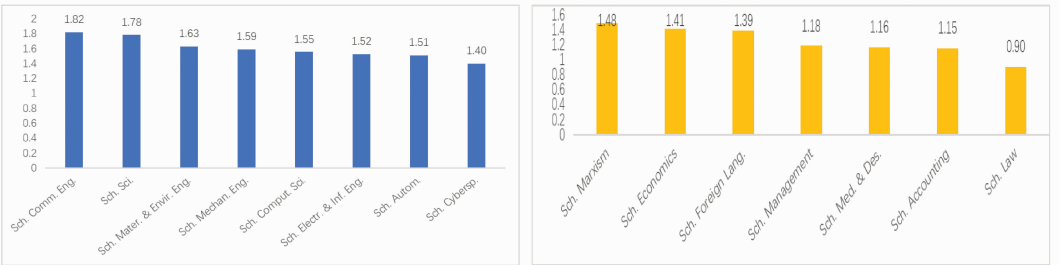

Figure 1 The comprehensive guidance ability ranking of different schools in HDU

3.2 Individual Analysis

1) Analysis of the first–level indices of the quality of the dissertation

The 655 effective advisors in the whole school were ranked according to the quality of the dissertation (including the four second-level indicators of blind review, defense, provincial sampling, and provincial excellence) from high to low. In terms of guidance, 40 advisors (top 30 in science and engineering, with several tied for ranking; top 10 in humanities and social sciences). It can be found that, in general, the advisors of science and engineering colleges have higher scores while the scores of humanities and social sciences are lower. What's more, there are more advisors on the list from the School of Automation, School of Electronic Information, School of Communication Engineering, School of Computer, and School of Materials and Environmental Engineering.

Table 3 Analysis on the quality of the dissertation (The top 30 and 10 advisors respectively from natural sciences and humanities and social sciences)

ranking	school	score	ranking	school	score
advisor1	Sch. Electronics & Information Engineering	3.21	advisor21	Sch. Computer Science	2.70
advisor2	Sch. Automation	3.15	advisor22	Sch. Computer Science	2.70
advisor3	Sch. Materials & Environmental Engineering	3.00	advisor23	Sch. Sciences	2.70
advisor4	Sch. Materials & Environmental Engineering	3.00	advisor24	Sch. Sciences	2.70
advisor5	Sch. Computer Science	3.00	advisor25	Sch. Communication Engineering	2.70
advisor6	Sch. Computer Science	3.00	advisor26	Sch. Communication Engineering	2.70
advisor7	Sch. Computer Science	3.00	advisor27	Sch. Communication Engineering	2.70
advisor8	Sch. Sciences	3.00	advisor28	Sch. Communication Engineering	2.70
advisor9	Sch. Sciences	3.00	advisor29	Sch. Communication Engineering	2.70
advisor10	Sch. Automation	3.00	advisor30	Sch. Communication Engineering	2.70
advisor11	Sch. Automation	3.00	advisor1	Sch. Economics	3.00
advisor12	Sch. Automation	2.90	advisor2	Sch. Foreign Languages & Literatures	2.70
advisor13	Sch. Materials & Environmental Engineering	2.85	advisor3	Sch. Management	2.40

ranking	school	score	ranking	school	score
advisor14	Sch. Automation	2.85	advisor4	Sch. Foreign Languages & Literatures	2.40
advisor15	Sch. Computer Science	2.73	advisor5	Sch. Management	2.40
advisor16	Sch. Materials & Environmental Engineering	2.70	advisor6	Sch. Marxism	2.40
advisor17	Sch. Electronics & Information Engineering	2.70	advisor7	Sch. Management	2.25
advisor18	Sch. Electronics & Information Engineering	2.70	advisor8	Sch. Marxism	2.14
advisor19	Sch. Electronics & Information Engineering	2.70	advisor9	Sch. Foreign Languages & Literatures	2.10
advisor20	Sch. Mechanical Engineering	2.70	advisor10	Sch. Marxism	2.10

Statistical box plots were used to analyze the quality of all dissertations from 15 graduate training colleges (including 8 in science and engineering and 7 in humanities and social sciences), as shown in Figure 2, where A, B, C, D, E, F, G, H, I, J, K, L, M, N respectively represent the 15 schools, i.e., School of Materials and Environmental Engineering, School of Electronics and Information Engineering, School of Law, School of Management, School of Economics, School of Computer Science, School of Mechanical Engineering, School of Accounting, School of Sciences, School of Marxism, School of Humanities, School of Communication Engineering, School of Foreign Languages and Literature, School of Cyberspace, and School of Automation. In general, the dissertations of the School of Communication Engineering are of better quality on average and have less variance.

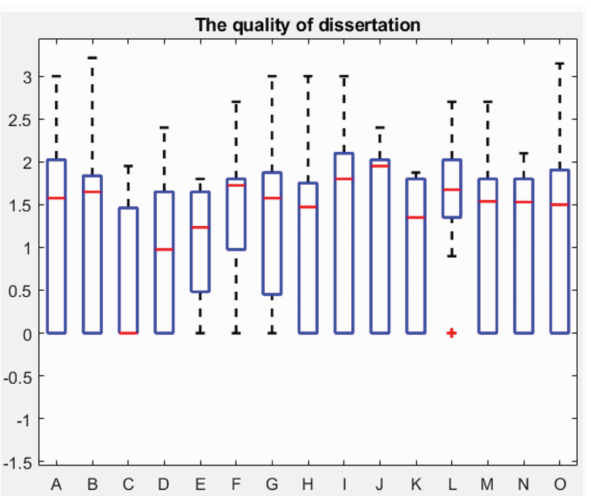

Figure 2 Statistical analysis on the quality of dissertation

2) Analysis of other first–level indices

The four first-level indicators of scientific and technological achievements, honorary titles,

scientific research practice and internationalization of the graduate student as the first instructor are shown in Figure 3, Figure 4, Figure 5 and Figure 6, respectively. From the statistical results, the following conclusions can be drawn:

(1) Judging from the scientific and technological achievements of the graduate student as the first instructor, the School of Science and Technology is obviously better than the School of Humanities and Social Sciences. In the field of Science and Technology, the School of Materials and Environmental Science and Engineering & the School of Science have excellent performance. Judging from the raw data, it can be found that there are significantly more scientific and technological academic papers than humanities and social sciences ones, and there are more papers in materials, mathematics, physics and other majors than in engineering majors.

(2) Judging from the first-level indicators of the graduate honorary title, the scores of each college are close. Since this indicator is composed of secondary indicators such as various scholarships and honorary titles, the number of scholarships for each college is allocated by the research department according to the number of graduate students.

(3) From the perspective of graduate research practice indicators, engineering colleges perform better. On the one hand, there are many categories of competitions in this type of discipline, and on the other hand, due to the relatively large base of science and engineering graduates, the number of people in the dissertation cultivation fund, innovation fund and the establishment of scientific research projects of the Education Department is more.

(4) From the perspective of graduate internationalization indicators, the School of Foreign Languages performs well in this indicator due to its obvious foreign-related characteristics. Other excellent schools are mainly from the field of science and engineering, such as the School of Electronic Information, the School of Mechanical Engineering, the School of Science and the School of Automation.

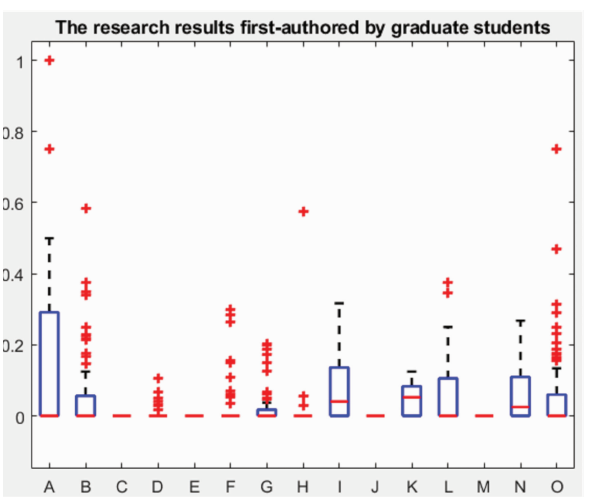

Figure 3 Statistical analysis on the research outputs first-authored by graduate students

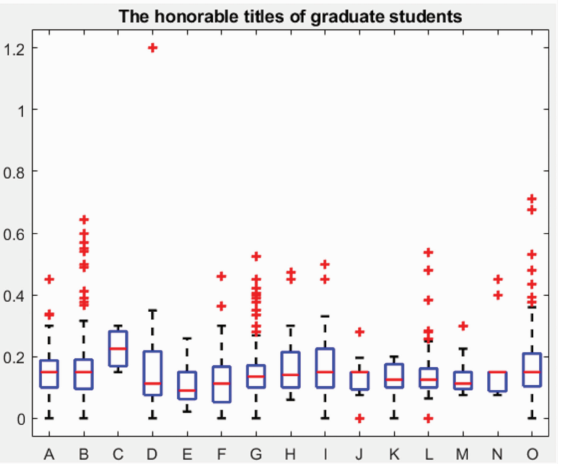

Figure 4 Statistical analysis on the honorable titles

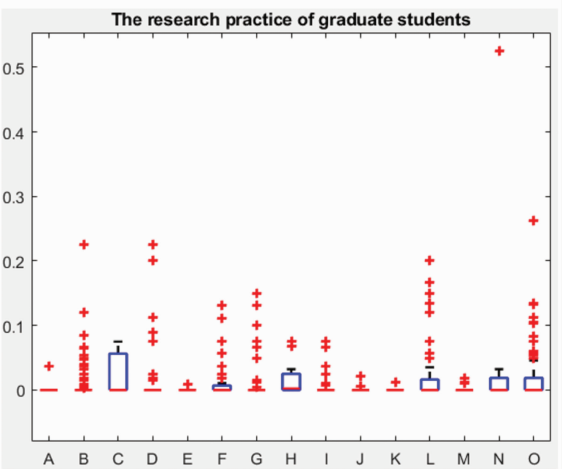

Figure 5 Statistical analysis on the research practice of graduate students

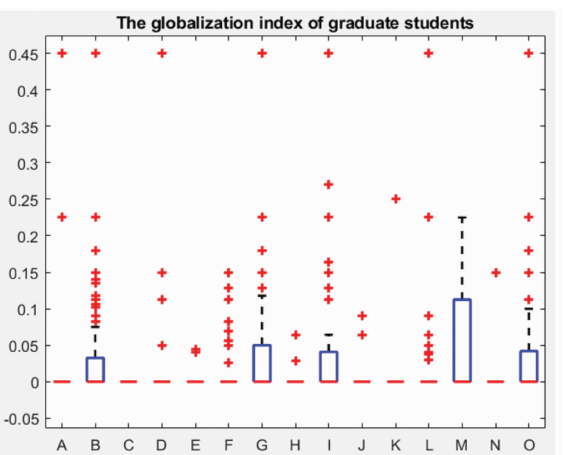

Figure 6 Statistical analysis on the globalization index of graduate students

From the school's point of view, it is possible to compare the scores of all graduate training colleges on each first-level indicator macroscopically to achieve optimal allocation of resources; from the college's point of view, it is possible to commend graduate advisors with outstanding guiding ability in each indicator, and exchange teaching experience. Through data analysis, Table 4, Table 5, Table 6 and Table 7 are the top 20 advisors in science and engineering, and 10 advisors in humanities and social sciences with excellent performance in the four first-level indicators of graduate scientific and technological achievements as the first constructor, honorary title, scientific research practice and internationalization.

Table 4 The ranking and corresponding scores of advisors according to the research results first-authored by graduate students (The top 20 and 10 advisors respectively from natural sciences and humanities and social sciences)

ranking	school	score	ranking	school	score
advisor1	Sch. Materials & Environmental Engineering	1.00	advisor16	Sch. Sciences	0.32
advisor2	Sch. Materials & Environmental Engineering	0.75	advisor17	Sch. Automation	0.31
advisor3	Sch. Materials & Environmental Engineering	0.75	advisor18	Sch. Mechanical Engineering	0.30
advisor4	Sch. Automation	0.75	advisor19	Sch. Automation	0.29
advisor5	Sch. Electronics & Information Engineering	0.58	advisor20	Sch. Mechanical Engineering	0.28
advisor6	Sch. Materials & Environmental Engineering	0.50	advisor1	Sch. Economics	0.58
advisor7	Sch. Automation	0.47	advisor2	Sch. Media & Design	0.13
advisor8	Sch. Communication Engineering	0.38	advisor3	Sch. Media & Design	0.13
advisor9	Sch. Materials & Environmental Engineering	0.38	advisor4	Sch. Management	0.11
advisor10	Sch. Electronics & Information Engineering	0.38	advisor5	Sch. Media & Design	0.08
advisor11	Sch. Electronics & Information Engineering	0.38	advisor6	Sch. Media & Design	0.08
advisor12	Sch. Electronics & Information Engineering	0.35	advisor7	Sch. Media & Design	0.07
advisor13	Sch. Communication Engineering	0.35	advisor8	Sch. Management	0.07
advisor14	Sch. Electronics & Information Engineering	0.34	advisor9	Sch. Economics	0.06
advisor15	Sch. Materials & Environmental Engineering	0.33	advisor10	Sch. Management	0.05

Table 5 The ranking and corresponding scores of advisors according to the honorable titles of graduate students The top 20 and 10 advisors respectively from natural sciences and humanities and social sciences)

ranking	school	score	ranking	school	score
advisor1	Sch. Automation	0.71	advisor16	Sch. Mechanical Engineering	0.46
advisor2	Sch. Automation	0.68	advisor17	Sch. Cyberspace	0.45
advisor3	Sch. Electronics & Information Engineering	0.64	advisor18	Sch. Computer Science	0.45
advisor4	Sch. Electronics & Information Engineering	0.60	advisor19	Sch. Sciences	0.45
advisor5	Sch. Electronics & Information Engineering	0.57	advisor20	Sch. Materials & Environmental Engineering	0.45
advisor6	Sch. Electronics & Information Engineering	0.55	advisor1	Sch. Management	1.20
advisor7	Sch. Electronics & Information Engineering	0.54	advisor2	Sch. Economics	0.47
advisor8	Sch. Communication Engineering	0.54	advisor3	Sch. Economics	0.45
advisor9	Sch. Automation	0.53	advisor4	Sch. Economics	0.45
advisor10	Sch. Computer Science	0.53	advisor5	Sch. Management	0.35
advisor11	Sch. Sciences	0.50	advisor6	Sch. Management	0.35
advisor12	Sch. Electronics & Information Engineering	0.50	advisor7	Sch. Foreign Languages & Literatures	0.3
advisor13	Sch. Electronics & Information Engineering	0.49	advisor8	Sch. Management	0.30
advisor14	Sch. Automation	0.48	advisor9	Sch. Management	0.30
advisor15	Sch. Communication Engineering	0.48	advisor10	Sch. Law	0.30

Table 6 The ranking and corresponding scores of advisors according to the academic practice of graduate students (The top 20 and 10 advisors respectively from natural sciences and humanities and social sciences)

ranking	school	score	ranking	school	score
advisor1	Sch. Cyberspace	0.53	advisor16	Sch. Communication Engineering	0.12
advisor2	Sch. Automation	0.26	advisor17	Sch. Automation	0.11
advisor3	Sch. Electronics & Information Engineering	0.23	advisor18	Sch. Automation	0.11
advisor4	Sch. Communication Engineering	0.2	advisor19	Sch. Mechanical Engineering	0.11
advisor5	Sch. Communication Engineering	0.17	advisor20	Sch. Automation	0.11
advisor6	Sch. Communication Engineering	0.15	advisor1	Sch. Management	0.23
advisor7	Sch. Computer Science	0.15	advisor2	Sch. Management	0.2
advisor8	Sch. Computer Science	0.15	advisor3	Sch. Management	0.11

ranking	school	score	ranking	school	score
advisor9	Sch. Automation	0.14	advisor4	Sch. Management	0.09
advisor10	Sch. Automation	0.14	advisor5	Sch. Economics	0.08
advisor11	Sch. Communication Engineering	0.14	advisor6	Sch. Law	0.08
advisor12	Sch. of Automation	0.13	advisor7	Sch. Management	0.08
advisor13	Sch. Computer Science	0.13	advisor8	Sch. Economics	0.08
advisor14	Sch. of Mechanical Engineering	0.13	advisor9	Sch. Economics	0.07
advisor15	Sch. Electronics & Information Engineering	0.12	advisor10	Sch. Economics	0.03

Table 7 The ranking and corresponding scores of advisors according to the globalization index (The top 20 and 10 advisors respectively from natural sciences and humanities and social sciences)

ranking	school	score	ranking	school	score
advisor1	Sch. Electronics & Information Engineering	0.45	advisor16	Sch. Materials & Environmental Engineering	0.23
advisor2	Sch. Sciences	0.45	advisor17	Sch. Computer Science	0.23
advisor3	Sch. Automation	0.45	advisor18	Sch. Communication Engineering	0.23
advisor4	Sch. Materials & Environmental Engineering	0.45	advisor19	Sch. Automation	0.23
advisor5	Sch. Computer Science	0.45	advisor20	Sch. Automation	0.23
advisor6	Sch. Electronics & Information Engineering	0.45	advisor1	Sch. Management	0.45
advisor7	Sch. Communication Engineering	0.45	advisor2	Sch. Management	0.45
advisor8	Sch. Automation	0.45	advisor3	Sch. Management	0.45
advisor9	Sch. Automation	0.45	advisor4	Sch. Media & Design	0.25
advisor10	Sch. Sciences	0.27	advisor5	Sch. Foreign Languages & Literatures	0.23
advisor11	Sch. Automation	0.23	advisor6	Sch. Foreign Languages & Literatures	0.23
advisor12	Sch. Automation	0.23	advisor7	Sch. Foreign Languages & Literatures	0.23
advisor13	Sch. Electronics & Information Engineering	0.23	advisor8	Sch. Foreign Languages & Literatures	0.15
advisor14	Sch. Computer Science	0.23	advisor9	Sch. Management	0.15
advisor15	Sch. Computer Science	0.23	advisor10	Sch. Foreign Languages & Literatures	0.11

4 Conclusion and Future Consideration

With the goal of improving the quality of graduate training and the starting point of improving the guidance ability of supervisors, this paper constructs a scientific, fair, equitable

and open evaluation index system for the guidance ability of graduate supervisors, which has the following advantages:

(1) Goal-oriented. The indicators of evaluating guidance ability focus on the advisor's effectiveness in cultivating graduate students rather than the advisor's own scientific research achievements. The index calculation is based on the average score of guiding students. Therefore, the advisors who guide students are few, and the advisors with good guidance are among the best. However, the average score of those advisors with excellent scientific research and more graduate students is not very prominent.

(2) Referenceability. All colleges can refer to this report to analyze their own strengths, weaknesses and corresponding reasons in graduate education, and make targeted and continuous improvements.

(3) Objectivity and equity. This statistical data is collected by the Graduate School, the Ministry of Research and Industry, and the Joint Network Center from the data reported to the Provincial Department of Education and the Academic Degree Center and other higher-level departments. It does not require additional data from the advisors, and does not increase the advisors' workload.

(4) Expansibility. There are very few quantitative evaluations of advisor guidance ability indicators in domestic colleges and universities. For the first time, Graduate School in HDU tried to quantitatively evaluate the advisor's guiding ability in combination with the concept of school education. Although the department has conducted sufficient discussions and solicited opinions and suggestions from various aspects, the index design, weight distribution and calculation methods are not necessarily completely scientific, especially in the aspects of hierarchical classification evaluation, qualitative and quantitative evaluation, etc., which needs to be improved iteratively in the future.

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