

Research on the Cultivation and Evaluation of Graduate Scientific Research and Innovation Talents

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Abstract: This paper proposes the idea of constructing a "diversified" evaluation system for the cultivation of graduate scientific research and innovation talents, establishing a "trinity" evaluation mechanism for the cultivation of graduate scientific research and innovation talents, and establishing a sound legal guarantee system for the cultivation and development of graduate scientific research and innovation talents. It analyses the evaluation indicators of graduate scientific research and innovation talents, which involve human environment conditions, institutional conditions, teacher conditions, material conditions, and scientific research conditions. The evaluation criteria for teaching conditions and other factors have been formulated, which has certain reference value for the cultivation and evaluation of graduate research and innovation talents.

Keywords: Graduate; Scientific research innovation; Talent cultivation; Evaluation

1. Introduction

With the continuous expansion of graduate enrollment scale and the increasing number of graduates day by day, many training units have experienced a shortage of educational resources. At the same time, the difficult employment of graduates has also become a hot issue generally concerned in the society. Thus, how to achieve the training quality objective of graduates under enrollment expansion situation, guarantee the level of degree award, and achieve harmonious and sustainable development of cultivation scale, quality and efficiency of graduate scientific research and innovation talents is an urgent and arduous task in front of the graduate education department. It is in urgent need of establishing and improving the cultivation and evaluation mechanism of graduate scientific research and innovation talents, and improving the cultivation conditions and evaluation system of graduate scientific research and innovation talents to guarantee the high-quality development of graduate education.

2. Establishing the cultivation and evaluation mechanism of graduate scientific research and innovation talents

According to the overall requirements of the country for the reform of the higher education management system, as well as the "Outline of China's Education Reform and Development", the higher education management system should gradually implement two-level management at the central and provincial, autonomous region, and municipality levels, with the principle of provincial-level priority, and increase the overall management power of provincial-level people's governments over degree and graduate education in their jurisdiction. At present, the three-level degree management system of state -- province and city -- colleges and universities has formed to guarantee normal operation and healthy development of degree and graduate education work. However, compared with developed countries, our country started late in aspect of cultivation and evaluation of graduate scientific research and innovation talents, and its system needs to be further improved.

2.1 Constructing a "diversified" organizational system for the cultivation and evaluation of graduate research and innovation talents

Through analysis on the situations of graduate quality assurance of France, US and UK and other developed countries, due to the differences of historical and cultural traditions and social development environment of various countries, the roles of three factors including government, intermediary organization and colleges and universities played in the quality assurance system also have their own

characteristics. According to the power comparison status of three factors including government, intermediary organization and colleges and universities in quality assurance system management, university quality assurance model can be summarized into three types: The continental model (government department-oriented), the American model (intermediary organization certification) and the British model (university self-management) ^[1].

The continental model refers to a kind of quality assurance model of higher education developed in western European continental countries, namely government department-oriented type. Characterized by evaluation of higher education strictly controlled by the government, the countries that implement this model are mainly some continental European countries, such as France, Germany and Netherlands, etc. The quality assurance of this model is promoted by the government from outside the higher education system. External review with government will and value orientation plays a significant role in this evaluation process. The management system of their higher education belongs to centralization type. The common characteristic is that government strictly controls the universities and universities enjoy relatively little autonomous right. It is basically a government control model. It focuses on the input quality of higher education rather than its output quality. The government mainly exercises different degrees of intervention to colleges and universities through the following matters: Teacher employment, appropriation budget, school enrollment, major and curricula ^[2].

The American model mainly guarantees higher education quality through certification of non-governmental organizations, ranking and evaluation of doctoral programs and other activities. There is no official special evaluation institution. The government does not directly participate in evaluation activity, but certification organization shall obtain governmental approval to conduct activities. It is regulated by American constitution, states and local governments at all levels are responsible for respective education, higher education is no exception, so as to form a distinct American model. One of the biggest differences from other modes is: It plays a role in market mechanism. Under the premise that school's autonomous right is not intervened, the government allocates funds for education. School can put forward its requirements to the government according to evaluation result and society can use evaluation results to select school majors and graduates. In specific, American higher education quality assurance model can be divided into: Higher education accreditation (certification), university ranking, doctoral program evaluation and other forms.

The British model is also called as self-governing community of fellow. It started from the idea of independence from external control of Oxford University and University of Cambridge in Middle Ages and was the product moderately influenced by professor's guild, college directors and administrative staffs ^[3]. It typically reflects the traditional characteristics of British "academic freedom" and "academic experts governing schools". The core feature is that universities have a greater degree of autonomy, and the quality of teaching is mainly the responsibility of the university itself, with academic experts organizing evaluations and less government intervention. The UK is one of the earliest countries in the world to carry out quality assurance movement in higher education. For the quality assurance of cultivation of graduate scientific research and innovation talents in higher education evaluation, the British government consciously referred to the "quality assurance" thought in total quality management (TQM) in industry. It took "quality assurance" as the goal, established verification mechanism of university running efficiency through evaluation and determined the obligation of various graduate training units to report the graduate education quality status to the government and the public.

It has three characteristics: firstly, the quality of graduate education is combined internally and externally, with internal guarantee as the main guarantee; Secondly, attach importance to the role of social supervision mechanisms; The third is to attach importance to the construction of a quality assurance system for graduate education.

2.2 At present, higher education and graduate education abroad have formed relatively perfect assurance system

Although different countries have different characteristics in the implementation, the different education institutions of the same country are also different. However, judging from the experience of most countries, they all formulate guide specifications from the perspective of state administration. Various education institutions can design respective quality assurance systems based on guide specifications according to their own cultural characteristics. This is consistent with policy guiding ideology of the reform of the educational system of our country. However, from the perspective of specific implementation, there is still a significant gap in China. Firstly, from the perspective of education management institution, our country's government management function needs to transfer to

policy-based and guiding management and supervision from detailed management in all aspects, and a series of guiding quality control policies and procedures shall be issued to assure the function and efficiency of the quality supervision system; Secondly, various higher education institutions have not generally formed institutionalized and programmed means for the moment to ensure the maintenance and improvement of their own education quality. Thus, our country shall further improve quality assurance system for the cultivation of graduate scientific research and innovation talents from the following aspects:

Firstly, we should transform the management functions of the government. In the guarantee of the quality of graduate research and innovation talent cultivation, the key issue of the quality assurance system for graduate research and innovation talent cultivation is how the government handles the relationship with universities, whether it directly controls universities or indirectly regulates them through market regulation. Government shall transform to indirect and strategic management from direct and transactional management to truly push higher education institutions to the market for the market mechanism to adjust its layout and teaching activities, and to gradually establish the quality assurance system of cultivation of graduate scientific research and innovation talents formed by internal and external levels of educational institutions.

Secondly, we should establish an Education Quality Assurance Office. At the national level, an Education Quality Assurance Office is established under the leadership of the Ministry of Education, responsible for guiding the quality of graduate students nationwide. Establish a national framework for graduate quality assurance procedures, regulate the content and procedures of graduate quality assurance from a macro management perspective, and provide policy guidance for various higher education institutions. In order to guarantee the smooth implementation of state macro management, a perfect external supervision and evaluation, and certification institution shall be established in charge of national graduate quality evaluation work, and certification work of qualifications and abilities of educational institutions to cultivate graduates and graduate's degree, etc. We should establish appropriate evaluation and certification standards, regularly evaluate and certify various educational institutions, and make their results public to promote the improvement of teaching quality in educational institutions from external management environment, public image, and market competition.

Thirdly, we should establish social intermediaries for the evaluation and recognition of higher education quality under the authorization of the government. This intermediary institution has independence, impartiality and academic authority. It is entrusted and funded by the government. Its members are the experts and scholars from and outside the higher education community. It is responsible for leading, organizing, implementing and coordinating education quality identification, certification and supervision and other work by the methods of audit and evaluation. It can objectively and independently implement evaluation activity, organizes and participates in higher education quality assurance activity. It is the bridge linking the government, society and higher education institutions. It plays an important role in promoting the reform of higher education management system, establish the fairness of quality assurance activities of higher education and promote scientific management of higher education. It is the important constituent part of higher education quality assurance system.

Fourthly, we can establish an expert group for evaluating the quality of graduate research and innovation talent cultivation, with teaching units as the main body. This group is responsible for the internal evaluation of the quality of graduate research and innovation talent cultivation in teaching units, and regularly checks and evaluates the graduate training conditions and teaching quality of the unit together with various departments, including humanistic environment conditions, teacher conditions, institutional conditions, scientific research conditions, teaching conditions, material conditions, as well as students' enrollment, teaching situation, and academic completion status throughout the entire process of graduate teaching. It also involves the feedback and follow-up investigation of students. The inspection work should also include the inspection and evaluation of the teaching guarantee situation of the teaching department, including whether the allocation of teachers, textbooks, facilities, etc. can meet the completion of teaching work, and whether the setting of the curriculum system meets the comprehensive improvement of students' quality. Establish a quality assurance organization composed of experts, employees, and students to jointly supervise the teaching quality of the school. The inspection and evaluation work should be conducted at least every two years and the results of the inspection and evaluation should be made public, in order to supervise the improvement of teaching quality in various educational institutions from an internal mechanism.

2.3 Establish a "trinity" mechanism for the evaluation and evaluation of graduate research and innovation talent cultivation

We should implement a monitoring model that combines government macro monitoring, independent education by universities, and evaluation by intermediary institutions, and establish a "trinity" mechanism for evaluating the cultivation of graduate research and innovation talents among the government, universities, and intermediary institutions to ensure the quality of graduate training. Firstly, government is the monitoring institution of graduate quality evaluation. Government is an important factor for higher education quality assurance. Government needs to correctly master the direction of development and reform of cultivation of graduate scientific research and innovation talents with a long-term vision and from the height of the whole. It mainly implements macro control through legislation, planning, appropriation, evaluation and supervision, etc. Secondly, colleges and universities are the main bodies of cultivation of graduate scientific research and innovation talents. Within the scope of national legal systems, they carry out graduate training and degree awarding work, responsible for enrollment, cultivation, management, degree acceptance, and self-evaluation of graduate quality. They are the internal guarantee system for ensuring the quality of graduate research and innovation talent cultivation.

Thirdly, intermediary institution is evaluation main body of cultivation of graduate scientific research and innovation talents. It has independence, public welfare, communication, coordination, impartiality and other basic characteristics, and has functions in five aspects including evaluation services, supervision and management, notarization appraisal, social communication and information consultation. Under the authorization of the government, we can carry out quality evaluation of graduate research and innovation talent cultivation, provide evaluation reports to the government and schools, and publish the evaluation results to the public in the media.

2.4 Establish and improve the legal guarantee system for cultivating innovative talents in graduate research

The cultivation of graduate scientific research and innovation talents has shown obvious international trend, internationalization of enrollment, the internationalization of training model, and the internationalization of talent quality standards. With the deepening of reform and opening up, the cooperation and exchange between higher education in China and overseas countries become more and more. Internationalization and international cooperation of cultivation of graduate scientific research and innovation talents become the general direction of development of our country's cultivation of graduate scientific research and innovation talents. Thus, the cultivation of graduate scientific research and innovation talents in China shall be in line with international educational concepts, establish international education concept and constantly strengthen international cooperation. In order to ensure the quality of cultivation of graduate scientific research and innovation talents, a complete legal system must be established to make that there are laws and rules for cultivation of graduate scientific research and innovation talents to follow; at the same time, graduate evaluation monitoring system must be constructed to strengthen education evaluation and supervision and guarantee harmonious and scientific development of cultivation of graduate scientific research and innovation talents. We should further strengthen the construction of education laws and regulations system, and provide a good legal environment for the harmonious development of graduate research and innovation talent cultivation. Strengthening the construction of education laws and regulations mainly includes the following aspects: firstly, improving the system of education laws and regulations, such as the promulgation of the Education Funding Law, the Social Forces Education Law, and the Education Administration Law as soon as possible. The second is to accelerate the formulation of implementation rules in response to the phenomenon of delayed implementation of education laws. The third is to improve the quality of educational laws and regulations, mainly by improving the operability of educational laws and regulations through legislative techniques. Strengthen administrative law enforcement and supervision to ensure the seriousness and effectiveness of laws and regulations. Law enforcement system of graduate education is not sound enough. Especially, supervision system and punishment system of graduate education laws and regulations are incomplete. Thus, strengthening the construction of supervision system and punishment system of graduate education administrative enforcement is a distinctly important key link in current legal construction of graduate education.^[4]

3. Improve the index system of cultivation and evaluation of graduate scientific research and innovation talents

3.1 Graduate cultivation condition evaluation index system is footstone of quality assurance of graduate cultivation

Deeply affected by current value orientation, the basic laws on cultivation of graduate scientific research and innovation talents are not well understood and grasped and essential characteristics of cultivation of graduate scientific research and innovation talents are not represented well, resulting the current status that quality of graduate education is questioned. Graduate cultivation condition evaluation index must lay emphasis on six aspects of human environment conditions, system conditions, teacher conditions, material conditions, scientific research conditions and teaching conditions to play its footstone role to quality assurance of graduate training [5].

3.2 Evaluation indexes analysis

Academic environment, scientific research conditions, teaching conditions, system conditions and other cultivation conditions have significant influence on graduate quality. However, teacher-student ratio, building conditions and library conditions have no big influence, which fully shows that practicing academic environment, scientific research level and rules and regulations and other internal skills is required, rather than just building a few buildings. A good academic environment plays an important role in the quality of graduate cultivation and avoids the impact of contemporary utilitarian value on graduates' thoughts to an appreciable extent. American cultivation of graduate scientific research and innovation talents particularly attaches importance to academic reputation. As a scholar said, a university is a pickle jar. Students in different majors in the same school can feel the school's unique academic atmosphere. Our country's colleges and universities shall establish a scientific and developing concept of quality and focus on cultivating own good academic reputation and academic characteristics [5].

Graduates are the highest level of education. The scientific research conditions of the school most important factors in determining the quality of graduates. The two indexes of funds invested by the school and average scientific research fund per tutor are not only very significant but also has a high partial regression coefficient, colleges and universities shall try to really improve the academic level of teachers, strengthen academic exchanges inside and outside the school, and continue to learn and explore the frontiers of the subject.

The teaching conditions of colleges and universities are also very important. Although graduate stage focuses on the application and creation of new knowledge, a solid foundation is the premise. Colleges and universities shall continue to build quality courses and practice bases.

In terms of system conditions, colleges and universities that enroll graduates earlier have relatively perfect enrollment, training, evaluation and employment system, so colleges and universities shall constantly standardize and improve a series of cultivation system of graduate scientific research and innovation talents suitable for them. As for teacher-student ratio index, it is not an important factor in graduate training conditions, but it is an important factor in the process of graduate cultivation. The increase in the number of graduates makes the schools have to lower the selection criteria for graduate supervisors. Some tutors have fewer topics and less funds and more students. The guiding force cannot keep up. At this time, teaching condition has big influence on graduate quality. The influence of school building condition on graduate quality is not significant. On one hand, the living environment of colleges and universities has been greatly improved with economic development. On the other hand, students at the graduate stage focus on the academic environment. After all, colleges and universities are the places to learn and create, rather than tourist places. The influence of book condition on graduate quality is not significant, which is caused by developed network resources. Online Chinese and foreign journals and various databases provide great convenience for doing research [6].

4. Evaluation criteria for graduate training conditions

Through comparative analysis, weight allocation was carried out on the evaluation indicators of graduate cultivation conditions, and the evaluation criteria for graduate cultivation conditions were obtained. The specific evaluation criteria are shown in Table 1.

Table 1: Graduate education quality evaluation index system

Dimension index	Classification index (Level II index)	Single index (Level III index)
Guidance from tutors	Tutor team construction	Tutor age and title structure
		Tutor degree structure
		Tutor reserves
	Tutor responsibility	Tutor guiding frequency
		Tutor guiding time
		Degree of trust of graduates to tutor
	Tutor's scientific research situations	Tutor's scientific research achievements
		Tutor's scientific research project approval situations
		Scale of scientific research funds for tutors
Management education	Training and teaching management	Rationality of training program
		Curriculum and teaching methods
		Situation of textbook construction
	Academic dissertation quality	Topic selection and overview of thesis
		Innovation and benefit of the thesis
		Knowledge and scientific research level reflected in the thesis
	Extra-curricular learning atmosphere	Ideological and political education of graduates
		Graduate academic innovation forum held
		Graduate academic research atmosphere
Material conditions	Teaching and scientific research equipment	Provision of teaching equipment
		Provision of scientific research equipment
		Research and practice base construction
	Books and reference materials	Network availability
		Quantity of books
		Quantity of E-book (light disk)
	Living conditions	Living conditions of graduates
		Living facilities for graduates
External evaluation	Employer satisfaction degree	Graduate employer complaint rate
		Graduates qualified for specific positions
		Comprehensive quality of graduates
	Social evaluation	Social credibility of graduates
		Overall employment rate of graduates

5. Conclusion

With the advent of knowledge economy era, facing the rapid development of graduate education, how to ensure that its education quality and the level of running school can adapt to the changes of the new era and continue to improve is hot issue generally concerned by the government and school-running units. Graduate education evaluation work as crucial means to measure and evaluate the quality of graduate education develops day by day and gradually becomes a significant component of graduate education management.

Our country's graduate education evaluation work started late. There are still gaps with the countries with perfect evaluation system. Outstanding performances are that education evaluation theory is relatively weak, evaluation technology is not mature enough, evaluation method is single, and evaluation information network construction lags and other aspects. This study focuses on discussing the theory of evaluation activity carried out by graduate training unit. At the same time, it appropriately introduces statistical comprehensive evaluation system analysis method and statistical sampling theory and method, and makes further discussion and research in aspects of deepening the evaluation theory of graduate education, improving evaluation technology and enriching evaluation and practice activities to promote continuous development and deepening of our country's graduate education evaluation system.

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