Graduate students are an important engine of national and regional development and the dominant force of contemporary scientific and technological innovation. It has become the historical mission of high-level research universities to provide strong talent support for the construction of innovative powerful countries with human resources. This investigation performed a systematic and comparative analysis of international postgraduate training models. The whole process of multidimensional training countermeasures and suggestions were proposed. Those specifically included updating the training concept, optimizing the curriculum structure, innovating teaching methods, strengthening practical training, strengthening the responsibility of the tutor, and expanding the international vision. After investigation and analysis, this research pointed out that the conditions of establishing and perfecting the examination system, evaluation mechanism, and incentive measures related to postgraduate education were guaranteed. Multiple measures to improve the quality of graduate students have certain reference significance for the current graduate education.

1. Introduction

Graduate students are the main force of future scientific and technological innovation. Their academic ability, style, ambition, and international vision determine the height of national or regional scientific and technological innovation and the speed of building an innovative country \[1, 2\]. How to improve the quality of postgraduate education in the new era has become the focus of international industry learning and research circles and has become an important topic for the sustainable and high-quality development of universities and research institutes around the world \[3\]. Graduate students, as high-level talents, play an important role in serving national strategy and improving national comprehensive strength and competitiveness \[4\]. Under the background of the new era, it has become the historical mission of high-level research universities to improve the quality of postgraduate training and provide strong talent support for the construction of an innovative country and a powerful country with human resources.

The profound changes in the international situation have driven every country to amend new requirements for national education. Graduate education has become the primary foundation of a nation’s talent and technological competition, as they play an essential role in significant innovations in the world. Therefore, both developed and developing countries attach great importance to high-level graduate education \[5\]. Currently, all countries are vigorously developing cutting-edge science and technology to seize the commanding heights of the world’s technology and industry. As the world is encountering changes unseen in a century, the new round of scientific and technological
The strategy of scientific and technological power in the new era puts forward new requirements for postgraduate education. Graduate education plays an important role in improving national innovation ability, serving social and economic construction, and promoting the modernization of the national governance systems and governance abilities. The guiding plan of “double first-class” construction of China’s higher education puts forward that it is necessary to reform the training mode and system of postgraduates, enhance the innovation ability of postgraduates, and vigorously cultivate advanced, sophisticated, and urgently needed talents [6]. The United States has closely linked the development of higher education to national competitiveness and put forward plans to ensure national security and prosperity [7, 8]. Germany proposed to build excellent universities and clusters and strongly support the innovation of education [9]. Japan proposes “two capacities, one environment, one learning network, and one set of mechanisms” to cultivate diverse capacities with high aspirations to lead and support sustainable social development [10].

2. Comparative Analysis of International Postgraduate Training Models

Quality is the lifeline of postgraduate education, and how to improve the quality of postgraduate training is the focus of global concern. Graduate education in Europe and the United States, which has a history of more than 100 years, has gradually developed from two stages of “standardized education, certificate-based quality” and “external ranking based on the pursuit of excellence” to the current stage of “focusing on students’ learning effect and promoting students’ development” [11, 12]. The complete training process covers enrollment, course teaching, training links, scientific research, thesis work, etc. Most international high-level universities are very strict in enrollment, selection, teaching process, and thesis work, and other links, graduate courses, and papers are quite high requirements and set extremely strict assessment standards.

2.1. Student Selection and Enrollment. In Western countries, universities have greater rights to enroll students independently, without government intervention [13]. Therefore, every university can recruit and select prospective students according to their criteria. Students usually need to provide their transcripts, diploma, and 2-3 recommendation letters from their professors during admission. In higher education, these recommendation letters are far more convincing than mere scores [14]. On the other hand, the graduate admission test, i.e., the Unified National Graduate Entrance Examination, is an admission requirement for all graduate schools in mainland China. Therefore, the selection criteria of the universities tend to be unified, and the stipulated arrangement is still relatively limited.

2.2. Curriculum and Teaching. In most international universities, conducting innovative research or professional training pieces is the principal component of graduate studies [15]. The teaching content does not advocate the so-called “designated teaching resources” yet often incorporates the latest research topics and results [16]. Graduate students are trained to focus on the knowledge and skills essential for scientific research through seminars, forum discussions, experiments, and more. On the other hand, graduate education in China adopts the segmented learning style. In the first year of the study, graduate students will take courses to gain knowledge and focus on their research later in the second year of the study. As a result, graduate students in China seem to be gradually ignoring the quality of teaching, as taking the courses is just simply counting the credits needed to be obtained in the first year of their study.

2.3. Comparison of Academic Training. Most international universities actively implement interdisciplinary learning plans and research topics, and their curriculum setting emphasizes the intersection and penetration between academic disciplines and fields [17]. Some universities frequently invite guest teachers to provide students with great high-level courses and lectures that comprise diverse novel knowledge. In addition, to meet the needs of interdisciplinary talents with innovation capability, universities add multidisciplinary approaches to broaden the knowledge and skills of graduate students. They positively influence their interdisciplinary problem-solving in science, technology, social economy, and their comprehensive ability to deal with complex problems. In contrast, the multidisciplinary learning plans and cross-integration of scientific research topics are very limited in mainland China. There are specific barriers between disciplines and colleges of the same university.

2.4. Stage Evaluation Comparison. Both the US and the UK graduate education systems have strict and systematic teaching curriculum arrangements. Students are not allowed to begin writing their thesis or dissertation before completing the courses. Although graduate students have different learning forms, i.e., scientific research is the central component of the study, course completion is still the primary requirement before the thesis work. Most high-level international universities have stringent teaching processes and training assessments [18]. The requirements for graduate courses are very high. If the students could not meet the criteria, they might be dropped out. It has been vastly reported that the graduation rate is much lower than the admission rate across the United States. However, these
requirements are essential to cultivating and screening high-quality graduate students. In contrast, higher education in mainland China adopts the "strict enrollment" model to screen high-quality students at the very beginning. Much to the professors' amazement, most graduate students can graduate very smoothly. Unless students voluntarily give up continuing their studies, they are uncommonly dropping out of school.

2.5. Focus on Capability Comparison. The core of graduate education in most international universities is scientific research. Every professor and student must have significant independent research. However, professors must not make rulings on students' research direction and content. Professors will guide the students by implying some research methods and providing corresponding references and frameworks [19]. In the process of learning and doing research, it is essential to attach great importance to the students' opinions and give them enough space to express and practice their thoughts to cultivate their critical thinking, encourage the exploration of new knowledge, and advocate a high degree of independent research and innovation [20]. After an extensive investigation in the early stage, it was found that most universities in China mainly emphasize the publishing of high-quality academic papers and writing dissertations for the graduation conditions and degree awarding standards of doctoral and master's degrees. To ensure the successful graduation of students, the supervisors had to pay more attention to the cultivation of students' writing ability. In view of the pressure of graduation, students mainly participate in the research topic of their supervisor as assistants, and they are unlikely to explore freely according to their scientific interests. In the long run, they cannot form their independent scientific thinking.

3. Countermeasures for Improving the Quality of Postgraduate Training

In recent years, with the expansion of the postgraduate education scale, China's postgraduate education is no longer elite in the traditional sense. Graduate education tends to be popular, and quite several graduates are application-oriented talents facing the demand of social production [21, 22]. At the same time, some disadvantages affect the high-quality development of graduate education. (1) The degree of learning and application of graduate students is not high, and the current training scheme cannot fully adapt to the social demand for graduate students' ability. (2) Compared with the rapid development of science and technology, the curriculum of graduate students lags, and there is a disjointed phenomenon of learning and application. (3) The teaching method of the course is single, and the students' sense of classroom acquisition is low. (4) Fewer opportunities for students go deep into the production line, lack of adequate practical training, weak vocational competence, and increasing employment pressure on graduates. (5) With the expansion of the enrollment scale and the increasing work pressure on tutors, the sense of responsibility in guiding students tends to weaken. (6) The international vision of graduate students is limited, and the international communication ability cannot meet the expectation of the country and society. By comparing and analyzing the differences between international graduate education systems [23], it is not difficult to find out that the only way to improve the quality of graduate education is to effectively deal with the shortcomings and disadvantages of the current graduate education. The framework of the overall theoretical system of postgraduate education quality improvement countermeasures proposed in this study is shown in Figure 1. The improvement and solution of the above problems need a series of multidimensional measures in the whole process of cultivation.

3.1. Optimization of Culture Program. The development of the graduate training scheme should be in line with the national strategies and needs and the frontiers of the disciplines. Sometimes, it is beneficial to take first-class universities at home and abroad as reliable examples, understand the differences, and adapt the training characteristics to promote the development of the graduate training scheme to be more advanced, forward-looking, and systematic [24]. Based on making clear the orientation of key points and self-orientation, the graduate student training program suitable for their development is made scientifically and rationally. At the same time, it is necessary to reflect differentiation and individualization according to different subject areas and degree types in every higher education institution [25]. Moreover, to support a stable model of the cultivation of top graduate talents, every higher education institution needs to grasp the specifications of degree award, properly, refine the degree award standards, integrate the subject resources, build a subject sharing research platform, and form a high-level subject platform.

The evaluation standard of talent quality should be incorporated into the training process of graduate students. Industries, enterprises, institutions, and universities are actively absorbed to jointly design training programs and discuss curriculum settings. It will be preferable if experts from industry, enterprises, institutions, and universities could design the training plan together to discuss the curriculum settings and clarify teaching goals and the practice standards while adhering to the goals to meet the needs of the society by focusing on detailed solutions on how to face the challenges of the new era.

Furthermore, quality consciousness should run through the whole process of training, and the mechanism of separation and elimination should be set up in the links of the dissertation proposal and dissertation defense, to extend the study period according to the situation and stimulate the research potential of graduate students. Simultaneously, it is also essential to ensure that the requirements of each link of the training program comply with the national regulations of graduate education. Efforts should be made to build a system conducive to improving endogenous quality, strengthening the construction of a quality assurance system, and forming a self-discipline mechanism for secondary colleges, subject
direction, graduate supervisors, lecturers, and management teams. Therefore, system construction promotes the continuous improvement of the quality assessment mechanism.

3.2. Optimization of Syllabus and Curriculum. Strengthening the core curriculum is imperative as it often reflects the significance of the study. The graduate school curriculum should cover all essential principles, techniques, and the latest research findings from a wide range of research directions [26, 27]. Notably, it must cover introductory courses and frontier innovative training and reflect the characteristics of the discipline and the overall strong point of the education team. It will be preferable to build a collaborative curriculum development team by selecting a pivotal teacher to serve as the course leader with 2–4 more teachers to participate in the curriculum construction and jointly undertake the course teaching and the formulation of the teaching plan and the preparation of the syllabus.

It is essential to develop professional courses according to the needs of different levels and types of graduate education. High-quality implementation of research-based instruction is needed throughout the graduate training process to form a high-level graduate curriculum system that is in line with international standards. In addition, every graduate school needs to develop its specialized course program to keep up with the current discipline/academic development. All schools are encouraged to welcome guest teachers to participate in graduate training activities to enhance knowledge sharing among academics, broaden students’ intellectual horizons, and strengthen the link between theory and practice of the graduate study.

Humanity as the basis of graduate education cannot be neglected. In the curriculum setting, apart from quality education, it is also essential to strengthen academics, morals, and humanities, vocational ethics education, and comprehensively improve academic literacy [28]. The ideological and political construction of the curriculum should be promoted solidly, and the sense of responsibility for linking scientific research with national needs should be stimulated. The national spirit education with patriotism and spirit education with innovation and entrepreneurship are strengthened, and the double improvement of humanistic quality and scientific spirit [29] is realized. Academic postgraduates should pay attention to cultivating their innovative thinking, while professional postgraduates should strengthen their entrepreneurial spirit and professional competence.

3.3. Promoting Innovation in Teaching Approaches. It is essential to change the teaching model by taking course quality as a critical indicator to measure graduate training. It is imperative to classify the scientific design courses, increase a couple of seminars, practical and research-based courses, provide forward-looking content for postgraduate training, and improve the innovation and entrepreneurship education curriculum system for graduate students [30]. It is necessary to continuously improve the teaching procedure and increase the quality of the course through intensive lectures and practice, for example, by actively promoting flipped classrooms, utilizing diversified teaching methods, supporting the construction of a case database for graduate courses, and expanding the amount of information and depth of knowledge delivered to graduate students by course teaching.

It is preferable to promote a digital learning and teaching environment by accelerating the integration of scientific research and the cultivation of top-notch innovative talents.
in the information environment and promoting the expansion of high-quality digital education resources under the conditions of informatization [31, 32]. All graduate education institutions are encouraged to build a batch of high-quality graduate online public courses to promote cross-disciplines and cross-university massive open online courses, micro-courses, and other advanced media courses to go beyond the traditional classroom restrictions to enrich graduate students’ self-study platforms, meet the needs of personalized learning, and stimulate students’ innovative consciousness.

Subsequently, it is fundamental to work on promoting the mutual recognition and credit transfer to accompany the increase in student mobility between faculties and even universities at home and abroad, such as focusing on integrated master-PhD courses, strengthening the integration and linkage of the curriculum system of different training stages, encouraging academic master students to pick classes among all degree levels, and recognizing the practical training credits of professional degree graduate students from every means of access. It is also essential to foster the credit recognition of optional doctoral courses for graduate students in the same discipline, construct an open elective course system, and provide more accessible ways for students to acquire credits.

3.4. Strengthen Scientific Practical Training. Increasing the proportion and quality of practical courses by carrying out specialized training courses to train students about various types of equipment and how to operate them could help students strengthen their practical skills and cultivate their innovative thinking [33]. Through excellent and high-quality practical courses, students are stimulated to improve their ability to solve practical problems and accustomed to independent learning and research-based learning. Hence, students transform knowledge into skills, and they are more likely to feel satisfied with the course learning.

In addition, it is essential to increase scientific research training for graduate students. Doctoral students should focus on cultivating scientific research and innovation capabilities, and professional degree master’s students should focus on improving their practice and application capabilities. Through typical, comprehensive, and advanced experimental projects and scientific research topics, graduate students are trained to master the fundamental processes and methods of scientific experiments so that students could experience the scientific research environment, familiarize themselves with scientific research equipment, integrate into the scientific research team, and participate in project activities [34, 35]. Accordingly, all scientific research training should be problem-oriented to nurture students’ skills for innovation and research for them to be able to conduct exploratory research by themselves. Graduate students are encouraged to explore freely according to their interests and to improve original innovation in scientific research.

Furthermore, it is essential to promote more scientific research activities through academic conferences, open forums, lectures by guest teachers, and more as they can be helpful for students to improve their innovative thinking and motivate them to increase the number and quality of innovations they create. Yet, for these activities, to successfully facilitate the academic exchange and help students nurture their organizational skills and coordination capabilities, it is essential to guide them to form a “self-organized, actively contributed, and self-expressed” academic community, to let students express their thoughts more actively, mutually inspire each other with innovations, exhibit their academic achievements, and strengthen the awareness of scientific research integrity. To increase efforts to promote cross-school and cross-cultural exchanges and communication, postgraduates are actively organized to participate in various social activities and practice exercises, to improve their employment competitiveness and professional competence.

3.5. Improvement of Supervisors’ Responsibilities. It is fundamental to give every supervisor the primary responsibility to lead and guide their students according to their style and ideologies. Supervisors can demonstrate and give students moral education and scientific ethics [36]. Letting them have a subjective initiative in their role as a supervisor could further strengthen their sense of responsibility for the quality of the graduate training. Hence, it will be preferable to give every supervisor the right and responsibility to participate in the enrollment selection, training link assessment, award evaluation, employment recommendation, and more.

Besides, higher education institutions are urgently called to facilitate supervisors to join the jointly group mentoring model through organizing joint combined exchange training between mentors and off-campus scientific research institutions and enterprises, regulating a certain proportion of supervisor’s occupation mobility, and utilizing the unique role of off-campus trainers in cultivating students’ innovation and entrepreneurship capabilities [37]. The guidance mode of the tutor’s research group was advocated, which could give full play to the advantages and specialties of each group member in postgraduate training. Supervisor team building can effectively relieve the work pressure and education pressure of graduate tutors.

Likewise, it is essential to continuously strengthen the supervisor’s management team by enriching the selection and management mechanism; providing appropriate and sufficient training for newly elected supervisors; implementing a rotation system for senior supervisors; expanding the domestic and foreign academic exchange and cooperation system for supervisors; facilitating them to participate in industry and enterprise practice; raising the quality of supervisor’s archives management system for graduate teaching; promoting supervisors to balance the relationship between graduate training, scientific research, and social services; and inspiring all supervisors to devote themselves entirely to the graduate training and focus on the quality of graduate education.

3.6. Expansion of International Vision. The education curriculum should reflect not only national but also international components. In the new era of education, colleges and universities are encouraged to open bilingual and English
courses and actively use foreign classic original textbooks. Through the teaching team construction policy of "Excellent, Young and International," the investment in foreign experts and teachers is increased. There is an urgent need for a graduate curriculum that is aligned with international standards and faculty that can engage in a truly equal dialogue in a global dialogue. Young teachers with overseas backgrounds and visiting experience are encouraged to conduct special lectures and interactive exchanges for graduate students to expand the international elements of the curriculum [38, 39].

It is essential to set up a multinational training environment by exploring the convergence management of overseas graduate education. For instance, it would be preferable to arrange overseas and local students together in the same class and research group to equally compete on the same platform; significantly improve the overseas academic exchanges and scientific research experience of graduate students; gradually promote the general study of graduate education with high-quality courses and greatly support doctoral students to participate in international academic exchanges and research program; and pilot some fields of study and research teams throughout the entire process of international teaching and training.

Consequently, it is essential to build an international education environment. High education institutions are encouraged to carry out comprehensive cooperation with world-renowned universities and research institutions in personnel training, scientific research, cultural exchanges, and more as well as promote the establishment of stable overseas study and practice bases in various fields of study and increase the promotion of international cooperation projects; accommodate high-level international academic conferences; increase the global influence and popularity of schools, disciplines, and experts to create an excellent international scientific research and practice platform for the students; and improve the quality of the graduate education in the international level.

4. Conditional Guarantee for the Quality Improvement of Graduate Education

4.1. Expanding and Raising Funding for Education. The enhancement of the overall planning of expanding and raising funds from the national government, universities, research projects, professional institutions, enterprises, and more is essential to support the whole process of graduate education. To create a harmonious and sustainable graduate education environment, most of the funds should be invested in scientific research and discipline construction to support the structure of the graduate curriculum, including the teaching process and practical teaching, especially for the professional degree graduates [40]. Accordingly, it will be crucial to improve the award policy system, increase the optimization of scholarships and funding, significantly raise the standards of graduate student awards, increase the budget for graduate students with financial difficulties, and further promote and improve the scientific research-oriented tutor funding system.

These scholarships and research funding programs could hopefully help graduate students finish their graduate education smoothly without stressing about financial problems and difficulties. Hopefully, it will result in more fantastic achievements. With the establishment of special funding for graduate academic activities, students participate more actively in intellectual salons and forums and scientific and technological practices, therefore promoting their theoretical innovations. Accordingly, to be able to build the circumstances mentioned above, all graduate education institutions are encouraged to adapt to the current development of the national graduate education funding mechanism, to link up performance indicators such as the quality of the graduate courses and the qualification rate of dissertations with the graduate education funding, and to develop a quality-centric graduate education funding allocation mechanism.

4.2. Establishing a Better Institution System and Regulation. First, it is essential to strengthen the standardization and institutionalization of graduate education and regard the improvement of the system as a necessary part of the connotation of improving the quality of the graduates. Likewise, the importance of improving the secondary management of graduate education and strengthening the construction of the graduate management team cannot be neglected. Every faculty and research institution plays an essential role in the whole process of graduate education [41]. Therefore, the core indicators of faculty and research institution performance evaluation should include the quality of its graduate education to encourage every faculty and research institution to improve its graduate education system and management continuously.

In the new era of education, every institution is encouraged to strengthen the information construction of graduate education management and implement an intelligent monitoring system of the whole process of the training process, including course teaching and assessment, thesis proposal, annual reports, professional training, and special lectures. Following the growth of the technology, the implementation of quality control throughout the entire process of training becomes easier as institutions could build student and lecture systems that could monitor and facilitate the whole training process. Both students and lecturers can access both the course credits and the graduate thesis system and receive notifications and announcements. In addition, through the system, lecturers, supervisors, and graduate students could jointly monitor and evaluate the quality of graduate training. Hence, this evaluation system should be set as an anonymous online system divided into three different stages, i.e., the pre-lecture design stage, lecture observation stage, and after-lecture evaluation stage. Meanwhile, it is also essential to improve the dynamic adjustment mechanism of the supervisor position. Single research orientation should be changed, efforts to train new supervisors should be intensified, and provincial recruitment should be implemented. Some measures such as suspending the recruitment or even canceling supervisor qualifications will also be needed to some extent. However, as the supervisors majorly
influence the students' development, the central element of supervisor evaluation should be linked to the development of their students.

4.3. Optimizing Educational Evaluation Mechanism. As evaluation is an essential component in the education development process, it is necessary to establish and refine the self-evaluation system for degree authorization points and carry out regular evaluation and trial basis international peer evaluation for the degree programs [35, 42]. Through the periodical evaluation of the degree programs, it is expected that the quality of the whole graduate training will be increased as it necessitates graduates' research ability and practical ability, demands academic exchanges, and appraises the quality of dissertations and other vital indicators. Moreover, it highlights the significant role of the graduate education team in discipline construction and promotes the gradual return of discipline construction to the standard of talent training.

Furthermore, by establishing a dynamic adjustment mechanism for the admission, early notice, and withdrawal of the degree authorization points, the dynamic adjustment of the degree programs will be linked to the evaluation results of the national and provincial degree authorization points and the school subject assessment results at the same time. Hence, the survival of the fittest will be carried out along with the results. Accordingly, it is essential to gradually establish and refine the dynamic adjustment mechanism for degree programs that is compatible with the orientation of the school, the quality of graduate education, and economic and social development; emphasize the quality evaluation based on the employer’s feedback and comprehensively highlight the importance of supervision, identification, diagnosis, regulation, and improvement; and guide employers to scientifically and reasonably determine the job descriptions and responsibilities, adhere to post-fixed salary, getting paid according to work, preferential work and preferential remuneration, establish an incentive mechanism that emphasizes actual performance and contribution, establish the ideal employment orientation, and promote the appropriateness of the job.

4.4. Establishing the Incentive Mechanism. To further strengthen the construction of graduate education teams, i.e., lecturers, supervisors, and management personnel, it is essential to establish an incentive mechanism for the quality of graduate education, thoroughly improve the evaluation system for the classification appraisal and assessment of academic and professional graduate degree supervisors, establish a feedback mechanism for the quality of graduate training [43], implement rewards and disciplines based on enrollment indicators, and link the quality of graduate training and supervisors with enrollment indicators. Besides that, all results and achievements, amount of work, and quality evaluation results of the graduate training must not be omitted in the series of teachers, supervisors, and professional technical job evaluation requirements to increase the standard and enthusiasm of the lecturers and supervisors in giving lectures and guiding the students.

In addition, it is also compulsory to actively carry out the selection of the best graduate courses, lecturers, and supervisors, improve the reward policies for curriculum construction achievements, and increase the funding for teachers to undertake postgraduate course construction and teaching reform projects [44, 45]. To build an excellent graduate education team, an achievement award is a requisite method to encourage the lecturers to devote themselves to research and teaching, supervisors to care about the development of students, and the management personnel to carry out research-based management.

5. Conclusion

Graduate education is a systematic project. Following the challenges and opportunities in the new era, the graduate training model is constantly adjusted and optimized to meet the different needs of the society for solid talents. To cultivate the ability of postgraduates to have dreams and lofty aspirations, to lead and support the sustainable development of society, and to have an international perspective and social development responsibilities, the quality of postgraduate education needs to keep pace with the times and continue to improve. As widely known, the quality of graduate training is reflected through the overall connotative development of colleges and universities, which requires long-term accumulation and perfection. Accordingly, it is necessary to expand and deepen the training objectives, training methods, training process, and quality assurance of graduate students. The development of graduate education should be planned pragmatically to serve the national economic construction.

Data Availability

No data were used to support this study.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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