

Research on the Path of Constructing Graduate Supervisor Teams Led by the Spirit of Scientists

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Abstract

The spirit of scientists in the new era is a crucial measure to guide the development of graduate supervisor teams and accelerate the building of a world power in science and technology. In terms of internal logic, its logical starting point is the spirit of patriotism; the spirits of innovation, seeking truth, dedication, and collaboration together form its logical middle term; and the spirit of educating people is its logical end term. The spirit of scientists in the new era has rich connotations. It points out the practical path for the high-quality and professional development of graduate supervisor teams in the new era from aspects such as deepening political guidance to consolidate the ideological foundation, strengthening the construction of teachers' ethics to cultivate the spiritual heritage, optimizing government functions to consolidate service guarantees, and refining publicity channels to promote the demeanor of scientific research.

Keywords

The Spirit of Scientists; The Construction of Teachers' Ethics and Conduct; Graduate Supervisor Team.

1. Introduction

Against the backdrop of the in-depth advancement of the innovation-driven development strategy, graduate education, as the core carrier for cultivating high-level national talents, is directly related to the realization of self-reliance and self-improvement in science and technology as well as the great cause of national rejuvenation. As the "primary responsible person" in graduate training, graduate supervisors' academic literacy, educational capabilities, and value orientations directly determine the quality of high-level talent cultivation. The spirit of scientists, which represents the spiritual character and value pursuit formed by scientific and technological workers in long-term scientific research practice, encompasses core connotations such as patriotism, innovation, seeking truth, dedication, collaboration, and education. It is not only the spiritual core of scientific and technological innovation but also the ideological guide and action guideline for the construction of graduate supervisor teams.

In 2019, the "Opinions on Further Promoting the Spirit of Scientists and Strengthening the Construction of Work Style and Academic Atmosphere" clearly defined the six core connotations of the spirit of scientists. These include the patriotic spirit of caring for the motherland and serving the people, the innovative spirit of striving for peaks and daring to be the first, the truth-seeking spirit of pursuing truth and conducting rigorous academic research, the dedicated spirit of being indifferent to fame and fortune and concentrating on research, the collaborative spirit of pooling wisdom for research and working together in unity, and the educational spirit of being willing to be a ladder for others and encouraging the younger generation. These spirits are closely related to the construction of graduate supervisor teams. Therefore, in-depth exploration of the path for the spirit of scientists to lead the construction of graduate supervisor teams is not only a practical need to solve the current difficulties in the construction of supervisor teams but also a strategic measure to implement the fundamental

task of fostering virtue through education and cultivate new generations who can take on the responsibility of national rejuvenation.

2. The Generative Logic and Diversified Origins of the Spirit of Scientists

The spirit of scientists does not emerge out of thin air, but is deeply rooted in specific theoretical systems, cultural contexts, and practical arenas. Specifically, it inherits from Marx and Engels' thoughts on science and technology, is inherently embedded in fine traditional Chinese culture, and is forged in the great practice of China's cause of building a powerful science and technology nation under the leadership of the Communist Party of China, embodying profound theoretical logic, historical logic, and practical logic.

2.1. Theoretical Origin: Inheritance from Marx and Engels' Thoughts on Science and Technology

The 19th century was not only an important stage for the rapid development of capitalism, but also a golden period for the rise and prosperity of modern science and technology. Marx and Engels keenly captured the era trend of modern scientific and technological development. In classic works such as *Das Kapital* and *Dialectics of Nature*, they systematically demonstrated and elaborated on the essential attributes, development laws of science and technology, and its core role in social development from multiple dimensions including philosophy and economics, forming a systematic Marx-Engels thought on science and technology, which laid a solid theoretical foundation for the formation of the spirit of scientists.

Firstly, science and technology are the core driving force for the development of productive forces. Throughout the evolution of human society, from the transition from the Bronze Age to the Iron Age, and the iteration from agricultural civilization to steam civilization, electrical civilization, information civilization, and even intelligent civilization, every transformation of means of production and change of social form are closely related to the progress of science and technology and its role in promoting social productive forces[1]. Technological innovation has always been the key engine for the leapfrog development of productive forces.

Secondly, science and technology are important transformative forces promoting social development. Engels clearly pointed out: "Since the steam engine and new tools transformed the old handicraft workshops into large-scale industry... the productive forces have developed at an unprecedented speed and on an unprecedented scale." This statement profoundly reveals the key role of science and technology in reshaping social relations of production and triggering changes in social structure, highlighting the important value of science and technology as the core driving force for social development.

Thirdly, science and technology are important symbols of the evolution of social civilization forms. Marx emphasized: "The means of labor... are indicators of the social relations in which labor is carried out." With the continuous innovation of science and technology, human civilization has successively experienced the industrial age, the electrical age, and the information age, and is gradually moving towards the intelligent age. Technological iteration not only promotes the transformation of production methods, but also becomes an important symbol of the upgrading and evolution of social civilization forms, profoundly affecting the development direction of human civilization.

At the same time, Marx and Engels also dialectically pointed out that science and technology have the characteristics of duality. While affirming the role of science and technology in promoting social progress, they also paid attention to the negative problems that may be caused by the development of science and technology, such as ecological crises, energy shortages, and climate anomalies. Engels warned: "We should not be too intoxicated with our victories over nature." This statement clarifies that the development of science and technology must follow

the laws of nature and adhere to the basic principle of harmonious coexistence between humans and nature, injecting a rational and prudent value orientation into the spirit of scientists.

2.2. Cultural Foundation: Inherent Embedding in Fine Traditional Chinese Culture

The Chinese nation has a 5,000-year-long history and splendid civilization, and has formed unique spiritual symbols and distinct national characteristics in the long-term historical accumulation. From the perspective of essential attributes, the spirit of scientists, as a spiritual wealth accumulated by the Chinese people in long-term scientific practice, is the inheritance and continuation of the unique spiritual genes in fine traditional Chinese culture; from the perspective of historical context, the spirit of scientists is deeply rooted in the soil of fine traditional Chinese culture, and its core spiritual genes are inherently embedded in the texture of traditional culture.

As a product of historical development, fine traditional Chinese culture has nurtured rich spiritual nutrients. In the thousands of years of civilization evolution, the hardworking and brave Chinese people have refined and formed excellent spiritual qualities such as patriotism, hard work, unity and cooperation, and seeking truth and pragmatism in production practice. These qualities constitute the core of the spirit of scientists and become the deepest and most essential cultural connotation of the spirit of scientists. Taking the spirit of patriotism as an example, as the most simple and profound emotional expression of the Chinese people towards the country, as the core spiritual gene of fine traditional Chinese culture, it is specifically transformed into the practical pursuit of saving the country through science and technology, serving the country through science and technology, and building a powerful country through science and technology in the spirit of scientists, becoming a spiritual banner inspiring scientists to engage in scientific research.

The distinct characteristics of fine traditional Chinese culture provide unique cultural genes for the spirit of scientists, which are precipitated in the spiritual blood of scientists and run through the entire process of scientific practice. Since modern times, in order to realize national independence, national prosperity, and people's happiness, generations of Chinese people have successively nurtured and formed valuable spiritual wealth such as the "Two Bombs, One Satellite" spirit, the Manned Spaceflight Spirit, and the Beidou Spirit in the New Era in the historical processes of revolution, construction, reform, and the new era. Essentially, these spirits are the creative transformation and innovative development of the spiritual genes such as hard work, invention and creation, and unity and cooperation in fine traditional Chinese culture. From the Beijing-Hangzhou Grand Canal to the Great Wall and other great ancient Chinese projects, they not only demonstrate the wisdom and talent of the working people and their concepts of invention and creation, but also reflect the spiritual characteristics of unity and cooperation of ancient ancestors, confirming the inherent unity between the spirit of scientists and fine traditional Chinese culture, and highlighting the inheritance and development of excellent traditional cultural genes by the spirit of scientists.

2.3. Practical Forging: Formation in the Great Practice of the Party-Leaded Cause of Building a Powerful Science and Technology Nation

Over the past century, in the historical process of leading the Chinese people in advancing revolution, construction, and reform, the Communist Party of China has always regarded science and technology as an important support for promoting social progress, attached great importance to the development of science and technology and the training of scientific and technological talents, provided a broad practical platform for the forging of the spirit of

scientists, and fully stimulated the enthusiasm and initiative of the majority of scientists to engage in scientific research and serve the country.

The germination of the spirit of scientists can be traced back to the period of the New Democratic Revolution. In the extremely arduous historical environment, a group of patriotic scientists adhered to the concept of saving the country through science and technology, persisted in scientific research and exploration under extremely difficult conditions, and laid a preliminary foundation for the country's science and technology cause. Since the 18th National Congress of the Communist Party of China, the Party Central Committee with Comrade Xi Jinping at its core has profoundly grasped the global trend of scientific and technological development, clearly proposed that scientific and technological innovation is the inevitable path for high-quality development, placed innovation at the core of the overall national development, and made a major strategic deployment of building a world power in science and technology. Under the strong leadership of the Party, the majority of scientific and technological workers have inherited the spiritual genes of the older generation of scientists, adhered to the rigorous and dedicated scientific research attitude of striving for excellence and selfless dedication, promoted the leapfrog development of China's science and technology cause, and achieved a series of major landmark achievements: "Chang'e-5" successfully achieved extraterrestrial object sampling and return; the launch of the quantum computing prototype "Jiuzhang" marked that China's quantum computing research has reached the world's leading level; the full commissioning of the Beidou Satellite Navigation System has built an independent and controllable global navigation network; the successful launch of the "Tianhe" core module has opened a new era in China's space station construction; the successful test flight of the C919 large jet airliner has achieved a major breakthrough in the field of civil large aircraft. The achievement of these major scientific and technological achievements is not only the practical result of the Party leading the development of the science and technology cause, but also further forged and enriched the connotation of the times of the spirit of scientists.

3. The Basic Connotation and Practical Value of the Spirit of Scientists

3.1. The Spirit of Scientists: Connotation and Significance

The spirit of scientists denotes the spiritual traits cultivated by scientific and technological workers in the course of their professional endeavors. Its core connotation consists of six fundamental dimensions: the patriotic spirit of cherishing the motherland and serving the people, the innovative spirit of scaling heights courageously and daring to take the lead, the pragmatic spirit of pursuing truth and adhering to rigorous academic standards, the dedicated spirit of being detached from fame and fortune and committing to research, the collaborative spirit of integrating wisdom to overcome key difficulties and cooperating in solidarity, and the educational spirit of acting as a stepping stone for others and fostering the younger generation[2]. As a crucial component of the spiritual genealogy of Chinese Communists, the spirit of scientists serves as a spiritual guideline for scientific and technological workers to advance persistently and an inexhaustible motive force for achieving the great rejuvenation of the Chinese nation.

(1) The "patriotic spirit of caring for the motherland and serving the people" inherits Chinese culture. Graduate supervisors are not only guides for graduate students to aspire to success but also leaders in scientific research innovation. With a profound cultural heritage, Chinese culture lays a solid cultural foundation for the construction of the graduate supervisor team. Guided by the beliefs of "caring for the motherland" and "serving the people", graduate supervisors actively integrate the excellent cultural connotations such as family-country feelings and sense of responsibility contained therein into educational concepts and scientific research practices. They practice patriotic feelings with a high sense of academic responsibility. When facing

academic controversies or interests temptations, they always put national interests first, adhere to the moral norms of Chinese culture, remain unshaken, and provide a guarantee for creating a healthy academic environment. Such spirits as self-improvement, family-country feelings, and moral cultivation are precious cultural heritages of the Chinese nation.

(2) The "innovative spirit of striving for excellence and daring to be the first" endows the scientific research literacy of the graduate supervisor team with vivid vitality and forward-looking vision. Innovation is the soul of scientific progress, driving supervisors to break free from the shackles of traditional thinking and bravely explore new horizons in the vast field of scientific research. With the innovative spirit, supervisors lead students to break through existing and relatively rigid research paradigms and explore new research topics; they encourage the exploration of unique research methods, advocate bold questioning and courage to try, and create an open and inclusive academic atmosphere.

(3) The "realistic spirit of pursuing truth and rigorous scholarship" consolidates the scientific research literacy of the graduate supervisor team. Seeking truth is the cornerstone of scientific exploration. Supervisors adhere to a rigorous, objective, and down-to-earth attitude in academic research. From the topic selection and planning of scientific research projects, to the detailed advancement of the research process, and then to the prudent presentation of scientific research results, every step strictly follows scientific methods without any falsification, imperceptibly cultivating students' quality of rigorous scholarship. It not only forms a down-to-earth atmosphere among the supervisor team but also lays a solid and reliable foundation for graduate training, enabling the high-energy talents cultivated to have a solid scientific research foundation and stand the test of the tide of practice in the future scientific research field.

(4) The "dedication spirit of being indifferent to fame and fortune and devoting oneself to research" is the spiritual support for graduate supervisors to perform their duties. Undertaking the important task of cultivating high-level talents, the dedication spirit, as one of the core elements of professional ethics, promotes supervisors to fully invest regardless of personal gains and losses. Supervisors strive to impart knowledge, patiently answer questions, and even willingly sacrifice their own scientific research resources to open up research paths for students, provide valuable guidance and support, and help students make steady progress on the academic road. This dedication extends not only to the academic level but also to the care for students' life and psychology, becoming a solid reliance for students on their learning journey, which fully demonstrates the supervisors' noble moral character.

(5) The "collaborative spirit of pooling wisdom for tackling key problems and united cooperation" is a key link to realize resource integration and complementary advantages. In the context of increasingly complex academic research, it is difficult for individual supervisors to meet the needs of graduate students' all-round development. The collaborative spirit urges supervisors to break disciplinary barriers. In intra-university interdisciplinary cooperation, they unite supervisors from all parties to discuss research plans and provide students with multi-perspective and all-round guidance.

(6) The "educational spirit of being a ladder for others and encouraging young scholars" is the core driving force for supervisors to promote academic inheritance. Supervisors are willing to be ladders for students to climb the academic peak, generously imparting their knowledge, experience, and even academic resources, paving the way for students to the palace of knowledge. Furthermore, supervisors stimulate students' academic enthusiasm through the righteous act of encouraging young scholars, making educational inheritance full of care and motivation. Education is not only about imparting knowledge and skills but also about shaping students' academic character, providing strong support for cultivating high-level talents and promoting scientific and technological development. This not only realizes the relay transmission of academic sparks, maintains the vitality of academic development but also

clarifies the core direction for the construction of the graduate supervisor team[3]. By deeply implanting educational concepts into daily guidance, comprehensively leading students' growth, and cultivating comprehensive talents with both morality and intelligence, the educational effectiveness of the supervisor team is demonstrated, the key role of the team in educational inheritance is strengthened, and thus the overall quality of the graduate supervisor team is improved.

3.2. Guiding the Direction of Scientific and Technological Innovation and Supporting Self-reliance and Self-improvement in Science and Technology

At present, global competition in science and technology is becoming increasingly fierce, and China is facing the problem of "strangulation" in key core technologies. The patriotic spirit and innovative spirit in the spirit of scientists can guide graduate supervisors to focus on national strategic needs, integrate research directions with industrial development and improvement of people's livelihood, and provide talent support and intellectual guarantee for self-reliance and self-improvement in science and technology.

(1) Reshaping the Academic Ecosystem and Curbing Academic Misconduct

In recent years, academic misconduct has occurred from time to time, seriously damaging the academic ecosystem. The truth-seeking spirit and dedicated spirit in the spirit of scientists can help graduate supervisors establish correct academic values, abandon the idea of seeking quick success and instant benefits, abide by academic ethics, and consciously resist behaviors such as plagiarism and fraud. At the same time, they can guide graduate students to develop good academic norms and create a clean and upright academic environment.

(2) Improving the Quality of Talent Cultivation and Implementing the Fundamental Task of Fostering Virtue through Education

The core goal of graduate education is to cultivate high-level talents with both moral integrity and professional competence. The educational spirit and collaborative spirit in the spirit of scientists can promote supervisors to return to the essence of education. They not only impart academic knowledge but also attach importance to cultivating graduate students' scientific literacy, humanistic feelings, and sense of social responsibility, realizing the organic unity of "teaching knowledge" and "fostering virtue", and providing the country with outstanding talents who possess both academic capabilities and a sense of national identity.

(3) Promoting the Reform of Educational Evaluation and Solving the Dilemma of "Five-Only"

In 2020, the "Overall Plan for Deepening the Reform of Educational Evaluation in the New Era" proposed to break the evaluation orientation of "only scores, only admission rates, only academic degrees, only papers, and only titles". The dimensions advocated by the spirit of scientists, such as innovation, seeking truth, and education, can provide a new value standard for the evaluation of graduate supervisors, promoting the transformation of the evaluation mechanism from "quantitative indicators" to "quality-oriented", and paying more attention to supervisors' academic contributions, educational effects, and spiritual inheritance.

4. Current Situation and Challenges in the Construction of Graduate Supervisor Teams

Graduate supervisors are the "primary responsible persons" in graduate education, and their role positioning is multi-faceted. At the academic level, supervisors are the "academic guides" for graduate students, responsible for guiding graduate students in research topic selection, method training, and achievement publication. At the moral level, supervisors are the "moral models" for graduate students, and their words and deeds directly affect graduate students' value orientations and personality development. At the professional level, supervisors are the

"career planners" for graduate students, helping them clarify their academic development directions and career paths.

4.1. Analysis of the Current Situation of Graduate Supervisor Team Construction

Firstly, the scale of the team continues to expand, and the structure is gradually optimized. In recent years, with the rapid expansion of the scale of graduate education, the scale of the graduate supervisor team has also increased accordingly. From 2019 to 2024, the number of graduate supervisors nationwide increased by an average of 8.2% per year. Among them, supervisors with senior professional titles accounted for 76.3%, and those with doctoral degrees accounted for 82.5%. The academic qualification level and professional title structure of the team have been significantly optimized. At the same time, the proportion of interdisciplinary supervisors and industry supervisors has continued to increase, injecting diverse forces into graduate training.

Secondly, a training system has been initially established, and the awareness of education has gradually increased. Various universities have built a hierarchical training system of "pre-service training for new supervisors and special training for in-service supervisors", covering aspects such as academic norms, educational methods, and research ethics.

Thirdly, the evaluation mechanism has been continuously improved, and a multi-oriented trend has initially emerged. Some universities have begun to break through the evaluation model of "only papers and only projects" and include educational effects, academic reputation, and social contributions into the supervisor evaluation indicators.

4.2. Challenges Faced in the Construction of Graduate Supervisor Teams

(1) The Construction of Teachers' Ethics and Morality Needs to Be Strengthened, and There Are Shortcomings in Value Guidance

Although attention has been paid to the construction of teachers' ethics and morality, some supervisors still have deviations in value orientation. Firstly, they focus more on scientific research than on education, devoting most of their energy to paper publication and project application, while investing insufficiently in the academic guidance and personality cultivation of graduate students. Secondly, their awareness of academic integrity is weak, and a small number of supervisors have academic misconduct such as irregular authorship and data fraud. Thirdly, they lack a sense of national identity, and the research directions of some supervisors are disconnected from national strategic needs, lacking the sense of mission of "serving the country through science and technology".

(2) Academic Innovation Capabilities Need to Be Improved, and the Leading Role of Scientific Research Is Insufficient

In the era of big science, the academic innovation capabilities of some supervisors are difficult to meet the needs. Firstly, there is a lack of original research. Most supervisors' research focuses on extended exploration in existing fields, with few breakthroughs in basic research and disruptive technologies. Secondly, their interdisciplinary collaboration capabilities are weak. Affected by factors such as disciplinary barriers and benefit distribution, the proportion of supervisors participating in interdisciplinary research is low, making it difficult for them to address complex major scientific issues. Thirdly, their research methods are outdated. Some supervisors still adopt the traditional individual research model and lack the ability to use new research methods such as big data and artificial intelligence, which restricts the improvement of research efficiency.

(3) There Are Shortcomings in Educational Capabilities, and the Quality of Training Needs to Be Improved

The educational capabilities of some supervisors are difficult to meet the growth needs of graduate students. Firstly, the guidance methods are single. Most supervisors adopt the "injection-style" guidance, lacking the cultivation of graduate students' innovative thinking and critical spirit. 45.3% of graduate students believe that "supervisors only pay attention to research results and do not attach importance to the training of research methods". Secondly, their humanistic literacy is insufficient. Some supervisors lack attention to the mental health and career planning of graduate students. 28.7% of graduate students said that "they will not turn to supervisors for help when encountering psychological confusion". Thirdly, they lack an international perspective. With the acceleration of the internationalization process of graduate education, some supervisors have insufficient international communication capabilities and cross-cultural communication capabilities, making it difficult for them to guide graduate students in conducting international cooperative research.

(4) The Evaluation Mechanism Is Still Imperfect, and There Are Deviations in Incentive Orientation

Although the evaluation mechanism has been reformed, the tendency of "Five-Only" has not been completely eliminated. Firstly, the evaluation indicators are still dominated by quantitative indicators. The weight of quantitative indicators such as the number of papers, project funds, and patents still accounts for more than 60% of the evaluation weight, while the weight of qualitative indicators such as educational effects and academic reputation is low. Secondly, the evaluation cycle is too short. Most universities adopt "annual evaluation" or "three-year assessment", leading supervisors to pursue short-term results and ignore basic research and talent cultivation that require long-term investment. Thirdly, the incentive mechanism is single. Incentives for excellent supervisors are mostly based on material rewards and professional title promotion, lacking recognition and inheritance at the spiritual level, making it difficult to stimulate the internal motivation of supervisors to practice the spirit of scientists.

5. Exploration of the Path for the Spirit of Scientists to Lead the Construction of Graduate Supervisor Teams

5.1. Values Shaping: Consolidating the Ideological Foundation of Supervisors with the Spirit of Scientists

Cultivate a sense of responsibility with the patriotic spirit and dedicated spirit, guide graduate supervisors to establish correct value pursuits, and closely integrate their personal academic ideals with the national destiny. Establish academic character with the truth-seeking spirit and innovative spirit, put an end to academic misconduct, and at the same time cultivate graduate students' rigorous academic attitude, thereby developing their innovative thinking and critical spirit.

Strengthen the construction of teachers' ethics and morality, and consolidate the value foundation with the spirit of scientists. Firstly, carry out a series of special educational activities on the spirit of scientists. Universities should incorporate the spirit of scientists into the core content of teachers' ethics and morality education. Online, they can build a learning platform for the spirit of scientists; offline, they can organize activities such as "the spirit of scientists entering the campus", inviting experts and scholars to share their scientific research experiences and spiritual insights to ensure that the spiritual connotations are deeply rooted in the hearts of the people. Secondly, establish a "dual supervision" mechanism for teachers' ethics and morality. Guided by the concepts of seeking truth and integrity in the spirit of scientists, build a dual supervision mechanism for teachers' ethics and morality involving "university supervision and student feedback". At the university level, establish a supervision committee for teachers' ethics and morality to conduct regular spot checks on supervisors'

academic behaviors and educational work, and implement a "one-vote veto system" for supervisors who violate teachers' ethics and morality. At the student level, establish an anonymous feedback channel to allow graduate students to promptly report problems encountered in the guidance process. At the same time, conduct a satisfaction survey on supervisors' ethics and morality every semester, and include the survey results in the supervisor assessment system to urge supervisors to consciously practice the spirit of scientists.

5.2. Capacity Improvement: Empowering Supervisors' Core Literacy with the Spirit of Scientists

Enhance research capabilities with the innovative spirit and collaborative spirit. Supervisors can continuously update their knowledge structure, master new research methods, improve the originality and forward-looking nature of scientific research, and at the same time cultivate graduate students' team collaboration capabilities to adapt to the transformation of the research paradigm in the era of big science.

Creating a Good Academic Atmosphere and Inheriting Cultural Genes with the Spirit of Scientists. Firstly, build an "academic community" and promote the spirit of collaborative innovation. Guided by the collaborative spirit in the spirit of scientists, promote universities to establish interdisciplinary and inter-unit "academic communities". Secondly, carry out "academic and cultural activities" to cultivate the scientific spirit. Regularly hold activities such as "academic culture festivals" to create an academic atmosphere that advocates science and pursues truth. Thirdly, build "cultural carriers for the spirit of scientists" to lay a solid cultural foundation and integrate the spirit of scientists into the construction of the campus environment[4].

Optimizing the Supervisor Evaluation Mechanism and Setting a Guiding Benchmark with the Spirit of Scientists. Firstly, construct a "multi-integration" evaluation index system. Break through the limitation of "only quantitative" evaluation and establish a multi-dimensional evaluation index system of "academic contribution + educational effect + spiritual practice" guided by the spirit of scientists. Secondly, implement a "classified evaluation and long-term assessment" model. Conduct classified evaluation according to the type of discipline and the characteristics of supervisor positions. At the same time, establish a "fault tolerance and error correction" mechanism to tolerate non-principle mistakes made by supervisors in original research and interdisciplinary exploration, creating an evaluation atmosphere that encourages innovation and tolerates failure, which is in line with the innovative spirit and truth-seeking spirit in the spirit of scientists. Thirdly, improve the incentive mechanism that emphasizes both "spiritual incentives and material rewards". In addition to traditional material rewards such as professional title promotion and research fund support, strengthen incentives at the spiritual level and set benchmarks for practicing the spirit of scientists.

5.3. Code of Conduct: Guiding Supervisors' Practical Actions with the Spirit of Scientists

Standardize academic behaviors with the spirit of scientists, abide by academic norms in scientific research activities, and uphold an open and fair attitude in academic exchanges, respect different viewpoints, and promote the collision and integration of academic ideas. Optimize educational behaviors with the spirit of scientists, and comprehensively cultivate the comprehensive quality of graduate students and promote their all-round development through activities such as forming research teams, conducting academic salons, and organizing social practices.

Firstly, construct a "three-dimensional" training content system. Design a three-dimensional training content covering "values shaping, research capacity improvement, and educational capacity cultivation". Offer courses such as "Serving the Country through Science and

Technology and Sense of Responsibility" to strengthen supervisors' patriotic spirit and truth-seeking spirit; invite industry experts and senior supervisors to give lectures to improve supervisors' innovative spirit and collaborative spirit; and enhance supervisors' educational spirit and international perspective through case analysis and simulated teaching.

Secondly, establish a closed-loop training system integrating practice and assessment. Integrate the practice of the spirit of scientists into the practical part of training, organize supervisors to participate in grass-roots practical activities, and deepen their patriotic spirit and dedicated spirit in serving national strategies and social needs. At the same time, establish a training assessment mechanism, take supervisors' participation in training, practical results, and student evaluations as assessment indicators, and take the tutorial team system as an indicator for the selection of "excellent supervisor teams".

6. Future Outlook

6.1. Constructing an International Supervisor Development Community as a Key Future Direction

Establishing an international supervisor development community to strengthen cooperation and exchanges with world-renowned universities and scientific research institutions, and inviting international experts to participate in graduate training, can broaden the international perspective of supervisors and graduate students, and enhance the internationalization level of education. In the future, international cooperation models will help cultivate high-level talents with international competitiveness, and promote the international dissemination and development of related disciplines in China.

6.2. Developing an Intelligent Supervisor-Student Assistant System as a Critical Future Initiative

Leveraging modern information technologies such as artificial intelligence and big data to develop an intelligent supervisor-student assistant system can provide more convenient and efficient services for supervisors and graduate students. This system can realize intelligent recommendation of learning resources, offering personalized learning materials and courses based on graduate students' learning status and needs; real-time tracking of learning progress to promptly grasp their academic advancement, identify problems, and provide targeted guidance; and an online platform for academic exchanges to facilitate academic communication and cooperation between supervisors and students, as well as among students. This will greatly improve the efficiency and quality of graduate training.

6.3. Establishing a Full-Cycle Development Support System as a Guarantee

An important measure for the construction of the supervisor team is to establish a full-cycle development support system covering supervisor selection, training, assessment, and career development, providing comprehensive support and guarantee for supervisors. In the selection phase, strict selection criteria should be implemented to recruit teachers with noble morality, profound academic attainments, and rich practical experience as supervisors. In the training phase, systematic training and learning opportunities should be provided to enhance supervisors' educational and teaching capabilities and professional literacy. In the assessment phase, a scientific and reasonable evaluation mechanism should be established to motivate supervisors to continuously improve teaching quality and scientific research level. In the career development phase, opportunities for promotion and development should be offered to encourage supervisors to continuously innovate and develop in the field of education.

7. Conclusion

The spirit of scientists in the new era has injected new vitality into the cultivation of higher education talents in China, and particularly clarified the direction for the construction of graduate supervisor teams in institutions of higher education. Guided by the spirit of scientists in the new era, the construction of graduate supervisor teams in colleges and universities is not only an inevitable choice to respond to the needs of the times but also a key measure to promote the high-quality development of the cause.

Looking back on the exploration process, we deeply recognize that the construction of supervisor teams in institutions of higher education needs to closely adhere to the patriotic spirit of "caring for the motherland and serving the people", guide graduate supervisors to integrate their personal academic pursuits with disciplinary inheritance and innovation, and national strategies, and let the innovative spirit of "striving for peaks and daring to be pioneers" become the spiritual background of the supervisor group. It is necessary to anchor the educational wisdom of the realistic spirit of "pursuing truth and rigorous scholarship", promote supervisors to take the educational spirit of "being a ladder for others and encouraging young scholars" as the core, pass on the essence of disciplinary culture through words and deeds, cultivate the disciplinary thinking and scientific research innovation capabilities of high-level talents through personalized guidance, and realize the in-depth integration of "imparting knowledge" and "educating people". It is required to strengthen the academic attitude of the collaborative spirit of "pooling wisdom for tackling key problems and united cooperation", encourage supervisors to take root in practice and the frontline of scientific research, and set an academic benchmark for students that values both "upholding integrity" and "pursuing innovation".

At the same time, it is also necessary to face up to the existing challenges in the construction process, such as the deviation in the understanding and practice of the spirit of scientists among some supervisors, and the gap between their educational capabilities and the requirements of the new era; the training mechanisms and evaluation systems at the institutional level still need to be further improved to better motivate supervisors to practice the spirit of scientists. In the future, it is necessary to continuously take institutional innovation as the guarantee, improve the connotation of supervisors through systematic training, guide supervisors to return to the original aspiration of educating graduate students as their conscious pursuit through diversified evaluation, and let the spirit of scientists truly integrate into institutions of higher education by creating a campus culture that respects teachers, values education, and devotes to nurturing people.

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