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Considerations on the Scientific Research Work of Application-Oriented Undergraduate Universities in the First-Class Construction

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Abstract: Cultivation of high-quality application-oriented talents is the main task of application-oriented undergraduate universities. Scientific research work is very important for application-oriented undergraduate universities. It can promote the overall teaching ability level and the quality of application-oriented talent cultivation and is also an important task in the construction of first-class application-oriented undergraduate universities. Application-oriented undergraduate universities should improve the level of scientific research work by adjusting the teaching staff structure, building scientific research platforms, implementing research incentive policies and strengthening deep cooperation between universities and enterprises. Only through these constructive measures can an application-oriented university better serve the local economic and social development and improve the quality of application-oriented talent cultivation.

1. Introduction

Building world-class universities and disciplines (referred to as Double First-Class), is a major strategic decision for China's higher education. It is of great significance for improving the education development level, enhancing the core competitiveness, and laying the foundation for long-term development of China [1]. At the same time, the Ministry of Education, the National Development and Reform Commission and the Ministry of Finance jointly issued policies to guide some local undergraduate universities to transform into application-oriented universities [2]. In March 2021, the Jiangsu Provincial Department of Education launched the first-class application-oriented undergraduate university construction plan [3] to promote the construction of application-oriented undergraduate universities in Jiangsu Province, trying to build several national-level first-class application-oriented undergraduate universities in Jiangsu.

Application-oriented Undergraduate Universities refer to undergraduate higher education institutions with the goal of cultivating application-oriented talents. Application-oriented Undergraduate Universities are important components of national higher education. They cultivate high-quality application-oriented talents with strong social adaptability and high competitiveness in accordance with China's current economic and social development needs [4]. As the main power

responsible for cultivating application-oriented talents, teachers in application-oriented undergraduate universities need to focus on both teaching and research. Teachers should constantly update teaching contents, improve teaching models, enhance teaching quality and arouse students' enthusiasm and initiative in learning in order to get better results for application-oriented talent cultivation. Academic research is the lifeline of universities. Through professional scientific researches, teachers can improve their understanding of certain subjects and can apply the research results to their teaching work and improve the timeliness and attractiveness of the teaching contents. This can cultivate the students' abilities to solve practical problems, to innovate and to start businesses and can contribute to training of high quality application-oriented talents.

Scientific research is an important part of the daily work of university teachers. Through scientific research, teaching ability can be improved. Thereby the level of teaching and education can be promoted. The basic conditions required for scientific research work mainly include funds, teams, instruments, and professional knowledge and skills. Application-oriented undergraduate universities should have all necessary resources. Although they are not comparable to Double First-Class universities as far as scientific resources are concerned, they can choose appropriate research directions based on their own conditions and subject characteristics and can direct their scientific researches to serve local economic development.

In the process of first-class construction, application-oriented universities should attach great importance to their scientific research work. Firstly, they should optimize their teaching staff structure and build a double-qualified teacher team with high educational levels, strong scientific research capabilities and rich practical teaching experiences. Secondly, they should build up more scientific research platforms and create more chances and better conditions for their teachers to engage in scientific research work. Thirdly, they should develop and implement appropriate research incentive measures to encourage teachers to actively participate in scientific research work. Lastly, the application-oriented universities should further deepen the university-enterprise cooperation [5]. Through these close operations, the application-oriented universities can solve practical engineering problems in enterprises and the enterprises can provide better practical research conditions for teachers. By taking the above measures, the application-oriented universities can promote their scientific research work and improve the overall quality of application-oriented talent cultivation.

2. Strengthen the teaching staff construction

Teachers are the undertakers of scientific research work in universities. Under the background of the "First-Class" construction, the number and quality of graduates with doctoral degree will significantly increase year by year. In this context, application-oriented undergraduate universities should actively introduce young teachers with doctoral degrees from top-level universities, laying a solid foundation for the improvement of their scientific research work. Taking Jinling Institute of Technology as an example, there are 1300 full-time teachers, among which the teachers with doctoral degree account for 65% and the double-qualified teachers account for 60%. In addition, Jinling Institute of Technology has a group of outstanding experts, such as experts granted special allowance by state council, experts named as national excellent teachers, outstanding young and middle-aged experts with outstanding contributions in Jiangsu Province, etc. These experts, together with all other full-time teachers, constitute a very strong power for the institute’s scientific research work [6].

Most new teachers are graduated from top-level domestic universities or well-known foreign universities. In terms of academic research, many teachers have achieved fruitful results during their doctoral studies. In addition, the development of the Internet has also made academic

exchanges far easier in cyberspace. On one hand, young teachers can continue their research original work in certain fields. On the other hand, they can strengthen communication with well-known experts and professors in these fields, especially the connection with their doctoral supervisors' research teams. Application-oriented universities can strengthen young teachers' engineering practice and practical teaching abilities through the Visiting Engineer Program and encourage young teachers to participate in local enterprise product development and technical research through deepening school-enterprise cooperation. This can both serve the local economic and social development and improve the research level of application-oriented undergraduate universities and the total quality of their application-oriented talent cultivation.

3. Accelerate the research platform construction

The research platform is an important carrier for application-oriented undergraduate universities to gather research teams and carry out high-level scientific and technical innovation activities. Its construction quality has a significant impact on the role of application-oriented undergraduate universities in scientific research, talent cultivation and social service [7]. The Medium and Long Term Plan for National Major Science and Technology Infrastructure Construction (2012-2030) issued by the State Council pointed out that China must accelerate the construction of major science and technology infrastructure and highlight the fundamental, future-proof and strategic role of facility construction in China's overall development strategy. Connections of the infrastructure construction with other relevant development plans and programs, and the infrastructure's support and service functions should be strengthened. And a relatively complete major scientific and technological infrastructure system shall be established to enhance our independent innovation capabilities and support the construction of a modern innovative country. Under the guidance of a series of favorable national policies, the construction of research platforms and practice training bases in application-oriented undergraduate universities has been continuously strengthened. This provides a solid hardware guarantee for the improvement of scientific research level.

In order to attract more outstanding talents, universities should provide certain fund support to new teachers. This may support them in establishing personal research platforms and help them carry out scientific research work as soon as possible by, for example, establishing research initiation funds. By conducting various academic salons, lectures and other activities, we aim to build an academic exchange platform for young teachers, provide guidance and services and cultivate their interdisciplinary and interdisciplinary research abilities, making them the main force in the construction of research platforms as soon as possible [8].

At the same time, application-oriented undergraduate universities should strengthen resource sharing, establish a shared platform for large instruments and equipment, and improve the equipment utilization efficiency. Scientific research platforms should strengthen information technology construction, build large-scale instrument and equipment resource sharing platforms, and solve the problem of individual platform instruments and equipment being idle for a long time or occupied by some individuals. A long-term resource sharing mechanism should be established. Resource sharing should be properly assessed and encouraged on scientific research platforms to and arouse teachers' awareness for platform resource sharing. In addition, universities should fully utilize the resource advantages of enterprises in practical technology and production equipment, and create innovative cooperation modes through joint construction of laboratories, engineering research centers, research institutes, and many other means. Taking Jinling Institute of Technology as an example, there are dozens of state or provincial science and technology platforms established jointly with enterprises, including research centers, test centers, key laboratories and many other types of science and technology platforms. These platforms have provided good conditions for

teachers to engage in related research. In the past three years, the institute has completed more than 1800 government sponsored or enterprise-funded projects and has obtained nearly 1300 patent authorizations. More than 50 scientific and technological progress achievements have been granted the science and technology progress awards and the philosophy and social science research excellent achievement awards.

In addition, establishment of a mechanism for sharing instruments and equipment with other universities can help reduce the cost of scientific research platform construction and improve the efficiency of scientific research work. Jinling Institute of Technology has established the “Yangtze River Delta Application-oriented Undergraduate University Alliance” with nearly 80 universities across the country, aiming to strengthen cooperation and exchange among in-alliance universities. This may contribute to promote mutual understanding and learning, achieve educational resource sharing, enhance overall scientific research capacity, highlight each university’s characteristics and provide intellectual and talent support for the rapid development of the social economy in the Yangtze River Delta region. While strengthening cooperation with other application-oriented undergraduate universities, Jinling Institute of Technology actively collaborates with well-known domestic and foreign universities such as Nanjing University, China University of Mining and Technology, Nanjing University of Technology, Metropolitan University of Hong Kong, Century University of Malaysia, Southeast University of the Philippines, etc. to jointly build a shared research platform, providing greater support for the smooth implementation of the university's scientific research work.

4. Increase scientific research incentives

Talent is the core element for the high-quality development of scientific research work in universities. Application-oriented universities should take incentive measures to attract outstanding talent to work for them. In order to better regulate the talent introduction work, the General Office of the Ministry of Education has issued several notices on further strengthening and standardizing the talent introduction work in universities, deepening the reform of the personnel management system in universities. These notices can help coordinate the establishment of a high-level talent income distribution system, correctly handle the relationship among talent introduction, talent cultivation and talent use, and further create a good situation for the mutual development of various types of talents. Jinling Institute of Technology has formulated a talent introduction policy, providing settling-in allowance, rental subsidy and start-up research fund for outstanding talents. It has attracted a large number of top talents to join its teaching staff. This has promoted the construction and development of the institute’s teaching staff and has made outstanding contributions to creating the first-class application-oriented undergraduate university in Jiangsu Province.

Performance assessment is the basis for personnel management such as selection, appointment, salary, rewards and punishments of university teachers. The assessment and evaluation policy is a pointer that can direct the enthusiasm and initiative of teachers in their work. It has a global and fundamental impact on promoting teaching reform, improving education quality, adhering to the correct scientific research direction, promoting the transformation of scientific research achievements and carrying out innovation and entrepreneurship and social services in universities in the new era. Therefore, the Ministry of Education has issued guidance on deepening the reform of the assessment and evaluation system for university teachers. According to relevant regulations of the country and Jiangsu Province, Jinling Institute of Technology has also formulated the "Implementation Measures for Performance Wage Distribution at Jinling Institute of Technology" and the "Assessment Measures for Scientific Research Work of Secondary Colleges (Departments)

of Jinling Institute of Technology " in accordance with actual conditions. According to the above two measures, research papers, monographs, scientific achievement award applications, major scientific research projects, intellectual property rights, high-efficiency research achievement transformation, etc., are subject to performance assessment and rewards. This greatly enhances the enthusiasm and initiative of teachers in scientific research work and motivates teachers to involve themselves in scientific research, platform base construction and achievement transformation work. The quality of application-oriented talent cultivation and the ability to serve the society with scientific research are greatly improved. A batch of high-level landmark scientific research achievements yielded has promoted the sustainable development of the institute's scientific research work.

5. Promote university-enterprise cooperation

The biggest difference between an application-oriented undergraduate university and a research-oriented university lies in type of talents they cultivated. Application-oriented universities cultivate application-oriented talents and maintain close relations with enterprises. Application-oriented universities should create a collaborative innovation mechanism of “government, industry, university, research and application” to facilitate rapid application of their research achievements in industry and thus contribute to regional social and economic development. We can promote technical innovation and achievement transformation in universities, deepen the integration of industry and education, fasten the connotative development of universities through innovation, enhance their comprehensive competitiveness and influence, and further promote the construction of characteristic brands in application-oriented undergraduate universities. Jinling Institute of Technology has actively cooperated with many government units, research institutes and industrial enterprises to carry out multi-form, multi-level and diversified cooperation. Nearly 70 university-enterprise cooperation research platforms have been built. Many scientific and technological achievements have been industrialized, achieving good economic and social benefits.

Cultivating innovative, entrepreneurial, practical and versatile talents is an important task for application-oriented undergraduate universities under the present situation. It complies with the requirements of international competition and meets the new requirements of national strategic development and regional economic and social development. Taking projects as the carrier and innovation competitions as the effective means, an innovation and entrepreneurship education ecosystem with application characteristics should be established to promote the integration of innovation and entrepreneurship education and professional education. This may have positive significance in comprehensively improving students' engineering practice, innovation and entrepreneurial abilities. It can also promote the reform of innovation and entrepreneurship education models [9]. Jinling Institute of Technology actively responds to the national call for "mass entrepreneurship and innovation" and vigorously supports the entrepreneurial practice of teachers and students. The "Jinke Maker Hub" has been recognized by the Ministry of Science and Technology as a national level maker space, with a number of national high-tech enterprises, provincial technology-based small and medium-sized enterprises, and provincial private technology enterprises settled and incubated.

The research projects of universities mainly include government sponsored projects funded by government agencies at all levels, enterprise-funded projects and research projects funded by universities themselves. In the context of the country's strong promotion of the First-Class construction, the competition for government sponsored projects such as the National Key R&D Plan, National Natural Science Foundation, Ministry Fund, and Provincial and Municipal Fund is becoming increasingly fierce. For application-oriented undergraduate universities, while

encouraging teachers to apply for various government-sponsored projects, they can actively leverage the advantages of close connection between application-oriented undergraduate universities and enterprises. They regard the actual needs of the enterprise's production line as an important source of engineering technology research focus and carry out collaborative researches on important engineering problems, key industrial technologies, core processes and general technical difficulties encountered by enterprises. We should promote the transformation of scientific research and technological achievements in universities, highlighting their functions in serving social progress, economic development, and national construction. Through deep university-enterprise cooperation, application-oriented universities may grow into an important driving force for industry technological progress and regional economic development. By close university-enterprise cooperation, an atmosphere of deep integration and coordinated development among industry, academia and research may be formed and the effective transformation of university science and technology into practical productivity for enterprises may be achieved.

6. Conclusions

The First-Class construction provides an effective path to implementing the policy of building a strong education country. For application-oriented undergraduate universities, scientific research work is an important way to improve their teaching ability and overall educational level and to serve the economic and social development. In the process of First-Class construction, application-oriented undergraduate universities should strengthen their teaching staff construction, improve their research work platforms, formulate research incentive measures and deepen the integration between universities and enterprises. Only in this way can application-oriented universities comprehensively improve their research work level, promote local economic and social development and improve the quality of application-oriented talent cultivation.

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