

Research on the Innovation of Interdisciplinary Versatile Talent Training Mode in Colleges and Universities of Guangdong Province under the Background of University-Enterprise Cooperation

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Abstract—Interdisciplinary versatile talent training is the focus of future talent training in colleges and universities. At present, Guangdong is at a critical stage of innovation-driven development, and colleges and universities have become an important pillar for implementing innovation-driven development. Therefore, it is of certain theoretical and practical significance to research the talent training mode in colleges and universities of Guangdong. From the innovation-driven perspective, this paper puts forward the corresponding countermeasures from aspects of construction of the interdisciplinary platform for scientific research innovation, reform of the credit system and construction of teaching staff based on the systematic combing and analysis of the current situation of domestic and foreign researches and the current situation of talent training in colleges and universities of Guangdong, providing a decision-making reference for interdisciplinary talent training in colleges and universities of Guangdong.

Index Terms—Interdisciplinary; versatile talent; training mode; University-Enterprise Cooperation

I. INTRODUCTION

At present, China has become the world's largest manufacturer, and manufacturing industry also occupies a key position in global manufacturing. The three economic zones in the Yangtze River Delta, the Pearl River Delta and Beijing-Tianjin-Hebei Region have formed certain industrial characteristics and competitiveness, and preliminarily possess the foundation and potential for developing into the world's leading industrial areas. However, the existing problem is that we has long been in the low-end locking position in the global value chain subject to the global value chain in the control of advanced countries in the international manufacturing division of labor system. As China's "demographic dividend" is diminishing gradually, the advantage of low human cost that supports the growth of

the traditional manufacturing industry has been no longer obvious, and the traditional manufacturing industry needs to be driven by innovation urgently to climb to two ports of the "Smiling Curve". The 18th National Congress of the Communist Party of China clearly put forward the innovation-driven development strategy. In the implementing process of the innovation-drive development strategy, it all depends on human effort, and innovative drive may tend to have different types of talent resource demands under different conditions of resource endowments institutional.

Mechanism and industrial agglomeration. It means that the implementation of innovative drive cannot emphasize the number of talents only, which not only needs multi-level professionals supporting systematic links, but demands a large number of versatile talents who can Grasp "government-industry-university-research-enterprise" strategic cooperation with international vision and executive force and cooperative capability. At present, Guangdong is at a critical stage of innovation-driven development, and colleges and universities have become an important pillar for implementing innovation-driven development. Therefore, it is of certain theoretical and practical significance to research the talent training mode in colleges and universities of Guangdong.

II. LITERATURE REVIEW

Wu Xiangming et al. (2008) put forward the measures of establishing interdisciplinary versatile talent training mechanism, promoting the reform of interdisciplinary versatile talent training mode and offering a wide range of interdisciplinary courses through the comparative analysis of the interdisciplinary versatile talent training modes in a number of colleges and universities between China and the United States. Hu Jigang (2009) introduced the training of interdisciplinary graduates in the United States by taking Washington University's "Urban

Ecology” IGERT doctor program as case, providing some innovative practices and basic experience for the cultivation of interdisciplinary graduates in China. Wang Jiefang (2012) pointed out that the construction of interdisciplinary marketing professional talent training mode shall include the following measures: First is to clear the training objectives and curriculum system, second is to develop training programs, third is to introduce the interdisciplinary integrated teaching mode and fourth is to build institutional cooperation mechanism. Zhang Lei (2013) indicated the importance and necessity for colleges and universities to cultivate interdisciplinary innovative talents, and the main directions for the reform of higher education shall aim at reforming the current talent training objectives, course system and training programs of colleges and universities, building a new mode for the cultivation of interdisciplinary innovative talents and establishing the corresponding quality monitoring system. Liu Ping (2013) held that measures shall be taken to establish a cross-sectoral, cross-college, school-enterprise integration coordination organization to plan related matters as a whole, so as to give play to the collaborative superiority of relevant specialties and building versatile distinctive talents.

With regard to the interdisciplinary graduate education, Meng Chengmin (2011) took South China Agricultural University as example to explore and practice the interdisciplinary graduate training from aspects of cross-research platform construction, interdisciplinary academic degree integration, standardized training and management, quality guarantee of source of students and disciplinary cultural integration. Meng Chengmin (2011) discussed the correlation between interdisciplinary versatile talent training and research innovation platform construction, and provided an empirical analysis of construction of research innovation platform based on interdisciplinary versatile talent training from aspects of construction of major research innovation platform, building of cross-research platform, management mechanism and specification of research platform and interdisciplinary training system in rotation. Wang Yuxin et al. (2013) took Cornell University as example to investigate and analyze from aspects of interdisciplinary graduate training objectives, training mode, course setting, cross-disciplines and internationalization. In addition, the research results have some reference value for learning the advanced foreign graduate training mode and management concept and improving the quality of graduate training in China.

III. ANALYSIS OF PROBLEMS IN THE CULTIVATION OF INTERDISCIPLINARY TALENTS IN COLLEGES AND UNIVERSITIES OF GUANGDONG

A. *It lacks the top-level design and management system for interdisciplinary talent training*

The cultivation of interdisciplinary versatile talents involves the integration of different disciplines, specialties, scientific research platforms and teachers in colleges and universities, so the key for interdisciplinary

talent training is to design effective and sound management system and mechanism. However, most colleges and universities in Guangdong are still in the state that different disciplines and specialties are independent from each other in terms of talent training, they have not established a variety of management system and communication coordination mechanism suitable for interdisciplinary education either from the school level or secondary college level, and have no specific agency to coordinate and plan the matters in relation to interdisciplinary talent training as a whole and lack effective top-level design and institutional construction. Meanwhile, it is difficult to share scientific and technological resources and results between different colleges and universities and even different disciplines in the same college or university owing to the lack of effective regulation means and cohesion mechanism, which ultimately leads to the failure of interdisciplinary talents cultivated in schools to have access to effective institutional guarantee. Therefore, it appears to be particularly important to construct a management mechanism that adapts to interdisciplinary talent training.

B. *The existing institution and mechanism are not conducive to the cultivation of interdisciplinary versatile talents*

First, the evaluation system of scientific research teaching is not complete, the evaluation standard is relatively simple and the evaluation short-terming and quantification is serious. ① The existing scientific research and teaching evaluation system often neglects the correct guidance of teachers’ scientific research and teaching values, but simply quantifies how many scientific research projects, project level funding and number and level of papers published and directly links up with teacher’s title appraisal, job promotion, welfare benefits and other interests, resulting in more serious phenomenon of seeking quick success and instant benefits among teachers. ② Interdisciplinary versatile talent training involves different disciplines, colleges, research institutions and other subjects, but the existing scientific research and teaching evaluation system is relatively simple and cannot develop the differentiated evaluation criteria according to the characteristics of different disciplines, interdisciplinary talent training characteristics and contributions of different personnel in interdisciplinary research and talent training, so that the evaluation system cannot better reflect the contributions of teachers involved in interdisciplinary talent training.

Second, it lacks an effective incentive mechanism, and the assessment method is not scientific. The existing assessment method and incentive mechanism cannot fully reflect the inherent nature and development law of interdisciplinary versatile talent training. If the assessment elements are not suitable for the diversity and complexity of interdisciplinary research and talent training, the incentive mechanism and assessment method will also be led by single discipline. The timeliness of the assessment is not in line with the development law of interdisciplinary research and talent training. In particular,

the “annualized” and “short, adaptable and fast” phenomenon is far away from the cycle of interdisciplinary research and talent training. Meanwhile, it lacks policy support and inclination towards the interdisciplinary academic direction, does not reflect the superiority of interdisciplinary knowledge background in the evaluation mechanism and fails to give them more promotion opportunities and incentive measures, which is not conducive to mobilizing the initiative of teachers to participate in interdisciplinary talent training and scientific research.

C. It lacks the cultural foundation and spirit for interdisciplinary talent training, which is not conducive to endogenous interdisciplinary talent training

Interdisciplinary versatile talent will be the focus of future talent training in colleges and universities. In addition to the establishment of interdisciplinary talent training mechanism, the reconstruction of cultural system is also an important component, but the establishment of interdisciplinary cultural system still remains at the initial stage owing to the human division between different disciplines for long. Since each subject has its own research object, research scope, research method and evaluation criteria, the cultural system of different disciplines is also different. The lack of powerful interdisciplinary cultural system will lead to the lack of communication between different disciplines, each is keen to go it alone and cannot blend in the research team and also lacks team spirit. It is neither conducive to the exploration and discovery of new areas of knowledge and innovation of the discipline system in universities, nor conducive to the prosperity of academic research and cultivation of innovative talents with high comprehensive quality, hindering the cultivation of interdisciplinary talents. Meanwhile, the lack of interdisciplinary cultural system support makes the cultivation of interdisciplinary talents fully dependent on the drive of external environment and policy, lacking endogenous power.

D. It lacks the interdisciplinary teaching team, which is not conducive to the improvement in quality of interdisciplinary talent training

Subject to the limitations of the traditional single interdisciplinary training mode for long, most scientific research and teaching personnel in colleges and universities cannot meet the requirements for interdisciplinary talent training in terms of knowledge reserve and training awareness. Those teachers who can really get involved in interdisciplinary research and education are universally insufficient and the high-level interdisciplinary research team and teaching team are even rare, severely hindering the sustainable development of interdisciplinary talent training.

IV. INNOVATION OF THE TRAINING MODE OF INTERDISCIPLINARY TALENTS IN COLLEGES AND UNIVERSITIES OF GUANGDONG

A. Innovation of institution and mechanism based on interdisciplinary versatile talent training

1. Integrate relevant forces and actively apply for and set up a cross-type major scientific and technological innovation platform. The cultivation of interdisciplinary talents involves the integration of relevant resources of different disciplines and different colleges, so colleges and universities in Guangdong shall focus on serving the local economic development and implementing major national strategies by integrating the research and teaching forces of economics, management, law, science, language and other subjects, actively set up the interdisciplinary scientific research innovation platform within colleges and universities and carry out interdisciplinary talent training relying on the cross-type scientific research innovation platform. At the same time, they shall integrate the scientific research and teaching resources of different colleges and university in Guangdong and well-known colleges and universities at home and abroad to set up the interdisciplinary collaborative innovation center, and actively apply for the national coordinated innovation center, aiming to further improve the interdisciplinary scientific research ability and training level of versatile talents of the schools, so as to provide an important scientific research innovation platform for cultivating more versatile talents, especially the high-level graduate talents. Meanwhile, the schools shall promote the construction of innovation team, improve their overall level of scientific research, give full play to the team form of outstanding talents and strive for iconic significant achievements, so as to provide an important platform support for the cultivation of interdisciplinary versatile talents.

2. Improve the operating mechanism of the cross-type scientific research innovation platform and the management mechanism for cultivation of interdisciplinary versatile talents. Given the particularity and complexity of the cultivation of interdisciplinary versatile talents, the schools shall make an effective attempt at the top-level design and institutional construction of interdisciplinary (colleges and scientific research platform) talent training, and institutionally guarantee the stability and sustainability of interdisciplinary talent training by establishing interdisciplinary communication and coordination mechanism, academic management system, student management system and other related administrative measures.

3. Establish a normal communication and exchange mechanism between teachers of different disciplines. It is an important link of interdisciplinary talent training to have regular or irregular communication and exchanges between teachers of different disciplines. First is to encourage and support college and university teachers to have short-term exchanges of other disciplines inside or outside the colleges and universities on the basis of completing the scientific research and teaching tasks of the disciplines, and the schools shall offer key support for them in transportation, accommodation and research funding, etc. Second is to support the backbone teachers to get disengaged from work as visiting scholars or teaching researchers to get involved in scientific research,

teaching research and talent demand investigation in well-known colleges and universities, enterprises or research institutions at home and abroad, and their staffing and treatment will remain unchanged during the disengaged period. At the same time, the schools shall link interdisciplinary research experience up with title appraisal and job promotion, so as to improve the enthusiasm of the teachers to participate in interdisciplinary research and teaching.

B. Improve the reform of credit system to provide support for the cultivation of interdisciplinary versatile talents

1. Develop an open training program. The cultivation of interdisciplinary versatile talents is an important embodiment of innovative talents, but the traditional professional training program imposes many limitations on the setting the student's courses, so that the students cannot select the courses in different specialties, disciplines and colleges. Therefore, the school shall learn from the experience in reform of the mature credit system of foreign universities to develop a more open professional training program which is in line with the characteristics of interdisciplinary versatile talents. In addition to the necessary professional core courses, the school shall also highlight the flexibility of teaching arrangements, and shall encourage teachers to offer more interdisciplinary research and application courses. In addition, the school shall apply a flexible studying system in terms of study time, so that the students can make flexible arrangements of their study time to maximize the learning results according to their own needs.

2. Promote a more flexible course selection system. First, the school shall develop and improve the system to mutually select the courses between different disciplines, specialties and colleges, and shall impose no limitation on the school's optional courses and college and department's optional courses to encourage students to select the courses across department, specialty and college according to the social need and their own hobbies and interests, so as to flexibly construct their own compound knowledge structure. Second, preponderant disciplines of different colleges and universities will be different while complementary. To better make use of the teaching resources of the university town, Guangdong shall develop a credit system for mutual recognition of courses selected in colleges and universities of Guangzhou University Town, and encourage students to select courses in different colleges and university to promote in-depth exchanges between different schools. Third, with regard to the selection of teachers, students can make their own choice of course teacher if there are more than two teachers offer the same course, and more teachers shall be encouraged to offer interdisciplinary optional courses.

3. Vigorously promote the dual-degree system of majors and minors. Interdisciplinary talent training requires the students to possess a compound knowledge structure of different disciplines, and colleges and universities may offer minors and dual-degree system to encourage students to select another discipline specialty

they are interested in to meet the need of development of versatile talents under the circumstance of completing their learning tasks of their major and still having learning capacity.

C. Enhance the construction of teaching team

1. Innovate the talent introduction and cultivation mode. First, increase the efforts to introduce international and domestic high-level interdisciplinary talents and scientific research team and provide "express pass" for high-level talents in promotion of professional and technical posts to allow the promotion from lecturer to professor. Second, implement the key talent projects in the school and construct the high-level interdisciplinary talent pool to achieve whole process track management of high-level interdisciplinary talents. Third, vigorously cultivate young talents, improve the talent training and opening-up mechanism, and apply "SAR management" to some outstanding young doctors, try the "SAR" talent evaluation mechanism and develop the classified promotion system of professional and technical posts. Fourth, give interdisciplinary and team leaders corresponding capital allocation right and personnel distribution right. In addition, academic leaders have the right to use the funds for team construction allocated by the governments at all levels of government and colleges and universities, and they can appoint or dismiss the team members and implement the scientific research performance assessment system, lifelong professorship system and annual salary system on their own, and the schools shall establish the output performance assessment system based on the innovation team's long-term and long-acting scientific research input as a whole.

2. Establish a reasonable incentive mechanism and appointment mechanism to mobilize the enthusiasm of teachers. First, the school shall establish an incentive mechanism based on interdisciplinary talent training, put people first and pay attention to the inherent requirements of the teachers to mobile their enthusiasm to the most extent. Second, encourage teachers of different disciplines and different colleges to set up interdisciplinary research and teaching team, the school shall provide the interdisciplinary team with certain financial support and official location guarantee, and the interdisciplinary teaching team may carry out the work through academic exchanges, seminars and cooperative research to get more teachers involved in interdisciplinary research and enhance their interdisciplinary research level. Third, establish a flexible teacher appointment system to eliminate the traditional barriers between different disciplines and different colleges and departments and break the talent unit ownership. Since the scientific research personnel are from different colleges and departments, two appointment system shall be implemented with the system as guarantee, so that the teachers will be devoted to interdisciplinary research and teaching wholeheartedly.

3. Strengthen the training of team spirit. The interdisciplinary team is composed of teachers from different disciplines and different colleges, which is more complex and diverse than traditional research and

teaching teams. Every teacher in the team operation process has their own backbone discipline, so that no doubt they will be stuck in the state of working for themselves, and any outstanding teacher can play a very limited role in the team only. Therefore, only team work can produce huge energy. Schools shall vigorously create an atmosphere of interdisciplinary cooperation between teachers, encourage and guide teachers to participate in interdisciplinary research and teaching through system construction, policy inclination, financial support, team building and other ways, create a strong interdisciplinary academic atmosphere and mutual caring atmosphere, and establish a harmonious relationship, so that team members can make a contribution to team research through their own efforts and become stable key talents, and teachers in the team will always enjoy it and devote themselves to teaching or scientific research on interdisciplinary talent training, laying a good foundation for interdisciplinary talent training.

V. CONCLUSION

Interdisciplinary versatile talent training is the focus of future talent training in colleges and universities. At present, Guangdong is at a critical stage of innovation-driven development, and colleges and universities have become an important pillar for implementing innovation-driven development. Therefore, it is of certain theoretical and practical significance to research the talent training mode in colleges and universities of Guangdong. From the innovation-driven perspective, this paper puts forward the corresponding countermeasures from aspects of construction of the interdisciplinary platform for scientific research innovation, reform of the credit system and construction of teaching staff based on the systematic combing and analysis of the current situation of domestic and foreign researches and the current situation of talent training in colleges and universities of Guangdong. The concrete research conclusions are as follows: (1)The interdisciplinary versatile talent training in colleges and universities of Guangdong mainly has the following problems such as missing top-level design of interdisciplinary talent training, unsound institution and mechanism, lagged construction of talent team and missing cultural system. (2)Schools shall integrate relevant forces, actively apply for and set up the cross-type major scientific research innovation platform, improve the operation mechanism of the cross-type scientific research innovation platform and cultivation management mechanism of interdisciplinary versatile talents, reform the title appraisal system and highlight the interdisciplinary performance orientation. (3)They shall develop an open training program, promote a more

flexible course selection system and strengthen various teaching practices.

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