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Original Paper

The Path Mechanism of Promoting Interdisciplinary Integration through Discipline Competition

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Abstract

Interdisciplinary integration plays an important role in cultivating innovative talents in higher institutions, but the main problem is currently which disciplines can cross and how to do so. This study summarizes the main models and problems of interdisciplinary research. Interdisciplinary teaching materials, the selection of tutors, and student training are currently facing significant difficulties. Anhui University of Finance and Economics promotes students to master interdisciplinary knowledge by means of discipline competition, and produces interdisciplinary textbooks, which provides new ideas and talent training mode of interdisciplinary concepts.

Keywords

discipline competition, Cross-disciplinary, Statistics, Undergraduate education, "New economic management" strategy

1. Question Raising

There is a global consensus on interdisciplinary integration and countries actively recommend such integration and talent training (Gläser et al., 2022). The National Academy of Sciences of the United States describes interdisciplinary concepts as "the integration and synthesis of ideas and methods." Stanford University considers basic disciplines such as medicine, computer science, and physics as the foundation for interdisciplinary integration (Albert et al., 2020; Bergland, 2021). Japan, Germany, and other countries have formulated disciplinary development strategies at the national level (Müller & Kaltenbrunner, 2019).

Interdisciplinary integration is an important way to cultivate innovative and compound talents, which has been a major concern for the Party and the state in recent years. The "double first-class" construction in 2018, the establishment of special interdisciplinary categories by the Ministry of Education, and the establishment of interdisciplinary departments by national science funds all

demonstrate the importance and support at the national level for interdisciplinary disciplines. Particularly with the recommendation of the construction of "new engineering, new liberal arts, new medicine, and new liberal arts," interdisciplinary integration has become an important fulcrum for promoting the development of frontier disciplines and collaborative innovation of universities. The evolution from highly integrated economic force to highly differentiated economic force. In recent years, driven by a new round of scientific and technological revolution, the paradigm of scientific research has changed dramatically. A single discipline cannot solve major scientific problems, and the boundary between disciplines is gradually blurred; cross-disciplinary integration continues to expand new research fields. The opportunity in the future comprehensive national strength competition can only be seized by firmly grasping the trend of discipline integration (Piggott et al., 2019).

However, regardless of whether it is interdisciplinary integration or talent training construction, it is necessary to coordinate colleges' and universities' educational resources to ensure that the innovative talents cultivated meet the needs of national and social economic development and the requirements of talent ability training (Gonzalez-Mendivil et al., 2019). In terms of how to deal with the relationship between interdisciplinary integration, grasp such integration, and promote the reform and innovation of the system, all universities need to carry out in-depth exploration according to subject construction (Krücken, 2021; Oberbichler et al., 2022).

2. Status and Problems of Interdisciplinary Construction

2.1 Main Interdisciplinary Modes

At present, colleges and universities at home and abroad have launched a multidisciplinary exploration of the path of interdisciplinary integration of talent training. Through combing, this can be summarized into three main forms. In the process of classroom teaching, the traditional method of hematemesis, in which teachers teach and students listen, is still adopted, and the cultivation of students' thinking and hands-on abilities is lacking in the teaching process. Classroom teaching occupies a large proportion, while practical teaching and school-enterprise cooperation platforms are relatively small, ignoring the use of their professional characteristics and discipline advantages to provide talent, technology, and resource services for enterprises, thus reducing students' initiative in learning.

The first mode is to realize the crossover of teaching content through curriculum setting. Through the setting of cross-courses, the original single curriculum model and teaching organization form are broken, and the subject courses with the possibility of integration and penetration are integrated to set up a new major. The theories of subject B are used to solve the problems of subject A, involving the cross-integration of natural science and humanities, and the internal cross-integration of the aforementioned and social sciences. For example, Beijing Normal University combines computer theory with Chinese character research, and the University of Electronic Science and Technology of China combines information technology with media culture to establish a teaching subject research center. The curriculum crossover mode is at the primary interdisciplinary level. Some comprehensive

colleges and universities have a cross-specialty elective mode that can be conveniently transferred to the teaching discipline training mode. Because of its convenience and effectiveness, it has also been explored extensively.

The second mode is a project model, characterized by interdisciplinary training, which is mainly oriented toward disciplines or scientific research problems, and cultivates interdisciplinary talent in solving problems. This is specifically manifested in the talent training model in which multi-disciplines complement each other. In the cross-project process, teachers and students with different professional backgrounds are included in a unified research group, and through the development of the project, talent training systems such as training programs, curriculum settings, and practical activities are explored. Its advantage is that it does not need to increase additional faculty or build new professional points, and it does not need to change the degree, school status, or major of students. This significantly reduces the cost of cross-disciplinary construction and can promote the maximum utilization efficiency of cross-disciplinary resources and explore different cross-integration directions in the same research group. In engineering, science, humanities, and social sciences, the integration of many aspects have been explored. The disadvantage of this real-time mode is that it must rely on strong scientific research teams and coordinate teachers and students from different disciplines and professional backgrounds in the talent training system to ensure that each research direction and discipline can rely on and cooperate with each other. In addition, this mode can be well implemented in the cross-disciplinary talent training mode of postgraduates, but is difficult to implement for undergraduates or professional colleges and universities.

The third mode is an institutionalized model, which aims to achieve interdisciplinary talent cultivation goals through the establishment of specialized interdisciplinary specialties and teacher teams. It is a “top down” talent cultivation model reform. The institutionalized model conforms to the hierarchical system of “schools, departments, teaching, and research offices” in China’s higher education institutions. Setting up interdisciplinary disciplines with schools as the leading factor, discipline construction as the goal, and departments as the support can give play to the advantages of “concentrating efforts to do great things,” avoid the need to coordinate the problems of teachers, courses, and laboratories among various departments in the process of talent cultivation, and establish professional administrative and teaching teams. Strengthening interdisciplinary talent cultivation, enrollment, and employment, teaching goal setting, textbook selection or writing, and other issues have effectively solved the administrative dilemma in talent cultivation. In practice, this model can give full play to the characteristics of the discipline and the disciplinary advantages of institutions of higher learning, establish projects aimed at cutting-edge, fundamental, and pioneering disciplinary issues, take professional construction as the guidance, cultivate teaching discipline talents from freshmen onward, and contribute new forces to social development. However, this model is applicable to more mature interdisciplinary talent cultivation programs, and the scientific nature of the training objectives should be ensured; the development of interdisciplinary disciplines fully developed to avoid problems that

affect the future of students and the reputation of the school, such as "unemployment upon admission." In 2021, the Academic Degrees Committee of the State Council and the Ministry of Education established a specialized "interdisciplinary" category. The development of this model has solid theoretical support and policy guidance. An increasing number of colleges and universities have begun to establish new interdisciplinary departments and majors, such as the Statistical Cross Science Research Institute at East China Normal University, the Big Data and Intelligent Decision Research Center at Dalian University of Technology, and the Big Data School at Fudan University.

2.2 Current Interdisciplinary Problems

(1) Curriculum. The curriculum lacks standardized teaching materials and integrates only two similar disciplines into a professional training program. There is a lack of relevance between courses in terms of knowledge. It is impossible to unify the same concepts using different noun expressions across different disciplines (Dillon et al., 2021).

(2) Mentor selection. In the context of the relatively late development of interdisciplinary research in China and the large gap between basic disciplines and educationally developed countries, most traditional disciplines in universities and colleges still lack a solid guarantee of teacher strength, which leads to a shortage of teachers to establish interdisciplinary research (Hudley et al., 2020). Most teachers have a single academic background in their undergraduate and graduate stages, and when serving as interdisciplinary teachers or mentors, they still focus on their own disciplines, with teaching concepts and content centered around traditional disciplines (Secules, 2019). The degree of integration between different courses is not high, and professional courses are referred to as interdisciplinary, but is actually a separation of disciplines. The lack of a stepped teacher team is another dilemma in the development of interdisciplinary teachers. Although some colleges and universities rely on interdisciplinary talent to establish complete interdisciplinary teacher teams, most existing talent teams obtain professional capabilities through self-study and interdisciplinary research. They lack a professional reserve teacher cultivation system and knowledge inheritance system, often facing the risk of teacher chain breakage; once the existing teachers leave, they face problems such as no one teaching, having to stop opening courses or enrolling majors, and lack injection of fresh talent (Jæger, 2021).

(3) Problem of separating "enrollment and training" in student training.

The submission of students' graduation papers for approval has also become a new issue. Owing to the lack of a multidisciplinary professional database and the lack of distinction between whether they belong to interdisciplinary disciplines when submitting graduation papers for approval, there are many difficulties in doing so, which has resulted in adverse social impacts on the construction of interdisciplinary disciplines. Graduates of interdisciplinary majors face a relatively serious sense of self- and social identity, especially as interdisciplinary disciplines develop from "double top" universities to ordinary colleges and universities, increasing numbers of graduates are finding it difficult to find "professional matching" jobs. When students choose to pursue higher education after graduation, they face the dilemma of the backward construction of master's and doctoral programs in

interdisciplinary disciplines. Even if there are similar disciplines, they often have very different directions, such as those dominated by big data and artificial intelligence, which may involve multiple disciplines such as engineering, medical science, liberal arts, and economic management. Some enterprises and institutions clearly distinguish between graduates' disciplinary attributes when recruiting, leading to the marginalization of interdisciplinary graduates in the process of employment and further education.

(4) Policy incentives and Institutional Safeguards. Although "interdisciplinary" has become the 14th university discipline in China, how to place teaching disciplines in the same important position as traditional disciplines remains unresolved. The classification of its interdisciplinary primary and secondary disciplines remains unclear, and there is still a lack of a complete educational statistical basis for degree awarding and discipline management. Although some universities have "interdisciplinary" training majors and departments, they still follow the traditional disciplinary model in talent cultivation, which is highly utilitarian and simple, and cannot promote the improvement of talent cultivation quality and the development of scientific and technological innovation activities.

3. Practice of Interdisciplinary Integration

3.1 Building a Multidisciplinary and Integrated Teaching Team

Starting from the discipline competition, there is a need to build an interdisciplinary teaching team. The teaching staff are the guarantee for building interdisciplinary disciplines and cultivating talents. The School of Statistics of Anhui University of Finance and Economics has established a platform for teachers from different majors, disciplines, and schools to exchange and learn through guiding discipline competitions, cultivating a group of backbone teachers who master the foundation of construction statistics and have a solid theory of economic and management disciplines, and achieving the construction of a teaching team of "statistical methods+application of economic and management disciplines+cross integration practice." Based on the outstanding competition results, guiding teachers have led students to conduct in-depth research on competition issues, and write and publish academic papers. By promoting teaching development through scientific research and innovation, they have achieved a combination of "teaching and learning, learning and application"; teaching and learning are mutually beneficial, and scientific research feeds back teaching, effectively improving the level of the teaching team in interdisciplinary teaching. At the same time, the Institute of Statistics is actively exploring the introduction system of teaching discipline talents, actively introducing talents through the method of "self-cultivation+introduction combination+temporary training+domestic and international cooperation." With the help of the platform of Hefei Institute of Higher Studies of Anhui University of Finance and Economics, it is exploring the reform of the talent recruitment system, providing a strong team guarantee for interdisciplinary integration (Rietveld & Schilling, 2021).

3.2 Construction of Interdisciplinary and Integrated Curriculum System

Building a cross-disciplinary curriculum system with disciplinary competition courses as the core and

integrating the curriculum content of innovative ability cultivation. The cultivation of innovative ability should be integrated into the curriculum system. The teaching content takes the cultivation of innovative ability as the theme, and discipline competitions, academic papers, and major innovation projects as the fulcrum. Participating in competitions becomes a practical link in classroom teaching, organizing competitions becomes a means to improve teaching ability, and publishing papers and implementing innovative projects become the touchstone for testing teaching results (Li et al., 2019).

(1) Integrate competitions into classroom teaching and participate in competitions as a practical part of classroom teaching. Build a curriculum system around teaching modeling methods, software programming, and scientific paper writing, effectively solving the problems of "either reading from the textbook, or separating from the textbook, or ignoring or catering to students" in the teaching process.

(2) Translate the competition results into teaching materials, compile planning textbooks for discipline competitions, combine competition and teaching, and form a batch of teaching materials such as "Introduction to Mathematical Modeling: 125 Interesting Economic Management Problems," "Scientific Paper Writing," and so on during the guiding competition.

(3) By offering lectures and interdisciplinary comprehensive experimental courses, such as software applications and event introductions, the inclusion of disciplinary competitions in the school's talent cultivation program in 2018 has been promoted, forming a complete innovation ability cultivation and training system, effectively improving the level of the school's disciplinary competitions.

3.3 Building an Atmosphere of Interdisciplinary Integration

There is a need to build a platform for peer learning and mutual assistance. Student associations should be used to establish a platform for "mentoring" and mutual learning among students to attract them to participate in the promotion, registration, organization, and training of various competitions. The backbone of the association is the main force of discipline competition and the participation of the competition organization. Publicity and communication among the members of the association help new members quickly understand the characteristics of the discipline competition, the required professional skills, and the experiences and lessons learned from the competition. Through conscious cross grade teaming, such approach plays the role of "bringing the old with the new" and cultivates the inheritance of peer learning, guide students to form cross professional teams, cultivate their interdisciplinary skills, and continuously inject fresh talent and new strength into discipline competitions.

4. Research Conclusion

Interdisciplinary integration is a multifaceted issue, and the main issues currently facing us are which disciplines can intersect and how to do so. The current research demonstrates that using subject competitions as a means to promote students' comprehensive ability cultivation and interdisciplinary integration can avoid the problems of crossing disciplines for the sake of crossing. Using discipline competition as a fulcrum, this approach can discover and solve scientific problems in problem-solving,

and master interdisciplinary methods and tools. Simultaneously, teachers can summarize interdisciplinary experiences and compile textbooks during the process of guiding student competitions to solve the current dilemma of the lack of textbooks for interdisciplinary teaching. The interdisciplinary practices of Anhui University of Finance and Economics provide a good model for cultivating interdisciplinary talents in economics and management. Based on the above, the following policy recommendations are proposed:

(1) The concept of "concept first, two-way shaping and interdisciplinary integration." This concept is the precursor to action. To promote deep interdisciplinary integration in universities, it is necessary to first create a conceptual atmosphere in which universities attach importance to interdisciplinary integration (Lyall, 2019). On the one hand, driven by the national policy of promoting interdisciplinary integration and setting up interdisciplinary categories in colleges and universities, "top down" guides colleges and universities to form the concept within the campus, incorporating it into the development strategy and planning of colleges and universities, and conducting the concept extensively at the self-study level, gradually creating a culture of interdisciplinary integration within colleges and universities. On the other hand, colleges and universities should encourage grassroots academic organizations, teaching, and research personnel to carry out interdisciplinary activities, providing a foundation for grassroots academic organizations to generate interdisciplinary concepts "from the bottom up." In the final analysis, the extent to which different disciplines can intersect and integrate depends on whether grassroots academic organizations and their teaching and research personnel have the awareness and action guarantee of disciplinary intersection.

(2) Innovate organizational forms and provide interdisciplinary organizational carriers. When an organization develops to a certain stage, it often produces structural inertia. For universities, after traditional single-discipline organizations have developed into the dominant organizational form, the structural inertia they generate has become the main obstacle to interdisciplinary research. Therefore, promoting interdisciplinary development in universities requires organizational reform, restructuring of traditional disciplinary organizational structures, and innovating organizational forms of interdisciplinary development. In addition to establishing independent interdisciplinary organizations, it is necessary to create diverse organizational forms. Internal integration can be used to create interdisciplinary organizational carriers, break down invisible barriers between traditional single-discipline organizations, and integrate existing disciplinary resources to carry out interdisciplinary integration activities. There are two main modes of internal integration: the college cooperation mode, which uses two or more single disciplinary organizations to jointly establish interdisciplinary organizations or interdisciplinary degree talent training projects and establish a close disciplinary resource-sharing mechanism. The second is the formation of a learning group model, which establishes a learning group system that integrates multiple disciplines through the reorganization and merger of two or more colleges, thereby providing an organizational carrier for truly interdisciplinary talent cultivation and research through multiple organizational forms.

(3) Formulate special systems and improve institutional safeguards for interdisciplinary research. The construction of support systems is key to promoting the institutionalization of interdisciplinary research. Universities need to develop relevant systems to ensure that teaching and research personnel engage in interdisciplinary activities. On one hand, we will establish a recognition system for interdisciplinary teaching and research activities, including those in the scope of tenure assessment, professional title promotion, and achievement recognition. We will explore the establishment of a multidisciplinary collaborative interdisciplinary academic achievement evaluation mechanism and remove obstacles for teaching and research personnel to engage in interdisciplinary teaching and research activities across departments. On the other hand, establishing a resource support system for interdisciplinary activities requires sufficient and stable resource guarantees for interdisciplinary talent cultivation and major frontier research. Taking interdisciplinary research as an example, sufficient financial support is required in the early stages of development. Therefore, universities should develop systems, such as funding support plans for interdisciplinary research initiation, allocation of teaching or experimental venues, and interdisciplinary talent cultivation.

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References

Albert, M., Friesen, F., Rowland, P., & Laberge, S. (2020). Problematizing assumptions about interdisciplinary research: implications for health professions education research. *Advances in Health Sciences Education, 25*, 755-767. https://doi.org/10.1007/s10459-019-09911-7

Bergland, B. (2021). The incompatibility of neoliberal university structures and interdisciplinary knowledge: A feminist slow scholarship critique. In *Marxism, Neoliberalism, and Intelligent Capitalism* (pp. 138-145). Routledge. https://doi.org/10.4324/9781003231967-10

Dillon, S., Armstrong, E., Goudy, L., Reynolds, H., & Scurry, S. (2021). Improving special education service delivery through interdisciplinary collaboration. *Teaching Exceptional Children, 54*(1), 36-43. https://doi.org/10.1177/00400599211029671

Gläser, J., Ash, M., Buenstorf, G., Hopf, D., Hubenschmid, L., Janßen, M., ... Lieb, K. (2022). The independence of research—a review of disciplinary perspectives and outline of interdisciplinary prospects. *Minerva*, 1-34. https://doi.org/10.1007/s11024-021-09451-8

Gonzalez-Mendivil, J. A., Rodríguez-Paz, M. X., Caballero-Montes, E., Garay-Rondero, C. L., & Zamora-Hernández, I. (2019, April). Measuring the developing of competences with collaborative interdisciplinary work. In *2019 IEEE Global Engineering Education Conference* (EDUCON) (pp. 419-423). IEEE. https://doi.org/10.1109/EDUCON.2019.8725163

Hudley, A. H. C., Mallinson, C., & Bucholtz, M. (2020). Toward racial justice in linguistics: Interdisciplinary insights into theorizing race in the discipline and diversifying the profession. *Language*, *96*(4), e200-e235. https://doi.org/10.1353/lan.2020.0074

Jæger, K. (2021). New-style higher education: Disciplinarity, interdisciplinarity and transdisciplinarity in the EHEA qualifications framework. *Higher Education Policy*, *34*(1), 155-174. https://doi.org/10.1057/s41307-018-00126-w

Krücken, G. (2021). Multiple competitions in higher education: a conceptual approach. *Innovation*, *23*(2), 163-181. https://doi.org/10.1080/14479338.2019.1684652

Li, R., Qian, Z. C., Chen, Y. V., & Zhang, L. (2019). Design thinking driven interdisciplinary entrepreneurship. A case study of college students business plan competition. *The Design Journal*, *22*(sup1), 99-110. https://doi.org/10.1080/14606925.2019.1602993

Lyall, C. (2019). *Being an interdisciplinary academic: How institutions shape university careers*. Springer. https://doi.org/10.1007/978-3-030-18659-3

Müller, R., & Kaltenbrunner, W. (2019). Re-disciplining academic careers? Interdisciplinary practice and career development in a Swedish environmental sciences research center. *Minerva*, *57*(4), 479-499. https://doi.org/10.1007/s11024-019-09373-6

Oberbichler, S., Boroş, E., Doucet, A., Marjanen, J., Pfanzelter, E., Rautiainen, J., ... Tolonen, M. (2022). Integrated interdisciplinary workflows for research on historical newspapers: Perspectives from humanities scholars, computer scientists, and librarians. *Journal of the Association for Information Science and Technology*, *73*(2), 225-239. https://doi.org/10.1002/asi.24565

Piggott, B., Müller, S., Chivers, P., Papaluca, C., & Hoyne, G. (2019). Is sports science answering the call for interdisciplinary research? A systematic review. *European journal of sport science*, *19*(3), 267-286. https://doi.org/10.1080/17461391.2018.1508506

Rietveld, J., & Schilling, M. A. (2021). Platform competition: A systematic and interdisciplinary review of the literature. *Journal of Management*, *47*(6), 1528-1563. https://doi.org/10.1177/0149206320969791

Secules, S. (2019). Making the familiar strange: An ethnographic scholarship of integration contextualizing engineering educational culture as masculine and competitive. *Engineering Studies*, *11*(3), 196-216. https://doi.org/10.1080/19378629.2019.1663200