Research on Collaborative Development and Innovation of University Innovation and Entrepreneurship Education and Transformation of Scientific and Technological Achievements in AI Era

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ABSTRACT
Under the background of AI era, the compound talents trained by universities lack the ability of technology commercialization, and the industrialization of laboratory results is hindered due to the lack of market orientation, and there is a significant structural fracture between the education chain, innovation chain and industrial chain. This paper puts forward the path of mechanism innovation from the dimensions of education, transformation and coordination, and at the same time, constructs a multi-level guarantee system including system, resources, technology and talents. The results of quasi-experimental research show that after the implementation of the collaborative mechanism and guarantee system, students' technical commercialization ability has been significantly improved, the conversion rate of laboratory results has increased by 29.4 percentage points, the average conversion period has been shortened by about 9.3 months, and the prediction accuracy of the dynamic evaluation model has reached 83.7%. This study effectively solves the practical dilemma of the disconnection between education and transformation, and provides theoretical basis and practical reference for the construction of the whole chain support system for the transformation of scientific and technological achievements in universities.

Keywords: *Innovation and entrepreneurship education, Transformation of scientific and technological achievements, Collaborative development.*

1. INTRODUCTION

The scissors gap between technology supply and industrial demand exposes the structural contradiction between the traditional innovation and entrepreneurship education system and the rapidly evolving AI technology. On the one hand, the number of "AI+ professional" compound talents trained by universities is increasing, but there are not enough entrepreneurs with the ability to commercialize technology [1]; on the other hand, due to the lack of market-oriented incubation mechanism, the patent has not been industrialized under authorization. This kind of educational chain, innovation chain and industrial chain break, which is more and more urgent under the background of accelerated iteration of AI technology.

There are intergenerational differences between the education cycle and the life cycle of AI technology, which leads to the disconnection between what students have learned and the market demand. The proportion of university teachers with enterprise R&D experience is small, so it is difficult to guide students to complete the leap from technical prototype to commercial products [2]. The current scientific research evaluation system pays more attention to papers than transformation. What is more serious is that the popularization of generative AI is deconstructing the traditional education model. This paradox of technological empowerment and increased risk urgently needs to build a new paradigm of coordinated development to adapt to the intelligent age.

The national "14th Five Year Plan" clearly proposes to "establish a full chain support system

for the transformation of university scientific and technological achievements", and the "Implementation Opinions on Deepening the Reform of Innovation and Entrepreneurship Education in Higher Education Institutions" jointly issued by the Ministry of Education and six other departments emphasizes "promoting the integration of new technologies such as AI into entrepreneurship education". Under this background, this study breaks through the static analysis framework of triple helix theory and constructs a dynamic collaborative model including technology maturity, market acceptance and ethical compliance. It provides a basis for universities to design the transformation acceleration mechanism of AI empowerment and the government to formulate differentiated support policies.

2. COLLABORATIVE DEVELOPMENT MECHANISM INNOVATION

Under the background of AI era, it is particularly important to innovate the collaborative development mechanism of university innovation and entrepreneurship education and the transformation of scientific and technological achievements [3]. In view of the fracture between the current education chain, innovation chain and industrial chain, this paper proposes to innovate from three aspects: education dimension, transformation dimension and synergy dimension, so as to build a new paradigm of coordinated development to meet the needs of the intelligent era ("Figure 1").

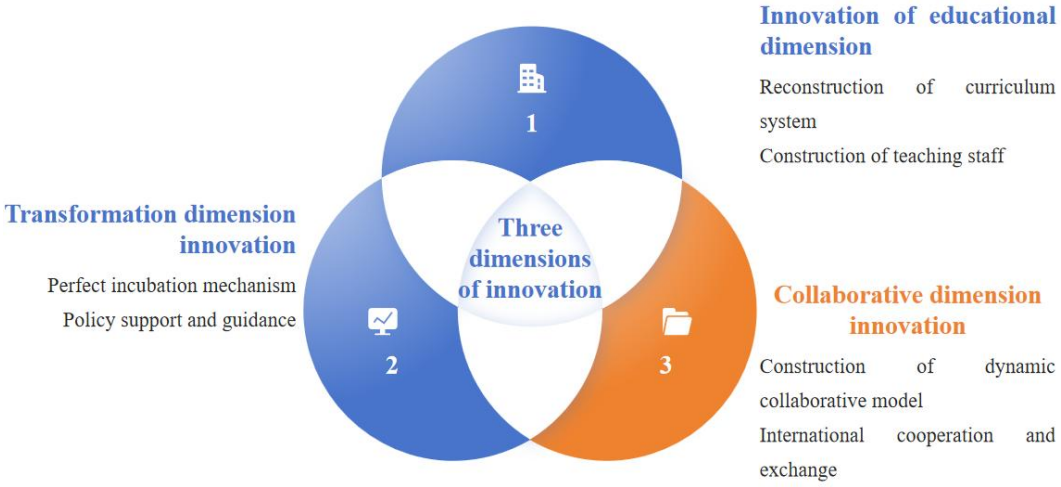


Figure 1 Three dimensions of collaborative development mechanism innovation.

Through the above innovative measures in education dimension, transformation dimension and synergy dimension, the structural contradiction between innovation and entrepreneurship education in universities and the transformation of scientific and technological achievements can be effectively solved, and the deep integration and coordinated development of education chain, innovation chain and industrial chain can be promoted.

2.1 Innovation of Educational Dimension

2.1.1 Reconstruction of curriculum system

The basic knowledge and application skills of AI are integrated into the curriculum system of each major, and the interdisciplinary course of "AI+ major" is developed to improve students' interdisciplinary integration ability [4]. Increase the links of experiment, training and project practice, encourage students to participate in real projects, and improve their technical prototype development and commercial application ability. Add AI ethics, data security, intellectual property protection and other related courses to cultivate students' sense of social responsibility and compliance.

2.1.2 Construction of teaching staff

Hire people with rich experience in enterprise R&D and commercialization as part-time teachers or tutors to make up for the shortcomings of university teachers' lack of experience in enterprises [5]. Regularly organize teachers to participate in industry training, enterprise attachment training and other activities to enhance their ability to guide students' innovation and entrepreneurship. Incorporate the results of guiding

students' innovation and entrepreneurship into the teacher performance appraisal system, and encourage teachers to actively participate in innovation and entrepreneurship education.

2.2 Transformation Dimension Innovation

2.2.1 Perfect incubation mechanism

Establish a market-oriented incubation mechanism, conduct early evaluation and screening of laboratory results, and give priority to incubating projects with commercial potential. Provide full chain incubation services from technology prototype development, business model design, marketing to financing docking, and reduce the threshold and risk of entrepreneurship. Build a cooperation platform for Industry-University-Research, integrate the resources of government, enterprises and investment institutions, and provide strong support for the transformation of scientific and technological achievements.

2.2.2 Policy support and guidance

The government should formulate differentiated support policies for the transformation of different types of scientific and technological achievements, such as tax incentives, financial subsidies and site support. Strengthen the protection of intellectual property rights, improve relevant laws and regulations, and provide legal protection for the transformation of scientific and technological achievements [6]. Establish a fault-tolerant mechanism for the transformation of scientific and technological achievements, encourage innovation attempts, and reduce the uncertain risk in the transformation process.

2.3 Collaborative Dimension Innovation

2.3.1 Construction of dynamic collaborative model

Construct a multi-dimensional dynamic evaluation model including technology maturity, market acceptance and ethical compliance, and comprehensively evaluate the transformation projects of scientific and technological achievements. Design a collaborative mechanism involving education, scientific research, industry, etc., clarify the responsibility and benefit distribution mechanism of all parties, and form a joint force for collaborative development. According to the evaluation results and feedback, the coordination mechanism and policy measures are continuously optimized to ensure that they meet the development needs of the intelligent era [7].

2.3.2 International cooperation and exchange

Encourage universities to carry out international cooperation projects with enterprises and international organizations to jointly promote education and scientific research cooperation in the field of AI. Actively learn from international advanced experience and practices, and carry out localization transformation and innovative application in combination with China's actual situation. Strengthen international talent exchange and cooperation, attract overseas high-level talents to work and start businesses in China, and enhance China's international competitiveness in the AI field.

3. CONSTRUCTION OF SECURITY SYSTEM

In order to effectively support the collaborative development and innovation of university innovation and entrepreneurship education and the transformation of scientific and technological achievements in the AI era, this paper constructs a multi-level and all-round guarantee system (as shown in "Figure 2"). The system covers four core pillars: system, resources, technology and talents, which provides a solid foundation for the smooth implementation of coordinated development.

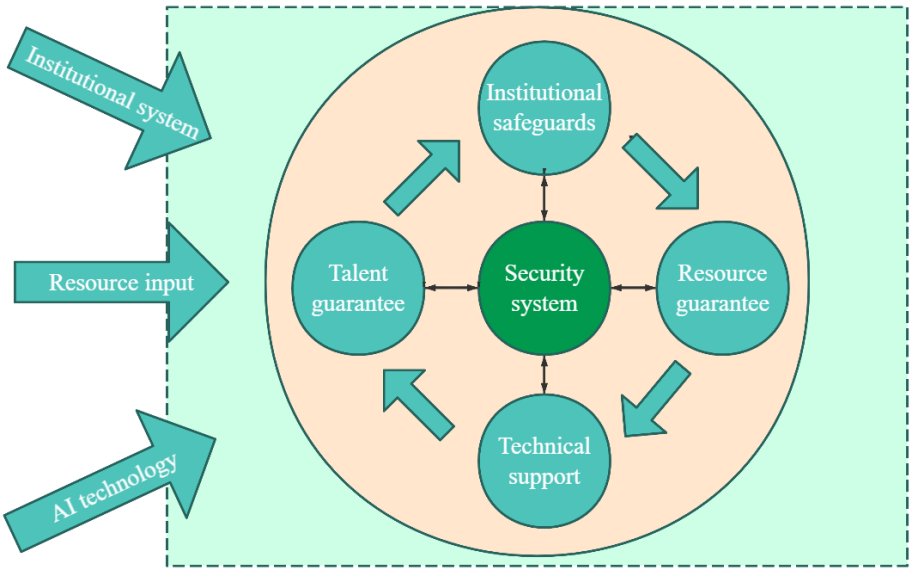


Figure 2 Construction of multi-level and all-round security system.

3.1 Institutional Safeguards

Establishing and perfecting an institutional system that meets the development needs of the intelligent era is the fundamental guarantee for coordinated development. This includes improving the internal evaluation system of scientific research in universities, changing the orientation of emphasizing papers over transformation, and bringing the transformation effect of scientific and technological achievements and the cultivation of technology commercialization ability into the standards of teacher assessment and professional title evaluation. Formulate a clear intellectual property ownership and benefit distribution mechanism to stimulate the enthusiasm of teachers and students to participate in innovation, entrepreneurship and achievement transformation. It is also necessary to establish a fault-tolerant and error-correcting mechanism, encourage bold innovation and attempt, and provide institutional tolerance space for high-risk and high-potential AI projects.

3.2 Resource Guarantee

Coordinated development requires sustained and stable resource input. Universities should set up special funds to support the development of interdisciplinary course, the incubation of students' innovation and entrepreneurship projects, and the market evaluation and screening of early scientific and technological achievements. Actively integrate government, enterprises, investment institutions and other resources, build a cooperation platform for Industry-University-Research, and provide full chain services for the project from technology research and development, prototyping to marketing and financing docking. Through policy guidance, attract social capital into the field of transformation of scientific and technological achievements in universities, and form a diversified resource guarantee pattern.

3.3 Technical Support

Make full use of AI technology itself to empower the construction of the security system. For example, a multi-dimensional dynamic collaborative evaluation model including technology maturity, market acceptance and ethical compliance can be constructed, and the transformation project of scientific and technological achievements can be scientifically and comprehensively evaluated and predicted by using big data and AI algorithm, providing a basis for decision-making [8]. Build an intelligent management and service platform, realize digital and intelligent management of project declaration, process tracking, resource matching and achievement display, and improve collaborative efficiency.

3.4 Talent Guarantee

Strengthening the construction of teaching staff and professional service team is the core of talent guarantee. On the one hand, by hiring industry

experts with rich experience in enterprise R&D and commercialization as part-time tutors, and organizing on-the-job training for teachers in the school, we will build a “double-qualified” teacher team that knows both academics and markets. On the other hand, it is necessary to cultivate and introduce professional technical managers, intellectual property consultants, business analysts and other compound service talents to provide professional and refined transformation services for teachers and students to make up for their shortcomings in commercial operation.

4. EFFECT EVALUATION

In order to verify the actual effect of the three-dimensional collaborative development mechanism and security system proposed in this paper, a “double-first-class” university was selected as a pilot, and a quasi-experimental study was carried out for one academic year from September 2023 to August 2024. The school has a good academic foundation in AI, electronic information and other fields, and there is a typical problem of "education-transformation" in the early stage, and the sample is representative.

There are 6 pilot majors in the experimental group, AI College and Innovation and Entrepreneurship College, with n=320 students, 35 teachers and 22 laboratory achievement projects. In the control group, there are four traditional engineering majors in the same school, such as machinery and materials, which have not implemented collaborative reform, n=210 students, 20 teachers and 15 laboratory achievement projects. The experimental group implements the education dimensions described in this article (“AI+major” course reconstruction, dual teacher team construction), transformation dimensions (full chain incubation mechanism, differentiated policy support), collaboration dimensions (dynamic evaluation model, industry university research platform), and supporting guarantee system; The control group maintained the original teaching mode and the process of achievement transformation. The specific evaluation index system is shown in “Table 1”.

Table 1. Evaluation index system

Dimension	Key indicators	Data source
Educational dimension	Students’ technical commercialization ability test score (percentage system) “AI+ Major” interdisciplinary course Reading Rate Teachers guide students’ innovation and entrepreneurship achievements into the assessment proportion	Final evaluation, Educational administration system, Personal records
Transformation dimension	Conversion rate of laboratory results (proportion of authorized patent industrialization) Average transformation period (month) Investment and financing rate of incubation projects	Science and technology department records, Incubator ledger
Collaborative dimension	Number of cooperation projects in Industry-University-Research Dynamic evaluation model prediction accuracy (matching degree between actual transformation and prediction) Teachers and students' satisfaction with the collaborative mechanism (five-point scale)	Cooperation platform data, Model backtracking test, questionnaire survey

After one year’s implementation, the average score of the technical commercialization ability test of the experimental group was 78.6, while that of the control group was 63.2 ($p<0.01$). The attendance rate of “AI+ major” in interdisciplinary course in the experimental group was 91%, while that in the control group was only 24%. 68% of the teachers in the experimental group included the results of guiding students’ innovation and entrepreneurship in the performance appraisal, while the proportion in the control group was less than 15%. The transformation dimension effect is shown in “Table 2”. The transformation rate of the experimental group increased by 29.4 percentage points, and the transformation period was shortened by about 9.3 months, which was significantly different from that of the control group.

Table 2. Transformation dimension effect

Index	Experimental group (pre-test/post-test)	Control group (pre-test/post-test)
Achievement conversion rate (%)	12.3 → 41.7	11.8 → 14.2
Average transformation period (month)	18.5 → 9.2	19.1 → 17.8
Proportion of financed projects (%)	8.1 → 34.6	7.9 → 9.3

The number of cooperative projects in Industry-University-Research increased from 9 to 28 in the experimental group and from 7 to 10 in the control group. The prediction accuracy of the dynamic evaluation model for whether the laboratory results can be industrialized within 12 months reaches 83.7%, which is significantly higher than the empirical judgment (59.2%). Satisfaction degree of teacher-student cooperation mechanism: the average of the experimental group is 4.2/5.0, and the control group is 2.8/5.0.

The pilot data show that the cooperative development mechanism and guarantee system constructed in this paper can effectively alleviate the fracture of education chain, innovation chain and industrial chain. The experimental group is significantly superior to the control group in key indicators such as the quality of personnel training, the efficiency of achievement transformation, and the activity of Industry-University-Research cooperation. In the future, the verification will be expanded in more types of universities, and the threshold parameters and ethical compliance weights of the dynamic evaluation model will be continuously optimized.

5. CONCLUSION

Innovative measures such as reconstructing the curriculum system to strengthen interdisciplinary practice, introducing “double-qualified” teachers to make up for the shortcomings of business experience, building a whole chain incubation mechanism to reduce the risk of transformation, and establishing a dynamic evaluation model to achieve accurate decision-making can effectively bridge the structural fracture between the education chain, innovation chain and the industrial chain. This mechanism provides an operable solution to solve the problems of lagging talent training and low conversion rate of scientific research results under the background of rapid iteration of AI technology, and has important theoretical value and practical significance for promoting the connotative development of higher education and the national innovation-driven strategy.

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