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The Pitfalls of Interdisciplinary Research Collaboration among University Teachers and Its Facilitation

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Abstract: *Under the background of the coexistence of highly differentiated science and highly integrated knowledge, education and scientific research have shifted from "vertical" exploration to "horizontal" expansion and integration, and discipline integration has gradually become a new research paradigm. In colleges and universities, teachers with single-discipline knowledge can no longer meet the demand for scientific knowledge innovation, and the multiple obstacles caused by the limited improvement of academic effectiveness, the dependence on disciplinary identity adaptation, and the lagging support of service connection have made the promotion of interdisciplinary scientific research cooperation among college and university teachers particularly urgent. In order to break down the barriers between the departments of interdisciplinary scientific research cooperation, we should make efforts to clarify the responsibility, maintain the cooperation network, and build a solid organisational guarantee, so as to promote the benign development of interdisciplinary scientific research cooperation.*

Keywords: *Interdisciplinary research co-operation; research synergy; university teachers*

1. Introduction

With the rapid development of the science and technology industry and the increasingly fierce global competition, complex problems in reality need to be solved by all stakeholders across disciplinary boundaries, integrating professional knowledge of various disciplines and collaborating, and interdisciplinary has become an epochal feature of contemporary scientific development. In the interweaving and penetration of disciplinary knowledge connotation and self-organisation, the organisational form and academic ecology of scientific research represent the development of openness, integration, plurality and synergy, and gradually build an effective structure and theoretical foundation for interdisciplinary research collaboration. Interdisciplinary research collaboration is becoming a brand-new research paradigm, which is of great significance in promoting knowledge exchange and sharing, stimulating innovative thinking and cross-disciplinary research, and promoting the expansion and breakthrough of disciplinary boundaries, thus influencing the development of China's scientific innovation capacity.

In March 2023, China's "Reform Plan for Adjustment and Optimisation of Discipline and Speciality Settings in Ordinary Higher Education" was issued, which explicitly pointed out the need to break through the boundaries of disciplines, strengthen the crossover and fusion of disciplines, and create outstanding young innovation teams. Colleges and universities are constantly exploring the path of the new pattern of discipline development and actively seeking to build innovative ideas of discipline and professional system, which is not only of great significance to the generation of great scientific research results, the cultivation of high-level composite talents and the provision of effective services for social and economic development, but also a concrete embodiment of the higher requirements for college and university teachers. Teachers need to break out of the framework of traditional disciplines, communicate and share knowledge across disciplinary boundaries, achieve their own professional development through interdisciplinary cooperation, and create a synergistic effect. However, despite the great potential of interdisciplinary research cooperation, the dilemma of interdisciplinary research cooperation among college teachers in actual implementation is caused by a variety of factors; differences in terminology and concepts between different disciplinary fields, as well as differences in research methods and standards of different disciplines, may lead to friction and misunderstanding among the cooperating teams. Therefore, it is necessary to further study and explore how to alleviate these blocking factors, promote the smooth progress of interdisciplinary research cooperation among

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university teachers, and realise the synergistic development of interdisciplinary cross-discipline and breakthroughs in innovative research.

2. Exploring the hidden concerns of interdisciplinary research cooperation among university teachers: multiple impediments co-existing

2.1. Demand-driven: the limited nature of academic effectiveness enhancement

As an important and innovative organisational form of cooperation, university interdisciplinary research cooperation is an important factor influencing research productivity, and the hidden concerns of interdisciplinary research cooperation among university teachers at the individual level are revealed as a limited improvement in the sense of academic efficacy. First, the difficulty of knowledge transformation and disciplinary overlap. Collaborative behaviour is often accompanied by contradictions and conflicts, and in interdisciplinary research collaboration, the causes of such contradictions and conflicts are more diverse. [1]And since each discipline has its own disciplinary system of thought and discourse, the process of interdisciplinary cooperation requires teachers to step outside the framework of their own familiar disciplines and to have a broad reserve of knowledge and the ability to cross disciplinary boundaries in order to understand and accept the viewpoints and methods of other disciplines. Individual teachers need to overcome disciplinary barriers and specialised training, adapt to linguistic and conceptual differences in interdisciplinary collaboration, access and integrate interdisciplinary collaborative resources, and actively seek authoritative recognition across disciplines. However, these collisions between disciplinary thinking and discourse systems sometimes escalate into conflict. Due to individual disciplinary expertise and limitations, this transformation may take more time and effort. Teachers may have different understandings of discipline-specific discourse systems and ways of thinking, leading to some degree of communication difficulties and understanding delays in interdisciplinary collaboration, creating the dilemma of individual and collective interests falling through the cracks at the same time, [2] hindering the development of university teachers' sense of the effectiveness of scientific research in interdisciplinary cooperation. Second, the academic background differences of individual academic views and research methods. For example, in the field of social sciences, some disciplines tend to use quantitative research methods, such as questionnaire surveys and experimental design, to obtain a large amount of data for statistical analysis, while humanities disciplines tend to use qualitative research methods, such as in-depth interviews and document analysis, to obtain detailed descriptive and explanatory data. Differences in theoretical frameworks and methodological interventions can lead to conflicting views and theoretical disputes among teachers in the interpretation of problems and logical paths of analysis. Some teachers may adhere to the theoretical orientation of their own disciplines and have reservations or disagreements with the theories of other disciplines, thus exacerbating conflicts in collaboration. Thirdly, factors such as teachers' gender, age and disciplines have an impact on interdisciplinary research collaboration. According to the study, the willingness of university teachers to collaborate in interdisciplinary research seems to increase and then decrease with age; between the ages of 36 and 45, there is the strongest willingness to collaborate in interdisciplinary research, and there are certain differences in the willingness of teachers of different disciplines to collaborate in interdisciplinary scientific research, [3] which laterally reflects the implicit role of each of the factors involved. At the same time, interdisciplinary members usually belong to different disciplines and colleges, in the early stage of collaboration, the inconsistency of communication time and space may lead to delay in information transmission, thus slowing down the speed of decision making and cooperation, and the inability to transmit key information between members in a timely manner will increase the uncertainty and synergy difficulties in cooperation, thus reducing the efficiency of cooperation.

2.2. Relationships of trust: the dependence of disciplinary identity adaptation

Trust in interdisciplinary research collaboration is a cognitive and behavioural tendency rather than a simple emotional or affective bond, based on members' perceived certainty and relational trustworthiness of each other's expertise and competence, i.e. the interdisciplinary team may need to transcend individual disciplinary identities in collaboration. However, the presence of an unavoidable disciplinary identity-based dependency can lead team members to overemphasise the strengths and perspectives of their own disciplines while ignoring the contributions of other disciplines, preventing team members from exploring knowledge and perspectives in other disciplinary fields, and hindering the rapport and coordination of interdisciplinary research collaborations. This is particularly evident in

ISSN 2522-6398 Vol. 6, Issue 31: 6-11, DOI: 10.25236/FER.2023.063102

the over-reliance of individuals or organisations on their existing identities and their unwillingness to take the initiative to change their way of thinking, the power and status differential between disciplinary identities which limits the active extension of organisational identity boundaries, and the risk that the construction of interdisciplinary organisations will be difficult to implement effectively on the ground in the course of implementation. Firstly, existing disciplinary organisations provide a relatively stable place for academic research and academic capital for their internal members, which is the basis for their identity construction. However, in the reality of interdisciplinary teams, there is no shortage of members of the phenomenon of "hitchhiking" or "opportunism", the use of opportunistic behaviour, such as violating the terms of the contract, in order to maximise their own interests.[4] As a result, some teachers will continue to seek self-identification in the value function of the original disciplines to give them an internal identity, and in the process construct new perceptions, resulting in a delay in changing the reality of interdisciplinary research collaboration. On the other hand, another part of the faculty will frequently move to obtain personal benefits based on the profit motive, leading to difficulties in adapting to the cognitive identity of different disciplinary organisations. Second, from the point of view of understanding the origin of interdisciplinary, interdisciplinary scientific research cooperation is largely narrowed down to a flat understanding of interdisciplinary organisational frameworks across borders, so that the overall nurturing function of interdisciplinary organisations is lost in the transmission of symbolic knowledge of disciplines, and the value of disciplines for human development is eliminated, [5] which in turn creates the biased differences in the identity of different roles in disciplinary organisations, hides the subjective initiative of the subject, and creates a misunderstanding or distorted interpretation of the members of organisations. The misinterpretation of concepts, actions or external cross-disciplinary organisational patterns of barriers, the dependence of members within the disciplinary organisation on the perception of organisational identity and the bias in the expectations of organisational development, exacerbating the exclusion of their academic cooperation and resource circulation inconsistent with the established status, and the formation of the risk of trust relationships.

2.3. Organisational functioning: lagging support for service linkages

Disciplines are the basis for building academic communities, and teachers are the core elements of academic communities with the most developmental value. [6] However, due to the existence of disciplinary boundaries, interdisciplinary research cooperation is not efficiently put on the agenda, disciplinary organisations lack effective planning and management of existing resources, certain projects or fields are in a state of resource scarcity, and the lag between disciplinary organisations and within organisational members presents synergistic service end support. In particular, the mismatch between the evaluation of disciplinary construction and the correlation mechanism of resource input allocation will all reduce the resource input of faculty interdisciplinary research cooperation and reduce the cost-benefit ratio. From the perspective of the organisational boundaries of interdisciplinary research cooperation, it refers to the relatively long-term boundaries of research cooperation and the social activity positioning of organisations, which interacts with the development of organisational relations, while the mechanism of linking the evaluation of disciplinary construction and the allocation of resource input is an important carrier of organisational mobility. It can continuously transform and optimise the flexibility of disciplinary resources across organisational boundaries, and strengthen the formalisation and institutionalisation of grassroots disciplinary organisational systems. However, China's current mechanism for evaluating disciplinary construction and allocating resources remains unresolved and lacks scientific and guiding significance. The first reason is that the administrative evaluation of academic disciplines has long determined the source of government and market resources for universities, and this evaluation mechanism will continue to lead to the "Matthew effect".[7-8] The second is the "fragmentation" and "dispersion" of subject assessment[9]. Particularly in subject-specific activities, teachers may pay too much attention to the achievement of expected results and neglect important factors such as communication, coordination and teamwork in the process of collaboration, and get caught up in the conflict between individual assessment and teamwork. At the same time, evaluation tools may not accurately measure key skills and competencies in cross-organisational collaboration, or the collection of evaluation data may be affected by technical problems or data bias, which may not ensure a comprehensive assessment of teachers' competencies and performance in collaboration.

ISSN 2522-6398 Vol. 6, Issue 31: 6-11, DOI: 10.25236/FER.2023.063102

3. Relieving the Dilemma of Interdisciplinary Research Co-operation among University Teachers: A Multidimensional Initiative in Parallel

3.1. Clarification of responsibility: safeguarding the scientific autonomy of interdisciplinary teachers

In interdisciplinary research cooperation among university teachers, clarifying the allocation of responsibilities and guaranteeing the autonomy of scientific research are the key issues, and clarifying the allocation of responsibilities and guaranteeing the autonomy of scientific research among different disciplines are the key and difficult points of collaborative research among different disciplines. As far as university teachers are concerned, interdisciplinary research collaboration mainly involves teachers from different disciplines participating in research projects with the aim of breaking the disciplinary boundaries and integrating multidisciplinary knowledge to solve complex real-world problems. Therefore, how to clarify the responsibility and guarantee the autonomy of teachers' scientific research is a necessary measure to facilitate interdisciplinary research cooperation among university teachers. First of all, in order to clarify the responsibility in interdisciplinary research cooperation, it is necessary to establish a clear cooperation mechanism, which mainly includes the formulation of a clear cooperation agreement or contract before the interdisciplinary cooperation project starts, and clarify the principles of responsibility, such as the distribution according to the degree of contribution and the delineation of the scope of responsibility according to the disciplinary speciality, etc., so as to ensure fairness and transparency. The collaboration agreement should specify the responsibilities and tasks of each member and record information such as the objectives, plans and expected results of the project and the mode of collaboration, so as to avoid the problem of ambiguous allocation of responsibilities and to ensure that each collaborator understands and identifies with his or her role and responsibilities. Secondly, scientific independence is a fundamental right of researchers. In order to ensure the academic research autonomy of interdisciplinary teachers, the academic views and research directions of teachers should be fully respected in interdisciplinary scientific research cooperation without interfering with their academic autonomy, teachers should enjoy the right to independently choose interdisciplinary cooperation projects, determine the research methodology and organise the team, etc., and they should learn to carry out risk management and problem solving in interdisciplinary cooperation projects, such as predicting and identifying potential risks and challenges, and taking timely measures to reduce the probability and impact of risks. At the same time, university teachers have the right to decide the degree of cooperation and the division of labour, and they should actively solve the problems and difficulties in cooperation to avoid the accumulation of problems leading to the failure of the project, and administrators should provide support and resources to help teachers achieve their research goals without excessive intervention or manipulation. Finally, the creation of an interdisciplinary scientific research cooperation atmosphere for teachers cannot be separated from the construction of disciplinary culture, and the integration between disciplines should be strengthened to build an inclusive disciplinary cultural ecology and establish an academic community with openness and synergy. Promote the development of disciplinary culture in the direction of openness, rebuild the disciplinary spirit, and break the rigid and closed cultural circle structure and mode, so as to systematically integrate the strength of disciplinary members in the practice of interdisciplinary cooperation.

3.2. Maintenance of cooperation networks: building a professional cross-disciplinary service platform

In today's complex and changing research environment, interdisciplinary research collaboration has become an important way to promote academic progress and innovation. In order to promote interdisciplinary research collaboration among university teachers, the establishment of professional cross-disciplinary service organisations is an important step in promoting interdisciplinary research collaboration among university teachers, so as to provide teachers with adaptable and professional cross-disciplinary support. Firstly, the collaborative network should provide a platform to connect teachers and researchers from different disciplines. The establishment and development of the cooperation network is the first step in promoting interdisciplinary cooperation, facilitating information sharing, exchange and the creation of cooperation opportunities. Firstly, regular academic conferences and seminars should be organised. Interdisciplinary faculty and researchers may be invited to participate, focusing on specific themes or issues to encourage interaction and discussion between different disciplines. Various forms of activities, including academic reports, research presentations, group discussions, workshops, case studies, etc., can be designed to give teachers and researchers from different disciplines the opportunity to present their research findings, exchange views and experiences, and provide a platform for face-to-face exchanges and cooperation. This will not only help to broaden

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teachers' academic horizons, but also to better identify potential partners and promote cross-fertilisation and innovation between disciplines. Second, teachers should be encouraged to participate in interdisciplinary research projects, and the implementation of interdisciplinary research projects should be financed through the establishment of a special interdisciplinary research project fund or award mechanism. More importantly, it is necessary to actively create training opportunities for university teachers, including interdisciplinary research methods and communication skills, to enhance their ability to participate in interdisciplinary research projects. Third, an interdisciplinary research centre should be established to provide a place where teachers and researchers from different disciplines can meet and strengthen the creation of interdisciplinary synergy relationships. In the field of interdisciplinary interaction, the creation of a shared resource environment, the promotion of interdisciplinary visits and exchanges, the establishment of interdisciplinary research centres, and the facilitation of the submission of collaborative projects will help teachers to better understand the characteristics and needs of other disciplines, help them to establish close interdisciplinary synergistic relationships, promote the development of interdisciplinary cross-fertilisation and collaborative innovation, and build a genuine interdisciplinary research synergy.

3.3. Organisational safeguards: optimising internal coordination mechanisms for disciplinary development

In interdisciplinary scientific research cooperation, the roles of different innovation subjects are different, and their needs are also different. By optimising the coordination mechanism of internal disciplinary development, it can lead to the development of a long-term virtuous cycle of interdisciplinary cooperation. First, one of the guarantees of interdisciplinary scientific research collaboration is to establish a good information communication mechanism, in which a knowledge and resource sharing platform, regular team meetings, the establishment of effective communication channels and collaboration tools, a cultural atmosphere of interdisciplinary communication and collaboration, and a timely feedback and evaluation mechanism are important manifestations, which will help to promote effective communication and collaboration among different disciplines, and promote the smooth progress and achievements of interdisciplinary research collaboration and the achievement of excellent results. Second, the outcome evaluation system plays an important role in motivating and constraining teachers' willingness to cooperate across disciplines. Teachers need to invest a lot of time and energy to participate in interdisciplinary collaboration, so they want to be sure that their efforts can be fairly evaluated and recognised. The traditional academic evaluation system usually takes the number of academic papers and the citation rate as the main indices, and these indices can hardly fully and accurately reflect the value and contribution of interdisciplinary research collaboration, and they are insufficient to evaluate the contribution and results of interdisciplinary research, and the research results of interdisciplinary collaboration are often difficult to quantify and categorise. This means that an important step in optimising the internal coordination mechanism for disciplinary development is that the evaluation system should focus on examining the innovation, academic quality and actual impact of interdisciplinary collaborative projects, including the number and quality of academic papers, the organisation of knowledge exchange activities and academic conferences, patent applications and technological transformations of projects, etc. The assessment of the team's contribution should also be made in terms of the project's innovativeness, academic impact, The team's contribution should also be assessed in terms of the project's innovativeness, academic impact, social benefits and other dimensions, so as to reflect the actual contribution of teachers in interdisciplinary cooperation in a more comprehensive and fair manner. Thirdly, in the process of fostering interdisciplinary research collaboration, there are differences between different disciplines, including research methods, academic languages, theoretical frameworks, and so on. It is necessary to identify the best knowledge pairs in interdisciplinary research collaboration, [10] and formulate an appropriate system to address these disciplinary differences. Specific systems may include the development of communication and cooperation mechanisms, incentives, rewards and penalties, and evaluation mechanisms for cooperation funds and research projects to ensure the excellent quality of interdisciplinary research and the effectiveness of cooperation. In addition, the establishment of knowledge sharing and exchange mechanisms is also an important mechanism for dealing with disciplinary differences. The use of knowledge sharing and exchange mechanisms can eliminate the information barriers between disciplines, encourage researchers to obtain and share information across disciplines, and then give full play to the leading role of dominant disciplines to ensure the breadth of interdisciplinary research cooperation and expand the scope of cooperation.[11]

ISSN 2522-6398 Vol. 6, Issue 31: 6-11, DOI: 10.25236/FER.2023.063102

4. Conclusion

As an important form of innovative organisation, interdisciplinary research collaboration in universities plays a key role in influencing research productivity. Through interdisciplinary research cooperation, university researchers are able to cross disciplinary "borders", integrate multidisciplinary perspectives and methods, be more creative and comprehensive, and better able to solve complex problems. There are many examples of successful interdisciplinary research collaboration. In those complex projects involving multiple disciplines, through interdisciplinary scientific research cooperation, experts from different fields work hand in hand to solve the problems and achieve more significant research results, which promotes scientific and technological innovation and talent cultivation, and contributes greatly to the development of society. In future research, we should pay more attention to the characteristics, behaviour and influencing factors of the subjects of scientific research cooperation, in order to deeply explore their roles in interdisciplinary scientific research cooperation, promote the further development of the field of interdisciplinary scientific research cooperation, and make a more profound impact on the development and progress of society.

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