

## Interdisciplinary Research & Education in China: Achievements & Challenges

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In China, interdisciplinary research and education began in the 1950's, with vigorous development in the early 1980's. Until now, it has made great progress and has worked out a set of unique development models. At the macro level, the state council has issued a series of developmental strategies and policy initiatives and carried out corresponding nation-wide project platforms as stimulation. At the micro level, there are all kinds of interdisciplinary research and education organizations in national scientific research institutions and research universities to form the operational mechanism.

### 1. National Strategies

#### 1.1 Policy initiatives

In 2006, the State Council issued a “National science and technology development plan in medium and long-term (2006–2020).” In this programmatic document which guides Chinese science and technology development, it states: 1) The multidisciplinary intersection is one of the main features of future science development in terms of disciplinary development. We need to cultivate the growth of new interdisciplinary subjects. 2) It calls attention to support new interdisciplinary research and education, more specifically, to strengthen infrastructure platform, to reform managerial mechanism, to construct national laboratories and other incubators that will be equipped with top research talent and so on.

Other related documents include the “PRC Scientific and Technological Progress Act” and other legal provisions, and “the 11th Five-Year Development Strategy” stipulated by the National Natural Science Foundation. They have all mentioned the importance of interdisciplinary research and education. In general, China has recognized the importance of interdisciplinary research and used policy tools to plan out future development as a whole.

#### 1.2 Project measures

The specific research project is vital to interdisciplinary research. China’s “Science and Technology Project” is an important mechanism. It consists of the Basic Research Project, the National Science and Technology Supporting Project, the High Technology Research and Development Project and so on, all of which contribute to the development of interdisciplinary research.

For example, the Basic Research Project includes the National Natural Science Foundation and the 973 Project. Among them, the National Natural Science Fund Committee selected 13 comprehensive and interdisciplinary fields to enjoy prioritized support. The “973 Project” also identified and emphasized interdisciplinary research. Therefore, interdisciplinary research

identified can get more funding and attract a high-level research team, and follow the principle of “unified management and integrated resource” in the course of the study, it can widely integrate and coordinate resources from government, academia and industry.

## **2. Interdisciplinary Research and Education Achievements**

### **2.1 Research**

China’s interdisciplinary research is mainly conducted through major scientific research projects. Among these, more than 70% are undertaken by comprehensive research universities. In general, interdisciplinary research organizations in Chinese universities have three types:

1) Interdisciplinary research organizations under the government approval  
“Owned by government, run by university” can well describe this kind of organization. It undertakes major scientific research projects initiated by the government. This kind of interdisciplinary research organization is generally affiliated with a school or a department; the school or department is in charge of its management and is responsible for coordinating the research task. Take Tsinghua University as an example, it currently has 123 such research institutions, most of which carry out interdisciplinary research.

2) Independent interdisciplinary research organizations set by universities  
This type of Interdisciplinary research organization can either rely on one school or department, or is not affiliated with any schools or departments. It is autonomous and can bring together related schools or departments to conduct cooperative research.

In 2000, Zhejiang University set up the first independent interdisciplinary research center, Micro System Research and Development Center, and 6 out of the school’s 21 departments are engaged in interdisciplinary research coordinated by it. In 2006, Peking University set up the Frontier Interdisciplinary Research Institute to carry out interdisciplinary research related to high-tech science. Currently, it has 9 research centers. In the meantime, PKU established the Molecular Medical Research Institution. It follows the principle “from molecular to people.” The multidisciplinary integration and dual focus both on research and application features its uniqueness. With core purpose of solving major biomedical difficulties to improve the wellbeing of Chinese citizens, it also cultivates “innovative, comprehensive and interdisciplinary” talents. Moreover, in 2010 Tsinghua University established the Cross Information Institute, which is the first teaching and research unit dedicated to the study of cross information science.

3) Interdisciplinary organizations co-founded by universities and external entities  
This kind of interdisciplinary organization is co-founded by universities and external independent entities, mostly from the business sector. It usually becomes the research base of large enterprises or a campus-enterprise joint entity. For example, Tsinghua University has 102 campus-enterprise research institutions. This kind of institution is also involved largely in the interdisciplinary research.

### **2.2 Graduate Education**

In recent years, interdisciplinary graduate training of our university has made great progress,

mainly reflected in the following aspects: Firstly, the idea of interdisciplinary graduate education has appeared and showed a tendency to grow. Many research universities, especially the “985” universities, have attempted to carry out interdisciplinary graduate education and training in environment, biomedicine, life science and language cognition fields.

Secondly, the establishment of various interdisciplinary research organizations has paved the road for the further development of interdisciplinary graduate education, for it provides the organizational and managerial basis for interdisciplinary training. Also, the merger of universities originating from the 1990’s forms many comprehensive universities with many relatively complete disciplines, which laid the foundation for interdisciplinary education.

Thirdly, in the latest “Degree Granting and Talents-nurturing Discipline Catalogue (2011)” carried out by MOE, the number of first-level disciplines increased greatly, whereas the second-level disciplines decreased. The State encourages universities to set new interdisciplinary majors in the range of first-level disciplines according to social needs.

Next, in graduate school enrollment, we encourage students to choose interdisciplinary courses; we allow a doctoral supervisor to recruit students from different disciplines should the prospective students meet the requirements. As for the interdisciplinary program itself, we tried out the combination of tutor supervision and collective training to form a new model of interdisciplinary education. We also require students to take a certain number of courses that are multi-disciplinary. Even for regular graduate students, we require them to take several courses outside their majors.

Last but not the least, we perfected the supportive system of interdisciplinary graduate education, such as facilitating the relative research for the rapid development of interdisciplinary research helps the execution of interdisciplinary education; We also began to develop multi-forms, multi-levels, and multi-types of undergraduate interdisciplinary programs.

### **3. Challenges in Interdisciplinary Research and Education**

As for interdisciplinary research, existing challenges in our country mainly consists of: Firstly, the coordination mechanism at the national government level for science and technology resource allocation is still not perfect, with poor communication between departments, and lack of cohesion in major scientific and technological projects. Our research funding compared with major developed countries still seems very insufficient, and the structure for research investment still needs to be improved. For example, the ratio of basic research investment is too low.

Secondly, at the university level, there are inevitable resource competitions between interdisciplinary research and single subject research. At present, the science and technology resource allocation mode carried out in colleges and universities is still based on the relatively solidified single mature disciplines. When new research areas do not belong to the existing discipline category, they are easily neglected and excluded.

Thirdly, for interdisciplinary research organizations themselves, they lack first-class academic leaders and highly qualified research teams. And, the traditional “campus-faculty -department”

three-class academic organization structure is not compatible with the flow of interdisciplinary scientific research personnel. In this academic organization system, disciplinary boundaries are very clear, and there are barriers and competition between different disciplines. Teachers still belong to a certain department, and without certain permission, they cannot realize free flow as their will, which without a doubt could harm interdisciplinary research in the future.

In interdisciplinary graduate education, at present, existing challenges in our country mainly consists of the following: Firstly, the Graduate Subject Catalog designed and published by MOE neither sets interdisciplinarity apart nor leaves spaces for the potential interdisciplinarity in the future, which would restrict the development of interdisciplinary education.

Secondly, university organization and management systems may hinder the development of interdisciplinary education to some extent. For one thing, our universities organize and set schools or departments based on the first-class disciplines in the Graduate Subject Catalog, therefore, there are many schools and within each school, the major is divided to detailed. For another, most of our universities form a university- school- department three-level management system based on disciplines. The universities are used to regard schools as the basic units for policy making, resource allocating, personnel management and evaluation. Therefore, it may ignore interdisciplinary development consciously or unconsciously.

Thirdly, the traditional single-discipline education mode may affect the development of interdisciplinary education. For example, there are not enough graduate supervisors with rich interdisciplinary teaching and research experience; and there are only limited interactions, cooperation and joint training programs among different supervisors. In terms of degree granting, it is still the custom to apply single-discipline thinking to the evaluation of interdisciplinary research outcomes or to the review the interdisciplinary dissertations.