



Interdisciplinarity: The Inevitable Trend of Science and Education Development

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The theme of this summer school, Integration, is very inspiring.

Interdisciplinarity is an important aspect of integration and of great value. Our Digital PET is just an example of interdisciplinarity, a case of "Covering different fields, Bridging academia and industry."

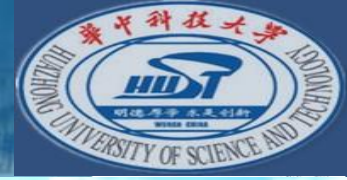
Today I would like to give a brief introduction of interdisciplinarity, the function of which is mainly embodied in three aspects.

At first, interdisciplinarity will solve major theoretical and application problems, and generate new theories.

With the development of social economy, science, technology and culture, the important problems in our world becomes more and more complex, while interdisciplinarity is the answer.

For example, the most important biological achievement in the 20th century is the discovering of DNA double helix structure, which has greatly promoted the development of biology.

It is done by a biologist, two physicists, and a chemist .



Secondly, interdisciplinary research will create new growth points for disciplines.

For example,

Based on the crossover study of plant and biochemistry, UC Berkeley has pushed development of biology by establishing a new research direction of molecular cell.

By combing the Network Journalism and Information Technology, our university has set up a new trail in Network Journalism and Communication.

Thirdly, interdisciplinarity will finally breed new disciplines through the crossover and cooperation.

For example, to answer the challenge of data processing, computer science appears from a “chemical reaction” of electronics, mathematics, linguistics and other disciplines.

There are plenty of examples like biochemistry, physical chemistry, educational philosophy, quantitative economy, and so on.

Max Planck, a famous physicist and founder of quantum theory, pointed out that “Fundamentally science has its own internal integrity. Classification of science into separate categories is not dependent on the nature of the objects, but due to **the limitations of human cognitive ability**. In fact, there is a unbreakable chain linking physics to chemistry, as well as connecting biology and anthropology to social sciences”.

Manyu YUE and Xiaoli WANG, *The Convergence of Knowledge, Technology and Society*, Guangming Daily, February 8, 2017, 14th edition.



Because human cognitive ability is limited, our understanding of the objective world can only be achieved step by step. There is a process for the development of science and education.

During this process, interdisciplinarity becomes the inevitable requirement for the development of society and science, while the innovation is its essence.

The development of science and education is embodied in four aspects.

Discipline development:

High integration - High differentiation

High integration based on high differentiation;

Discipline structure of university:

Single - Multiple - Comprehensive;

Function of university:

Teaching – Teaching & research

Teaching-research-industry;

University education:

Humanities Education - Science Education

Integration of humanities and science education.

1. Discipline development:

High integration: In ancient times, science was in a comprehensive and fuzzy period, because of the low level of productivity. I.e. Philosophy of Nature.

High differentiation: the number of disciplines of Natural Science reached 4126 in the 19th century.

High integration based on high differentiation : In the 1980s, 5550 disciplines have been developed at the meso-level, of which 2581 are interdisciplinary, accounting for 46%.

2. Discipline structure of university:

The structure of university disciplines is adapted to the development of disciplines, and undergoes a process from being single, to multiple, and to comprehensive.

For example: Harvard, Oxford, from the college of arts and science to the comprehensive university; MIT, Berkeley from technical college to the comprehensive university.

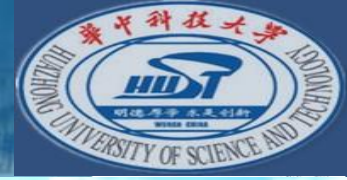
Nowadays, the comprehensive and agglomerative nature of university disciplines will provide nurturing environment for interdisciplinarity and talents cultivation.

3. Function of university:

Teaching: The earliest university, whose function is teaching, mainly cultivates monks and priests.

Teaching and research: Pioneered by Berlin University, teachers and students jointly carry out research and learn from it.

Teaching-research-industry: With the development of science, scientific knowledge and practical application has become more and more involved. Discovery, invention, development and manufacture are merged into a whole process. Therefore, the combination of teaching, research and industry become the new “trinity”.



4. University education:

Humanities education: The earliest university education was based on Humanities education, mainly providing humanity disciplines, such as literature, law and theology.

Science education: In the past 300 years, natural sciences have developed rapidly and university education mainly focused on science education, which has resulted in the split between humanities and science.

Integration of humanities and science education: Nowadays “knowledge economy” requires great minds with both humanistic and scientific qualities, which calls for the integration.

Interdisciplinarity is the source of innovative ideas.

Knowledge integration, mode combination, method collision and theorem cross-learning in interdisciplinary research can generate new ideas, theories and new methods to promote the development of science and education.

Difficulties of interdisciplinarity:

Stagnation of concept;

The existing discipline organization system leads to the difficulty in personal exchange and resource sharing;

Peer evaluation and monotonous standard bring obstacles in assessment and evaluation;

Isolated discipline culture ;

Lack of talents with interdisciplinary background.

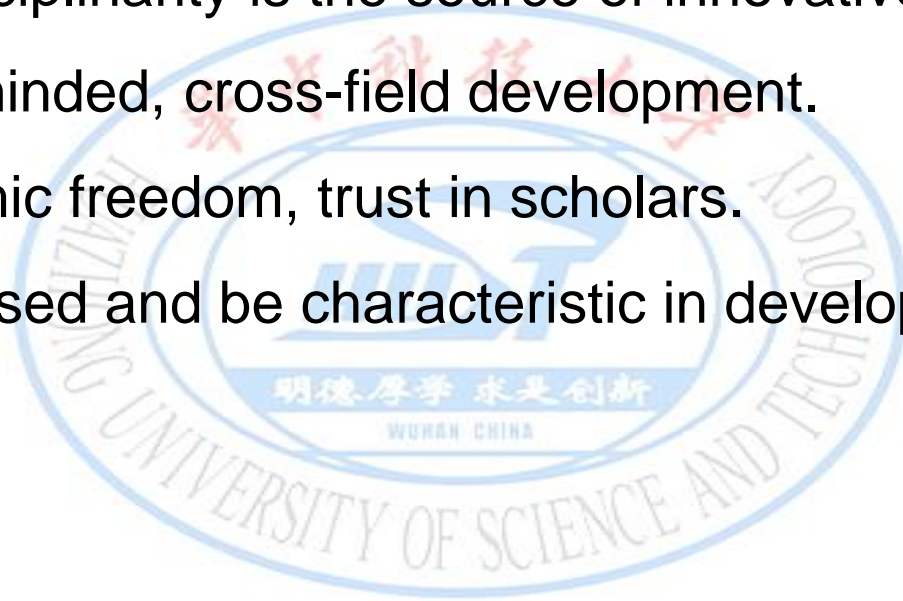
1. Change the concept

Interdisciplinarity is the source of innovative ideas.

Open-minded, cross-field development.

Academic freedom, trust in scholars.

Be focused and be characteristic in development.



2. Establish the network of discipline-organizing system.

The contradiction between the organization of single discipline and the intersection of disciplines has become a worldwide problem, worthy of exploring.

Improve the existing discipline organization and make it open.

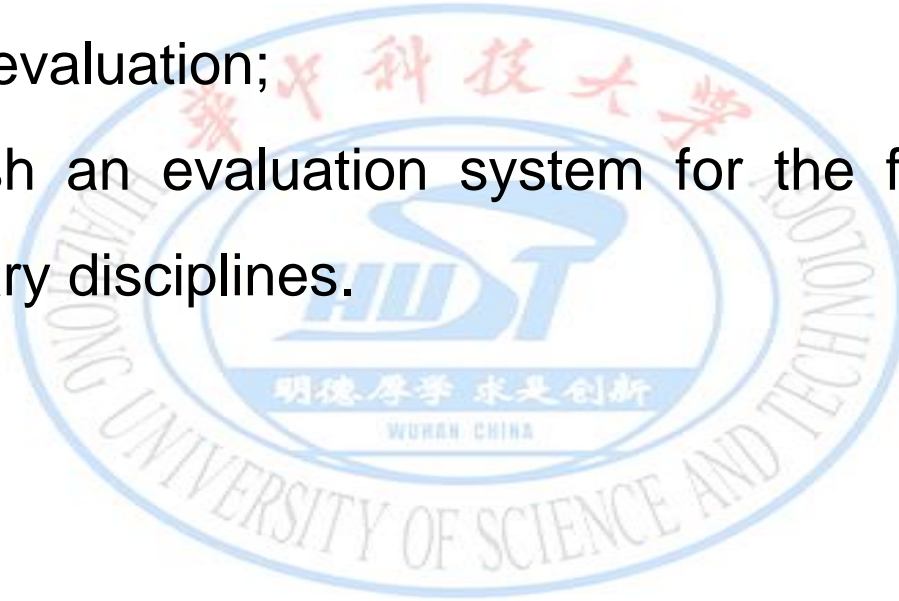
Establish interdisciplinary organizations, as well as proper relationship with the existing organizations.

Bilateral employment of faculty should be allowed and resources sharing should be encouraged.

3. Reform the single standard evaluation system.

Explore multiple disciplinary evaluation standards based on peer-to-peer evaluation;

Establish an evaluation system for the formation of new interdisciplinary disciplines.



4. Foster an open and pluralistic discipline culture.

Each discipline has its own culture with distinctive advantages.

Build a bridge among discipline cultures to foster a multi-disciplinary culture by interdisciplinarity and promoting interactions among scholars.

Examples:

Student Resource Center in the United States;

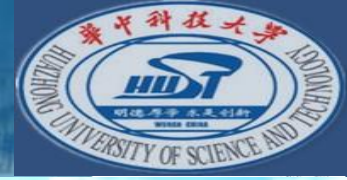
Student Support Center in Japan.

5. Cultivate talents with multiple-disciplinary background.

Encourage undergraduate students to take interdisciplinary in their study;

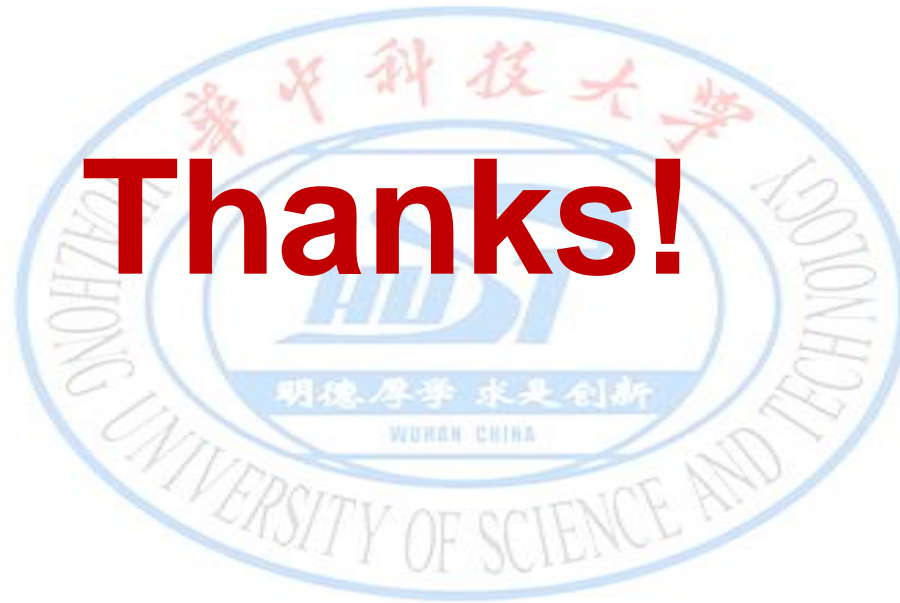
Students take different subjects during their undergraduate, master and PhD studies (Advocated by Prof. Tien Chang-lin of UC Berkeley);

Interdisciplinary research during postdoctoral stage.



In colleges and universities, interdisciplinarity has a crucial impact on the education.

We should strive to pave the way for interdisciplinarity, so as to build the first-class discipline and first-class university.



Thanks!