

# Briefings on Construction of Transdisciplinary Teaching and Research Teams in College and Universities

Gang Chen

Scientific Research Department  
Qiqihar Medical University  
Qiqihar, China  
chengang151201@126.com

Shuping Wang

No.1 Hospital of Qiqihar City  
Qiqihar, China  
fengqingqg@163.com

Mingyu Cong

Scientific Research Department  
Qiqihar Medical University  
Qiqihar, China  
lijinglj0@163.com

Haitao Yu

Scientific Research Department  
Qiqihar Medical University  
Qiqihar, China  
liuyongmei0616@163.com

Jingchun Wang

Scientific Research Department  
Qiqihar Medical University  
Qiqihar, China  
zhuyulinging@163.com

Yan Zheng

Scientific Research Department  
Qiqihar Medical University  
Qiqihar, China  
kuanglixia0528@163.com

**Abstract**—In order to adapt to the current development of science and technology discipline overlapping and mutual penetration, facing the paradigm shift towards integrating approaches of multiple disciplines, most college and universities creatively brought the “team” concept from enterprise to establish the commensurate transdisciplinary teaching and research teams. Construction of a transdisciplinary team is a major issue, and many challenges still need to be tackled in further steps of exploration. This article analyzed the nature and characteristics of commensurate transdisciplinary teaching and research teams, summarized the benefit significance of that. By diving deep into the current situation and existing problem of management structure, evaluation and engagement system, and team cultural construction. The corresponding solutions were proposed to provide benchmarking examples and guidelines for construction of transdisciplinary teams.

**Keywords**—College and universities; Transdisciplinary; research team

## I. INTRODUCTION

Nowadays, college and universities not only play an indispensable role in fundamental researches, hi-tech development and sketching the blueprint of national major technological projects, but also bear the critical mission of cultivating high-level talents. In the environment where the paradigm is shifting towards the integration of multiple disciplines, two problems regarding scientific researches and talent education arose thereby: 1. Individual effort and

expertise in a single subject or field alone cannot suffice the need for more comprehensive scientific advancement; 2. A problem came along is to continually infuse new bloods into scientific researches and teaching personnel in universities and society through cultivation of talents that are qualified for such requirement, which were described as “cross-like” talents who developed considerable expertise in a particular field while possess substantial knowledge in other realms. To address these problems, college and universities could take advantages of their resources in multiple disciplines, and adopt the “teamwork” concept from the industry, to build up transdisciplinary personnel. Evidences had shown that, such model has generated innovative achievements. However, it is still at the exploratory stage, where the enhancement of teamwork, improvement on operation and efficiency, and establishment of proper assessment are top priorities.

## II. CONCEPT AND CHARACTERISTICS OF TRANSDISCIPLINARY TEACHING AND RESEARCH TEAMS IN COLLEGE AND UNIVERSITIES

### A. Concept and characteristics of “team”

The American scholar Jon R. Katzenbach proposed that a team is composed of a few people who possess complementary skills and are willing to take the responsibility for a common goal, performance objectives and modus operandi. Stephen Robbins regards a team as a

formal organization in which the individuals orchestrates towards a particular goal. In other words, a team has four basic properties as follows: 1. A team is guided by a common goal; 2. A team is operated on orchestration; 3. A team needs common regulation and modus operandi; 4. The members within a team could complement each other in skills or expertise.

#### *B. Characteristics of transdisciplinary teaching and research teams in college and universities*

Based on the definition, a transdisciplinary teaching and research team consists teaching and research talents who are complementary in skills, and willing to work together to improve the scientific research levels and developing proper teaching methods. Therefore, a transdisciplinary teaching and research team should not only be equipped with those basic properties, but also have their own features: one resides in that such teams were targeted for scientific researches, innovation of educational methodology, and cultivation of high-level technological talents; the other dwells in the diversity of educational background, in which every member could provide resources or expertise from one or some aspects to add to the entire package, and thus endows the launched programs with novelty bordering on the line defining different disciplines as well as the methodology borrowed from other research realms. In addition, those teams are aimed for cultivating the “cross-like” talents.

### III. TRANSDISCIPLINARY TEACHING AND RESEARCH TEAMS BOOST UNIVERSITY EDUCATION AND RESEARCH

#### *A. Breaking the disciplinary barriers and promoting the overall subject construction*

A transdisciplinary teaching and research team brings together the creams from various realms, which enables the sparkling inter-disciplinary inspiration in communication and cooperation. Nowadays, most college and universities are seeking to propose novel directions and explore untapped areas in respective disciplines via enlightenment and methodologies from other subjects. These teams could break the barriers existing between departments or subjects, optimize allocation of discipline resources, congregate manpower and hardware, and build a brand new cooperative and sharing partnership, to facilitate synergistic operation, maximize the overall efficiency, and forward the subject construction.

#### *B. Developing new methodology and improving the capacity for scientific researches*

A transdisciplinary teaching and research team also broods new educational and scientific philosophy and methodologies. Therefore, it could tackle the problems facing a team with relatively homogeneous background from a variety of aspects, which could generate a more innovative and highly efficient solution, allowing for the team to undertake more challenging and important programs. In addition, due to the difference inherent in different subjects, the communication and inquiries among team members provide possibility for discovering new research directions in respective disciplines and/or in the intersected area of different disciplines, thereby enabling

the emergence of more breakthroughs and boosting the team's capacity in scientific research.

#### *C. Promoting talent cultivation*

A transdisciplinary teaching and research team promotes talent cultivation from two aspects. Firstly, it promotes the individual career development. Young researchers have opportunities to communicate with and learn from experts from different fields during their engagement in teamwork. Under the guidance of experienced scholars, they could achieve advancement faster than would otherwise obtain. Furthermore, inter-disciplinary communication increases the exposure of team members to knowledge and skills in other fields, and thus enriches their knowledges and methodology. Secondly, it facilitates talent cultivation for undergraduates. The transition to integrating approached from diversified disciplines poses higher criteria for being an eligible undergraduate, especially for those who are enrolled into the reservoir for scientific research, which should be cross-like talents that have a mastery of respective disciplines while possessing comprehensive knowledge on other subjects. This is also one of the reasons a transdisciplinary teaching and research team was built up for. Integrating theories and teaching methodologies, a transdisciplinary teaching and research team could on one hand expand the scope of teaching content, providing more directions for students to develop their capacities, and on the other hand, diversifies teaching methods, imparting knowledges in a more sensible way. The benefits include updating students with cutting edge of subjects and provoking divergent thinking.

### IV. CURRENT CHALLENGES FACING THE ESTABLISHMENT AND ADMINISTRATION OF A TRANSDISCIPLINARY TEACHING AND RESEARCH TEAM

#### *A. The lack of a commensurate administrative system*

In the established administrative regime, where projects, research groups, and key labs constitute the hierarchical structure of management, the teaching and research personnel usually belong to different administrative units. It works more like delegating personnel from different disciplinary background into different rooms, where they stayed in respective space without exchanging ideas with people from other rooms. Even when applying for a major program, which coincidentally requires efforts from different fields, the university would temporarily call for top experts from related disciplines to build up a transdisciplinary team. Strong as it may look as it gathers the top people in every realm, the team members still need a period of time to work compatibly after abrupt combination of organizations since their working styles have been much influenced by the long-formed thinking patterns in respective administrative units. Therefore, those team members would tend to work alone, instead of cooperating seamlessly.

#### *B. Immature performance evaluating system*

The current performance evaluating system, including the appraisal and employment system, appointment system,

and post allowance system, has rendered an ubiquitous problem in which the result, individual contribution and intelligence were over-emphasized, while the process, collective achievement and personalities were largely ignored. This has great impact on the enthusiasm of team members, discouraging their initiatives to cooperate with other team members, and leading to speciously compact yet truly disorganized teamwork. On the other hand, the majority of universities conduct assessment annually, a practice far too rigid to adapt to flexible schedule of programs, which result in the research teams swarming into the frivolous but manageable programs that could produce results in near future, instead of undertaking difficult but significant projects.

### C. *Neglect of construction of team spirit and culture*

Team spirit and culture is a collective consciousness agreed upon by every team member, which reflects the working ethos and morale, as well as the embodiment of common value, aspiration and faith, and is deemed as a cohesion cementing the team members and the spiritual power to push the team forward. It evolves during the development of a team, and in return is conducive to guidance of teamwork and realizing the common goal of a team. Although different teams might embrace different spiritual cultures, the basic factors are universal, which are mutual believe and team spirits. However, such cultures are absent in the current transdisciplinary teamwork in universities, mainly in two aspects: The intrinsic barriers between disciplines render a lack of deep communication between team members and the interest implication in existing performance evaluating system incurs conflict and friction between team members, which impede the team members to work together towards the common goal; On the other hand, the sense of belongings of team members is not sufficient that the individual interest and collective good could not be well reconciled, in which the initiatives of team members are diminished and they would complain or even leave the team.

## V. ADVICE ON CONSTRUCTION OF A TRANSDISCIPLINARY TEACHING AND RESEARCH TEAM

Based on aforementioned challenges, I propose the improvement could begin with the following:

### A. *Building a “genuine” transdisciplinary team*

The main issue comes from the fact that each members in a transdisciplinary team still work on their own. To promote the communication between team members, we can embark on the improvement in the following aspects. 1. Reform the current administrative system, break the inter-department, inter-disciplinary barriers, repudiate the organizational structure based on programs, research groups, or key labs etc., and create opportunities for exchanges between different subjects and a structure adaptive to the paradigm shift; 2. Build up a transdisciplinary team upon the existing teaching and research teams. Most universities have invested substantially on cultivating multiple teaching and/or research personnel, some of which improve rapidly or have already been considerably sophisticated. The universities could take the advantages of established resources, infuse

new blood from other fields and provide immediate and intensive support to allow for the evolution towards a genuine transdisciplinary team. Moreover, the team should embrace the philosophy “soft fire makes sweet malt”, accomplish and consummate a task step-by-step under strict regulations, which serves as a template for next task.

### B. *Improve the performance evaluating system*

Reform the current performance evaluating system, and establish one that could fully stimulate the initiative for scientific researches and promote the orchestrating operation of teamwork. However, there are several caveats to note. 1. Requirements should vary with positions, and assessment should depend on different tasks. A transdisciplinary team is composed of a leader, teaching and research key staff and assistants. The orchestration of different levels of personnel is critical for highly efficient operation of teamwork. In a transdisciplinary team, the leader should had impressive record in teaching or research, and is expected to lead the direction of the team and propose long-term strategy for team development, ensuring that the team could keep at the frontier in researches and teaching methodology. In addition, the leader should possess considerable ability to organize and coordinate. On one hand, they should delegate the team members and make the team operate rapidly, on the other hand, they should coordinate the external resources and strive for more favorable resources, and convert the theoretical results into concrete economic benefits. As for the teaching and research key staff, the assessment should emphasize on professional expertise, problem solving and analytic ability. While for the assistants, the knowledge and skills should be the major concern during assessment. 2. Focus on non-intellectual assessment. The current evaluation indications including publications, research programs that had been undertaken and science awards, lay much emphasis on intelligence. Though these indications are easily quantified and assessed, they could undermine the contribution of some non-intellectual factors, such as communicative skills, teamwork spirit, and the dedication to work, etc. 3. Flexible assessment time-table. There should be a shift from annual assessment towards a cyclic manner, and establish flexible assessment cycles depending on research schedules and program planning, to ensure that the long-term program can be invested with continual, adequate and systematic investigation, which would elevate the proactivity to undertake long-term but significant research programs.

### C. *Enhance the team spiritual cultural construction*

Culture is referred to as a complex whole including beliefs, values and codes of conduct, etc., peculiar to an organization, which was also termed as “unwritten regulations”. If the team member is regarded as a vehicle of the team, then the spiritual culture is the soul. An appropriate spiritual culture could produce free academic atmosphere in which the talents receive due respect, cooperation and sharing are encouraged, thereby attracting more highly educated talents, promoting the interaction of a variety of disciplines, and obtaining more innovative and significant achievements. To nurture such a culture, we need to respect and value talents in the first place, device a meritocratic and customizable employment system, to accommodate the diversity and individual differences, and

assign the talents to proper positions according to their skill packages. The common goal of team lays the foundation for the team and serve as a tie connecting team members. A definite common goal could also increase the members' recognition of the team and thus boosts their initiative to provide suggestions, makes the personal conflicts and friction more tolerable and the team member more willing to share and exchange ideas, which accelerates the team towards the common goal. Finally, we need to create the atmosphere where the communication, idea exchanging and sharing are encouraged. In this way, the team members could complement each other in knowledge and expertise through free communication and exchanging ideas, and the individual value can be maximized and new ideas and thought may arise thereby. On the other hand, such atmosphere facilitates the resolution of conflicts between team members, and creates transparent working environments.

## VI. CONCLUSIONS

In conclusion, construction of a transdisciplinary team is a major issue, and many challenges still need to be tackled in further steps of exploration. Using statistical analysis, we would be able to profile the status quo of team construction, discover major problems and seek for solutions. On the other hand, through case study of successful team construction, we can summarize the tactics and schemes, as well as the problems and corresponding successful solutions, to provide benchmarking examples and guidelines for construction of transdisciplinary teams.

## ACKNOWLEDGMENT

This project is funded by the “Exploring The Construction of Qiqihar’s Scientific research teams”, a

Designated Project for Soft Science Development of Qiqihar City in 2014, and the “Qiqihar Medical University Social Science Fund Project”.

## REFERENCES

- [1] Mitchell PH1. What's in a name? Multidisciplinary, interdisciplinary, and transdisciplinary. *J Prof Nurs.* 2005 Nov-Dec;21(6):332-4.
- [2] L Colucci-Gray, A Perazzone, M Dodman. Science education for sustainability, epistemological reflections and educational practices: from natural sciences to trans-disciplinarity. *Cultural Studies of Science Education.*, 2013, 8(1):127-183
- [3] MCEM Flores-Scott. Transdisciplinary teaching and research: what is possible in higher education? *Teaching in Higher Education.* 2011, volume 17(3):231-243J.
- [4] Clerk Maxwell, A Treatise on Electricity and Magnetism, 3rd ed., vol. 2. Oxford: Clarendon, 1892, pp.68–73.
- [5] Chrissie Boughy, Linking teaching and research: an alternative perspective? *Teaching in Higher Education.*2012, 17(5):629-635
- [6] Katja Brundiers \*, Arnim Wiek and Braden Kay. The Role of Transacademic Interface Managers in Transformational Sustainability Research and Education. *Sustainability* 2013, 5(11), 4614-4636; doi:10.3390/su5114614
- [7] J Merck , M Beermann. The Relevance of Transdisciplinary Teaching and Learning for the Successful Integration of Sustainability Issues into Higher Education Development. *World Sustainability.* 2015:19-25
- [8] Masaru Yarime , Gregory Trencher, Takashi Mino.et al.. Establishing sustainability science in higher education institutions: Towards an integration of academic development, institutionalization, and stakeholder collaborations, *Sustainability Science.* 2012,February 2012, Volume 7, Supplement 1, pp 101-113
- [9] Cerovac, Krešimir. Transdisciplinary Approach to Teaching and Research at the University. *Metodički Ogledi*, 2013, 20
- [10] JA Dyer , JA Dyer Multidisciplinary, Interdisciplinary, and Transdisciplinary Educational Models and Nursing Education. *Nursing Education Perspectives.*, 2003, 24(4):186-8