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The Complex Reality and Trans-disciplinary Approach in World of Higher Education

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Abstract: This paper discusses the transdisciplinary approach and its importance to be discussed and applied in the world of higher education research to understand and address the complexity of socio-cultural problems. Gilles Deleuze and Felix Guattari through a famous book, *A Thousand Plateaus* proposed two terms "arborescent" and "rhizome" as a metaphor for two paradigms and scientific approach in teaching and research. The concept "arborescent" in many respects considered inadequate applied in the scientific world that tends to see reality is atomistic, but complex and mutually overlap (networking). Gilles Deleuze and Felix Guattari proposed the concept of the rhizome as a metaphor for the paradigm and post-disciplinary scientific approach. UNESCO, CIRET and many scientific institutions and university in developed countries have done symposium, seminars and carry out research with a trans-disciplinary approach. The development of science-technology and complex and fast-changing cultural reality, requires colleges to understand and apply the trans-disciplinary approach.

Keywords: Concepts, Arborescent, Rhizome, Complex Reality, Trans-Disciplinary Approach.

1. INTRODUCTION

In the dynamic landscape of higher education, the complexity of addressing global challenges has become increasingly apparent. Universities and research institutions, once focused on specific academic disciplines, are now confronted with the need to integrate diverse knowledge systems to tackle multifaceted problems. Issues such as climate change, public health crises, and social inequality transcend traditional disciplinary boundaries, necessitating a shift in how knowledge is produced and applied. In response to this demand, the higher education sector has begun embracing more integrated approaches to research and teaching, where collaboration across disciplines becomes the cornerstone of innovation and problem-solving. This evolving paradigm requires not only academic expertise but also a flexible mindset that encourages trans-disciplinary research and a deeper understanding of the interconnectedness of global challenges.

A trans-disciplinary approach, which involves the integration of knowledge from multiple disciplines to create a holistic solution, has emerged as a vital strategy in addressing the complexities of contemporary society. This approach goes beyond simply combining insights from different fields; it fosters collaboration that transcends disciplinary boundaries, leading to the development of new methodologies, theories, and practical solutions. In the world of higher education, where the pursuit of knowledge is no longer confined to isolated silos, the trans-disciplinary approach is reshaping research agendas, curricula, and academic collaborations. This shift represents not only a challenge but also an opportunity for academic institutions to redefine their roles in society, equipping students and researchers with the skills and perspectives needed to tackle the most pressing issues of our time.

2. LITERATURE REVIEW

There are two epistemologies developed in the West World that is contradictory, namely Scientific Positivism and qualitative methods. Gilles Deleuze and Felix Guattari, in their book, *A Thousand Plateaus*, suggest the term "arborescent" and "rhizome" to describe these two different scientific paradigms (Deleuze & Guattari, 1983). The term "arborescent" means "tree", while the "rhizome"



means creeper. In the academic world, the technical term “tree of knowledge” is well known, which is used as a metaphor for the modern view of science. Tree standing upright supported by roots and its trunk grow two or three large branches where the growth of little rame. The roots is a metaphor for ontology, while the trunk is a metaphor for epistemology and methodology, while the three branches is a metaphor for science, social science, and humanities (Deluze & Felix. Guattari, 1991).

The concept of knowledge tree (arborrescent), which clearly materialized on Logical Positivism with the concept of unified science (Der Wiener Kreis’s view). The unity of science means that science just comes from the fact, using empirical-experimental methods and verification criteria of truth (Adorno, 1976; Ayer, 1936). In Logical Positivism Science, there is only one paradigm and outside the paradigm, that is not science. The metaphor of "tree of knowledge" by Richard Rorty referred to foundational epistemology (Rorty, 1980). In 1960s/1970s, post-structuralism and postmodernism evolved, particularly in France, which the main characteristic of the thought is rejection to the logic model of binary oppositions. It is presented by structuralism figures, like Ferdinand de Saussure and the model of opposition scientific paradigm (methodological) as stated by figures of Logical Positivism. Post-structuralist and postmodernist scientists reject the assumption of the theory as a representation or reflection of reality and the fix meaning of language by different arguments. Jacques Derrida suggests the concept of deconstruction, difference, trace and others (1976; 1978). Michel Foucault argued that there is a different episteme in each era; there is a relationship between the truth of power and knowledge (1970; 1979). Francois Lyotard states that the birth of the information age raises a transition from the modern era to the postmodern era. He states that it is accepted by modern thinkers to lose its grip (Lyotard, 1984).

Postmodern thinkers strive to appreciate pluralism and fragmentation. They fight totalitarianism and rigid systems in the scientific world. Gilles Deleuze and Felix Guattari have interesting thoughts (1979; 1991). They have a sharp critic on the view Structuralism and Logical Postivism by their own style. They propose the concept of "arborescent" and "rhizome" and I think it can be used to describe the development of scientific paradigm in developed countries, which are starting to use post-disciplinary approach. The term rhizome is used to criticize the views of foundationalist and binary opposition modes of thinking. “Rhizome” is not oppositional, not a replacement to “arborrescent”, but as a new approach that is used to understand and explain the reality (complex phenomenon). Rhizome is a botanical term for vines such as sweet potatoes, ginger, reeds and many other plants that do not have structural roots, not standing upright like a tree. Rhizome is a plant fibrous root that spread above or below the ground in all directions. Rhizome stem crosses and interconnects to one another (Deleuze & Guattari, 1991)

Term rhizome is proper used as a metaphor for post-disciplinary approach in the scientific world. To explain the reality of complex and intertwined that could not be explained by the paradigm of positivism and disciplinary approaches (mono-disciplinary), Gilles Deleuze and Felix Guattari state that the current reality, primarily socio-cultural reality is a complex reality, not atomistic, universal, and static reality. The postmodern world is a world of change and smelting dramatically, where the problems of class, ethnicity, gender, race, local, global, political, social and cultural sphere were once each autonomous, now merged with each other. Different elements of it blend in complex reality and interrelate to one another.

Deleuze and Guattari formulate the characteristics of the rhizome as follows: the principle of interconnectedness and heterogeneity, principle of multiplicity, horizontally modes of thinking, nonhierarchy and rejection of the model "arborrescent" logic, which is binary opposition; foundationalist, essentialist, vertical, dualistic, and hierarchical logic (Deleuze & Guattari, 1983). In addition to the concept of reality as a rhizome, a mode of thought can also be referred to as "rhizomatic-mind", the logic network model. In terms of Cultural Studies, the network between the texts is called "intertextuality". We can see the model or the logic of this thinking as a critique and alternative to vertical and hierarchical model of thinking on Scientific Positivism or according to Herbert Marcuse, the one dimensions model of thinking. in thought of Richard Rorty, the network model of thinking is called vocabulary. Thinking or mind is network of concepts and theories (Rorty, 1979). Reality is complex and network reality. It can not be explained by using disciplinary approach (monodisciplinary). Postdisciplinary or supradisciplinary approach is needed, such as: interdisciplinary, multidisciplinary, crossdisciplinary, and transdisciplinary. Centre for Cultural

Studies (CCCS) Birmingham has made the study of contemporary culture as interdisciplinary study. The scientists of the Frankfurt School who affect the CCCS figures, previously conduct interdisciplinary and multidisciplinary approach in their research and writing.

2.1. Complex Reality and Trans-disciplinary Approach

Karl Raimund Popper in the book, *Conjectures and Refutations: the Growth of Knowledge* Scientifics, stated we are not students of various fields of study, but students who study a variety of problems. And the problem must break through the boundaries of the field of study or the disciplinary approach (Popper, 1963). Popper statement expressed that scientists and lecturers need to follow the scientific developments that change very quickly and indicate interrelatedness of linkages between the various problems. It is necessary that scientists are not confined by the boundaries of discipline to follow the scientific development and provide solutions to the problems recently. Furthermore, Popper stated that theory is learned not to memorize, but to help us understand and solve present and future problems.

Changes in world scientific paradigms demonstrated by Critical Theory scientists (the Frankfurt School), Post-structuralism and Postmodern Theory. Almost all the postmodernist and poststructuralist thinkers criticize all modern scientific order which is considered established: such as philosophy, sociology, economics, and psychology. Radical postmodern thought generally stated that science is dead. They criticize the idea of representation, rationality, truth, system, foundation, certainty and continuity as an important concept in the modern scientific world. They argued about the birth of a new scientific culture because of the development of information technology (hyper-technology), which makes what we called cyber-culture (Silver & Massanari, 2006). Cyber-culture has formed a global community and global culture with the characteristics of codependency (interdependency) and highly interconnectedness. Now, Cultural Studies are based on a study of the global culture that appreciate cultural diversity critically (multiculturalism) by applying interdisciplinary and multidisciplinary approach.

Cultural Studies is based on Critical Theory and postmodern thinking that seeing a very broad cultural issues. In this context, socio-cultural issues are interrelated: the subject of sex, gender, race, ethnicity, class, religion, local or global is overlapping (hybridity) in shaping our society today. Feminist(ism) studies, post-colonial(ism) theory, multicultural(ism) theory is a study that is not approachable based on the views of positivism and disciplinary approaches (mono-disciplinary). The impossibility of it is due to the different ontology which requires the use of different methodologies and approaches (epistemology). Ulrich Beck in the book *Risk Society*, stated the modern era inherits a large risk, especially in the era which calls 'more modern'. Beck does not use the term 'postmodern', but 'new modernity', and he also states our society is a society full of risks (Beck, 1992).

The problems are inherited follows: the threat of nuclear technology, pollution (air, water, soil), deforestation and forest fires, threatened extinction of some species of flora and fauna, global warming, melting ice in the North and South Poles a threatened people living in foreshore. This is a complex and interrelated issue to one another. This is a problem for the rest of the world. The era of information and globalization is increasingly growing awareness that human beings have lived in one house or the one world. This awareness makes us realize that increasingly large and complex problems must be faced and overcome together because it is our problem together. We need cooperation between scientists from various fields of science, cooperation between the state institutions and universities, and participation of the community, even policy makers.

Cyber-culture or virtual culture not only provide benefits and great hope for the world population, but also causes many problems in accordance with the various forms of culture caused it. Cyber-culture networking with cyber-bussiness, cyber-community, cyber-pornography, cyber-crime, cyber-war, cyber-defense, cyber-spionase, cyber-sex, cyber-queer, cyber-psychology, cyber-therapy. There are various other forms of cyber-culture may not be understood by using the paradigm of positivism and disciplinary approach, but supra-disciplinary approach (exactly trans-disciplinary approach). David Bell, in the book *An Introduction to Cyber-culture*, states changing cultural studies with the advent of cyber-culture by showing chapters like: cyber-cultures, cultural studies in cyber-culture, community in cyber-culture, identities in cyber-culture, bodies in cyber-culture, cyber-subculture and

researching cyber-culture (Bell, 2001). And, Jean Baudrillard, the most popular scientist who write about cyber-culture problem states there are many important concepts (hyper-reality, simulacra, sign, image) that should be understood to understand the whole phenomenon of cyber-culture (Baudrillard, 1981; 1983; 1988).

How to understand, explain, and overcome complex cultural reality or solve its problems? This is precisely relevance of the supra-disciplinary or post-disciplinary (interdisciplinary, multidisciplinary, cross-disciplinary, and trans-disciplinary) approach to understand and address the complex cultural reality and its problems. There are difficulties to discuss disciplinary approach since there is unclear use of the concept of interdisciplinary, multidisciplinary, trans-disciplinary in some writings obtained. But I will explain it carefully. Rosenfeld (1992 stated about the difference between trans-disciplinary, multidisciplinary and interdisciplinary in research as follows:

Table 1. Comparison of Trans-disciplinary, Multi-disciplinary, and Inter-disciplinary Research

Trans-disciplinary Research	Multi-disciplinary Research	Inter-disciplinary Research
Collaboration in which exchanging information, altering discipline-specific approaches, sharing resources and integrating disciplines achieves a common scientific goal	Researchers from a variety of disciplines work together at some point during a project, but have separate questions, separate conclusions, and disseminate in different journals.	Researchers interact with the goal of transferring knowledge from one discipline to another. Allow researchers to inform each other's work and compare individual findings.

Source of Tabel: Washington University School of Medicin in St. Louis, [http://obesity-cancer.Edu/en/About/What is Transdisciplinary Research](http://obesity-cancer.Edu/en/About/What%20is%20Transdisciplinary%20Research)), 20 February 2015.

Alexander Refsum Jensenius give a brief definition and illustration of post-disciplinary approach: inter-disciplinary, intra-disciplinary, cross-disciplinary, multi-disciplinary, inter-disciplinary, dan trans-disciplinary as follow:

- a. Intradisciplinary: working within a single discipline.
- b. Crossdisciplinary: viewing one discipline from the perspective of another.
- c. Multidisciplinary: people from different disciplines working together, each drawing on their disciplinary knowledge.
- d. Interdisciplinary: integrating knowledge and methods from different disciplines, using a real synthesis of approaches.
- e. Transdisciplinary: creating a unity of intellectual frameworks beyond the disciplinary perspectives.

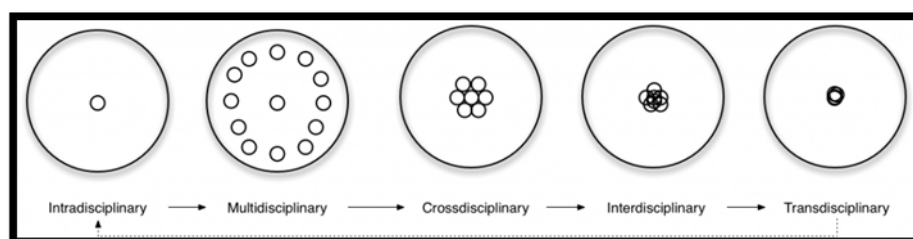


Figure 1. Comparison of Trans-disciplinary, Multi-disciplinary, and Inter-disciplinary Research

Source of Picture: <http://www.arj.no/2012/03/12/disciplinarity-2/>, 18 August 2016

Trans-disciplinary research is essentially research conducted by a team of experts consisting of various scientific disciplines that conduct research in persistent and tight attitude, and each contributes to the integration and a more holistic view of the problem examined accordance with their respective areas of expertise. They are working hard to understand and explain the overall complexity of the research project, not just as the parts that are mutually exclusive. Trans-disciplinary research allows experts and researchers to address their respective expertise and provide information on other areas, so the complexity of the issues examined is revealed. In the trans-disciplinary approach,

scientists from various fields exchange their information on concepts, theories, methods in their field of expertise, while working together to empower their expertise and discipline to find and develop a particular purpose.

Trans-disciplinary approach is not only the approach that crosses the boundaries of discipline within the social sciences-humanities, but it can be crossed into the area of natural sciences, even possible for public participation (stakeholders). Therefore, trans-disciplinary approach involves not only cooperation, or collaboration between the various disciplines, but the research would link the text to context, and then from the text to the culture and society. One important thing that distinguishes trans-disciplinary approach with other approaches is the goal, to solve the complexity of the problems that encountered in our life (the real world). So, there is a strong link between theory and praxis. There are many issues to be addressed and resolved that require trans-disciplinary approaches such as: pollution, globalization, biotechnology, nanotechnology, the negative impact of cyber-culture. I would like give example the globalization issue and pollution that related to many areas of science: sociology, anthropology, economics, communication, language, ethics, law, politics, international relations, humanities, even the natural sciences (such as chemistry, biology and physics). Furthermore, Nissani Karanika-Murray and Wiesemes (eds.), in the book *Exploring Avenues to Interdisciplinary Research*, provide an explanation of the characteristics and special benefits trans-disciplinary approach, as follows:

- a. Opening space for a creative breakthrough.
- b. Develop an objective perspective of an outside observer.
- c. Avoiding disciplinary approach.
- d. Helps to solve complex applied science or application problems.
- e. Promoting ideal entanglement of science.
- f. Develop flexible research, contribute to communication between scientists and resource mobilization.
- g. Facilitate the continuity of academic freedom.

Douglas Kellner, citing the opinion of David Bowie, states that developing new fields in this postmodern culture, we should be able to learn to live in the current fragmentation, information technology, and remarkable progress of hyper-reality, images and its process (Kellner, 2010). In the era of cyber-culture or the network era, most phenomenon intertwined with one another. Because of it, teaching and research post-disciplinary are important and necessary. For Kellner, multidisciplinary or trans-disciplinary approach is approach of culture and society that across the border between the various academic disciplines. Trans-disciplinary research linking the theory with practice in various ways to resolve the problems that may not be addressed through disciplinary approach, so it takes courage to experiment with new approaches. Scientists from various disciplines must dialog and search for interconnections between scientific fields with each other. There are several benefits and objectives trans-disciplinary approach put forward Dr. Karen Cronin in the reports were prepared for the Ministry of Research and Technology (MoRST) in September 2008 as follows:

- a. Grasp the complexity of problems,
- b. Consider the diversity of life world and scientific perceptions of problems,
- c. Link abstract and case specific knowledge and
- d. Constitute knowledge and practices that promote what is conceived to be the common good.

Trans-disciplinary research is needed to determine the policies by considering various aspects and giving positive impact to the implementation of the project. Project of reclaimed islands in Jakarta and Bali Benoa Bay becomes a national problem and debate, perhaps even global because it does not carry out trans-disciplinary research (impact of economic, social, cultural and environmental) beforehand. The US National Academy of Science report (2004) identified a range of institutional barriers to trans-disciplinary research including:

- a. Limited resources – Time and resources devoted to trans-disciplinary research are diverted from other research program and thus TDR projects need to be outstanding to attract funding. Centralised funding regimes may have few spare resources for research across rather than within departments.
- b. Academic reward system – Traditional systems for hiring, tenure and promotion etc are controlled by departments and there is often little reward for teaching or research outside one's disciplinary area.
- c. Institutional cultures – Collaborators may have different concepts of 'proof' or 'precision'. The culture of a mathematics department, for example, differs from a biology department.
- d. Evaluation Program– Academic institutions rely on tradition evaluation mechanisms to benchmark their program and allocate resources. When emerging fields are left out of assessments, they may not receive funding.
- e. Departmental procedures – Different departments have different methods for allocating resources, organising research, authoring papers, control of space and facilities and criteria for recruitment, which may impede or fail to reward trans-disciplinary approach.
- f. Start-up time for trans-disciplinary projects – Arranging staff, equipment etc for a collaborative project may take longer than within-department projects, thus reducing the time for research and reporting results.

The US Academy of Sciences report found that interdisciplinary research can be one of the most productive and inspiring of human pursuits. Various international organizations, regional and national agencies are doing symposiums, seminars and research on problems that we are facing lately (UNESCO, 1998). UN conference in Stockholm in 1972, UNESCO program on "man and biosphere" and various other activities on the environment is trans-disciplinary approach. Department of Philosophy, University of Indonesia (UI), from the beginning stated that the hallmark of its pedagogy as "dialogue among disciplines". It is clear a form of trans-disciplinary approach, and that approach realized by providing philosophy of science course, which generally studied in philosophy graduate program. In UI doctoral program, in addition to philosophy of science and methodology, Department of Philosophy gave a philosophy lecture in accordance with faculty, among others: philosophy of economic, political philosophy, social philosophy, philosophy of technology, environmental ethics and biomedical ethics, even cyber-ethics. Unfortunately there are many lecturers who are still asleep in the narrow disciplinary boxes. They do not realize that science-technology and culture have changed and grown very quickly are like a giant locomotive that moves with incredible power through the past (Giddens, 1990). Consequently, the old paradigm of thinking and theories are no longer able to explain the current phenomena. Umberto Eco, Italian scientists and the famous novelist said the right statement honestly, "the professor who know only the theory twenty years ago, including me, was better resign".

3. CONCLUSION

The history of science proves that the development of science (especially physics) gives birth to the scientific revolution which requires scientists to change the paradigm of thinking to understand the old reality in a new way or to understand new cultural-social phenomena. Now, we are faced with various complex problems that require collaboration between scientists from different fields of science, cross-disciplinary cooperation, even research which is supported by many countries. Trans-disciplinary approach us the most appropriate approach to tackle the problem together. Globalization and cyber-culture have spawned a lot of issues that require broad cooperation among disciplines, between different skills, locally or even globally. UNESCO and the European Union looks like standing on the forefront to develop an understanding and application of trans-disciplinary approach, to support the continuity of nature and all life in it. Earth as a home of humans is one system (rhizome). A little damage caused by it will damage the comfort of the home where we live. The concept of "green" (green economy, green politics, green literatures, green campus) is one good example of the trans-disciplinary approach. That is what we need today, and we must develop it.

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