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What is Interdisciplinary? How is it Different from Multidisciplinary?

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Abstract

Discipline based approach to knowledge and specialisation goes back to the classical Graeco-Roman times. It was Isaac Newton's *Principia*, which represented academic perfection of Renaissance inquiry that started the epochal model of knowledge and led to the making of the Age of Enlightenment. August Comte heralded an era of Positivism in academic research and prepared the ground for the making of disciplines. As new knowledge accrued over centuries, specialisation got diversified at the expense of holistic understanding. Academics of disciplinary specialisation sought to resolve the problem through multidisciplinary research. Inherently discipline centric, it got further distanced from social reality. Interdisciplinary approach began as a movement through convergence research aiming to restore holistic comprehension and draw knowledge closer to social reality. This paper presents an overview of how the production of knowledge beyond disciplines and across their interfaces enabling research output to be regenerative, non-conventional and resolution oriented.

Keywords: Interdisciplinary, Multidisciplinary, Transdisciplinary, Convergence, Epistemology

1. Introduction

It is increasingly felt that knowledge areas have been drawing closer to one another enabling convergence or holistic integration

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of deeper knowledge today. Over the past few decades several non-conventional areas of knowledge cutting across physical, natural and social sciences have come out as a result of researches beyond disciplinary boundaries, letting disciplines draw closer to one another. The deliberation seeks to distinguish this practice as interdisciplinary from multidisciplinary by examining the epistemological stances of both.

Discipline based perception of knowledge goes back to classical Graeco-Roman times. Aristotle had viewed Poetics, Politics, and Metaphysics as distinct fields of knowledge. Classical scholars knew that specialisation caused lack of holistic understanding, and they tried to overcome this by making themselves polymaths. Their assembly became *universitas scientiarum* out of which the medieval universities emerged. During the medieval period scholars followed two broad divisions: 1) the *trivium* (rhetoric, logic, and grammar) and 2) the *quadrivium* (music, geometry, arithmetic and astronomy).

Modern disciplines had their origins through post-Renaissance academia built up by Bacon, Galileo, Boyle, Descartes, and Isaac Newton. Newton made a major break in his *Mathematica Principia* that presented knowledge measurements, discoveries, specific theories, proofs, and a general theory of absolutist induction. He shook the 17th century intellectuals of Natural Philosophy with his strikingly different approach to knowledge production characterised by the discovery and theorisation of fundamental laws. Philosophers (Scholars) of natural and human fields felt that a study would be complete only with the formulations of fundamental laws. They were attracted by certain properties such as: a) Recognition of a genuine theory of knowledge outside the empirical field and the one that is beyond pure logic; b) Dependence on a method that takes one beyond the purely logical analysis of relations between theoretical statements; c) Possibility of choosing the method as required by the objective; d) Testability of theoretical statements; e) Empirical statements based on certain logical parameters such as verifiability alone do not ensure testability; f) Statements with susceptibility to revision or reconstitution or replacement, i.e., the potential to advance; and g) No insistence upon strict proof or conclusive disproof.

This new approach to knowledge engendered by Newton's *Principia* led to the Age of Enlightenment (18th century). Rousseau, Voltaire, Locke, Hume, Adam Fergusson, Miller, Montesquieu, Adam Smith, Malthus, and several others emerged as enlightenment intellectuals with their landmark studies. Those philosophers of the Age, who wrote on human affairs as part of moral philosophy made their studies as profoundly enunciated fields of theoretical depth. This led to the making of the 19th century as the Age of Science. William Whewell (1794-1866), an Anglican priest, theologian and historian of science of 19th century renamed Natural Philosophy as science. Science meant physics or the knowledge of finality, authenticity, authority, credibility, and universal acceptability. It opened a new epoch – the epoch of Modernity. Establishment of physics as the most authentic form of knowledge led to the imitation of its methodology by other fields of knowledge aspirants to be science. Social sciences emerged in this way as disciplines embodying knowledge modelled on science about social aspects. The term science became a word of power-knowledge combine compelling every knowledge area to follow the former's parameters of academic legitimacy. These studies laid the foundation of the 19th century social sciences.

August Comte had a major role in the making of the philosophy of disciplines. He rigorously separated the Newtonian quantitative, atomistic, mechanistic knowledge from metaphysics, and sought to extend it to human affairs and social processes. He tried to write social physics and founded the methodology of Positivism. Karl Marx was the next major break and like Newton's *Principia*, his Critique of Political Economy with its historical materialism literally shook the world. Enunciating critical theory as theory of theory, Marx provided intellectual justification for the production of knowledge about human affairs and social processes with the claim of being science. He was the first to make knowledge at once theoretical but pertaining to hard-core social reality and its revolutionary transformation. His approach was holistic, social, people centred, empowerment oriented and praxis driven.

Universities and Colleges in Europe and America opened academic Departments of Physical, Natural, and Social Sciences besides Arts and Humanities. These Departments of teaching and research drew

the contours and boundaries of academic disciplines with discipline based theories and methodology. Science established the knowledge of physical and natural phenomena primary and made the knowledge of human affairs based on abstract values and qualitative aspects of social life secondary. This gave rise to several object-specific sciences or objective disciplines. Internalising the cognitive mode, logical structure, constitutional texture and communicative strategy of knowledge in Sciences, the knowledge domain of human affairs and social life also gave rise to object-specific non-sciences or subjective disciplines.

Researches in certain topics necessitated theories from different disciplines. They would start off with the identity of a discipline but use theories drawn from various disciplines. This is multidisciplinary approach presupposing no fundamental difference in perspective. Disciplines began to draw closer to one another. Soon the disciplinary identity of research topics began to be epistemologically challenged. Epistemological critique of discipline based theories and methodology became a prevalent approach. Such epistemological debates and criticisms witnessed the process of epistemological collapse of the disciplinary identity of theory and methodology. Trans-disciplinary approach began to gain ground in researches on topics of no disciplinary identity. Naturally such topics of research facilitated convergence of multiple disciplines. In the process of convergence, their disciplinary identity was stripped off and got subsumed by the new knowledge area of the topic.

2. Plurality of definition

There are several working definitions of interdisciplinary perspective and most of them still remain moored in multidisciplinary perspective. Actually disciplinary and multidisciplinary are one and the same. This paper presents a few definitions of interdisciplinary formulated by a few academics in a conference at Ohio University. This is to show how they differ from one another and how we could arrive at an intelligible definition.

Andrea E. Frohne (Associate Professor of African Art History, School of Interdisciplinary Arts of Ohio University) says:

"Archaically, discipline meant instruction given to a disciple, and a "disciple" would take apart. Meanings for the prefix "inter" include between, among, and together. The word interdisciplinary as a whole suggests learning by both taking apart and bringing together. Interdisciplinary research is indeed vast with boundaries in flux that we continue to tailor to meet our own interests and contexts of study."(Frohne, n.d)

According to William Condee (Professor of Humanities and Professor of Theatre, Ohio University) "Interdisciplinary studies should ask complex or vexing questions that cannot be answered adequately within the boundaries of the given discipline as it is defined at a particular moment. Interdisciplinary studies should encounter a beast that, if examined solely with the tools of the discipline, would leave out major body parts—parts that are inexplicable within the discipline. In order to answer these troublesome questions, the scholar reaches out to other disciplines, borrowing tools, methodologies, or knowledge. The goal is to answer the question, to study the beast, to examine the object. The interdisciplinary scholar stands at the edge of the known world of the discipline and looks out. I am arguing, then, for a form of interdisciplinary that is solidly grounded within a discipline, employing, at least in part and at first, existing scholarship and methodology." (Condee, n.d.)

As Condee (n.d.) continues, her definition brings forth an ambiguous relation between multidisciplinary and interdisciplinary. She argues, "Interdisciplinary research then transforms the discipline, but is nonetheless based in that discipline. This form of interdisciplinarity might be called discipline-based, in which disciplinary work is essential to interdisciplinary studies, and interdisciplinary studies are essential to the future development of the discipline. The scholar should have a disciplinary home, but also have knowledge of cognate disciplines. The discipline provides the fundamental tools of education, core knowledge, identification of the problem, peer review, and dissemination."

Condee (n.d.) continues to assert that "Interdisciplinarity provides new methodologies and new areas of inquiry. The goal of

interdisciplinary studies, then, is not just to look at the same objects from a new perspective (as valuable as that may be), but to examine new objects that have previously not been considered noteworthy or sufficiently related to the discipline, and to do so in new ways. The goal, then, is not merely to produce new knowledge but also to engender new fields of inquiry."

However, the articulation below identifies the disjuncts between multidisciplinary and interdisciplinary. Condee (n.d.) argues, "Interdisciplinary studies provide the essential mechanism by which the discipline questions itself and opens itself up to external examination—ultimately perpetuating reform. Disciplinarity without interdisciplinarity is a dead discipline. Ultimately this argument undermines the opposition of disciplinarity and interdisciplinarity. If disciplinarity and interdisciplinarity exist at opposite sides of a binary opposition, the terms lose meaning; the structure collapses upon itself. Instead, these notions can be seen as sliding along a continuum. Disciplinary and interdisciplinary studies should permeate and infuse one another, operating in a complementary relationship. Disciplinarity provides the basis for scholarship and the peer-review process. Interdisciplinarity offers the opportunities for new questions, new tools, and new objects."

Garrett Field (Simhala Language Specialist, Ohio University) says: "We can distinguish two styles of interdisciplinary scholarship: the theoretical and areal. The theoretical scholar analyses a subject already studied in depth by colleagues in his or her home discipline but deploys a theory from outside the discipline to illuminate an unseen facet of the subject. In contrast the areal scholar focuses on a particular period and place and reveals a basis of comparison between seemingly disparate phenomena like historical developments in discourse, politics, and art forms." (Field, n.d.)

According to Michael Gillespie (Media and Communication Arts and the Black Studies Program at the City College of New York, City University of New York), "Interdisciplinarity is the combination of different disciplinary ideals and approaches for the purpose of new methodologies. As such, one firstly identifies the way in which disciplines represent distinct measures or critical interests and then moves to identify the collateral concerns of

different disciplines or how these distinct ideas might be brought in conversation with one another as diacritical or dialogical exchange. Thus interdisciplinary scholarship emphasises the consequential way objects and ideals appreciably represent multiple ideals and not strictly the critical concerns of a single discipline." (Gillespie, n.d.)

According to Vladimir Marchenkov (School of Interdisciplinary Art, Ohio University) "Interdisciplinarity in general is based on the deep affinity of all branches of knowledge, an affinity which is best expressed in philosophical thought. Art and philosophy have a common purpose: to change the inner human being, but they go about this purpose differently. Philosophy addresses the inner person in us directly, through conceptual thinking, while art transforms external reality – everything from landscape to the human body itself – in order to transform the human person's inner world. The various art forms are united by this common task and way of doing things and therefore are best understood in their mutual conjunction. This idea forms the basis for the simultaneous study of several art forms, as well as of philosophy along with the arts."(Marchenkov, n.d.)

Marina Peterson (Anthropologist, Ohio University) says: "Interdisciplinarity entails drawing on – or putting into conversation with each other – multiple fields of scholarly inquiry for the study of any given subject." According to Dora Wilson (School of Interdisciplinary Art, Ohio University), "I approach the arts from the standpoint of being a performer in music and a music historian. This is always a guiding force for looking to see how to find common threads within the work (s) under examination. I look to see an amalgamation of ideas, influences and/or objects. The resulting fusion, blending or integration of ideas brings about something different from specialisation or comparative techniques. Synthesis becomes an overarching principle for the way we look at things or ideas already present in certain disciplines, such as opera, theater, music, art, dance or film. In reference to my teaching, I see that I am working to find ways to interconnect more than one discipline into the frame of my courses. The focus on unification of ideas in the arts provides an interesting and exciting opportunity for interdisciplinary study." (Peterson, n.d.)

Roland Barthes (French Literary Theorist) defines: "Interdisciplinary work, so much discussed these days, is not about confronting already constituted disciplines none of which, in fact, is willing to let itself go. To do something interdisciplinary it is not enough to choose a subject (a theme) and gather around it two or three sciences. Interdisciplinary consists in creating a new object that belongs to no one." (Barthes, 1986)

3. Pre-requisites of interdisciplinary

Up-to-date comprehension of a particular discipline is an essential pre-requisite for being interdisciplinary. The primary requirement for this is up-to-date knowledge in one's own discipline. Discipline based empirical learning launches a teacher into the domain of deeper knowledge, but generally as distanced from social goals. Deeper knowledge is invariably theoretical and provides criticality, the most crucial factor that makes disciplinary learning social and people centred.

3.a Empirical grip

Every teacher has to acquire sufficient empirical grip at the outset. It is necessary to explore everything quantifiable about the empirical data. Quantification gives a feeling of thoroughness. Statistical quantification is very useful. However, checking averages and frequencies or even coefficients alone will not do for the production of deeper knowledge. Teachers have to come to terms with the fact that many aspects of society are abstract and metaphorical, hardly amenable to quantification. Moreover, quantification hardly exhausts alternative derivation possibilities of the same data. The exercise makes no sense if research questions are not inspired by critical social reality. Higher level quantification through sophisticated techniques is fine for achieving precision in answers, but often statisticians ignorant of social theory waste their time answering precisely a wrongly framed question.

3.b Primacy of theory

Most of our teachers think quantification is a substitute for theorisation and that it makes their study scientific. Heuristics or the study of data and hermeneutics or the study of interpretation,

are the two eyes of research methodology. Both are theoretical. Theory is essential not only for interpretation but also for recognising the data. For analysing and sorting out indicators, correlating them, deriving inferences and constituting the evidence, the teacher has to know the theory. The evidence is not out there for anybody to go and pick, for it is conceptually identified and theoretically constituted. There are theories about classifying the data and determining their veracity, just as there are theories providing frameworks of comprehension and interpretation. One should know the basis of scaling and sampling besides the limitations of questionnaire based data generation. A teacher has to be theoretically knowledgeable, to be defensive about his/her data. However, our teachers, particularly those in social sciences and humanities, have been distancing themselves from theorisation. The teacher gets lost in descriptive literature on one aspect or the other of the society in time and space. Key books and guides remain authentic for most of the college students and teachers of social sciences, in spite of the availability of a commendable body of authentic works. This accounts for the teachers' limited knowledge base and restricted output. A teacher has to experience the transition from empiricism to theorisation with a social critical outlook and, be inspired to transform the students accordingly. The teacher should feel the intellectual need for transcending the discipline in the process of cognitive encounters with the limitations of one's own discipline. In fact, that is the state of academic preparedness for being interdisciplinary.

Social sciences represent a form of knowledge noted for its hermeneutic strength, in the pedagogy of which conceptual clarity is of utmost importance. It is essential to emphasise interconnectedness of social aspects in a holistic perspective, a process precluded in the absence of theorisation. The general distaste for theory is explicit in Ph.D dissertations of most Universities, which suffer from oversimplification. Consequent on the distancing of theory from research, the conventional method of conceiving the social, economic, political, cultural, religious etc., as independent facets, continues to haunt. Teachers in Social Sciences and Humanities cannot make a choice between the empirical and theoretical. In fact, such a choice does not exist, for their subject matter is inaccessible without a theory, a distinct fact that no

teacher can afford to ignore. Social theory is an ever-growing domain that helps us unravel processes and interconnections below the surface reality of social life. It is the wisdom accrued through sustained attempts at exploring the deeper meanings of explicit features and practices of the society. By resorting to various analytical strategies, it helps us understand the link between the surface reality of social practices and their submerged referential. Theory makes the unseen visible and the inaudible heard. It is true that societal studies in general cannot end up formulating all inclusive theorisation in the form of equations and formulas. This does not preclude the possibility of constituting explanations based on deeper causation.

Lack of theoretical perspective is a defect common to researches in all faculties. Even science and technology research is in a similar state too, despite its inherently radical feature as the universally dominant form of knowledge. Science happens to be learnt without imbibing the scientific temper and taught without insights about science policy, for in both the processes noted for alienating institutional practices of teaching and evaluation, the radical aspect of the knowledge form gets contained and its authenticity and authority cultivated. Technology is imparted as a mere skill. Students of science and technology seldom learn the history and philosophy of their knowledge domain. With the result, they fail to understand the relation of their knowledge to politics. It is no wonder that India has the largest number of irrational and apolitical scientists and technologists. In short, the overall pedagogic strategy, learning mode and evaluation method followed in institutions of higher education prove to be most effective means of de-politicisation. It is high time we rearticulated the higher education curricula on the basis of a thorough revamping with the rigour of a movement.

3.c Epistemological positioning

Whether you wish it or not, there exists no option for any teacher today to be out of the modern – postmodern debate, if the teacher has aspiration to be an interdisciplinarian. Every teacher has to acquire at least a tenuous understanding of the meaning and implications of the modern and the postmodern. It is almost

indispensable for a teacher to gain some competency in epistemological positioning of oneself, which means positioning of oneself in the context of the science of knowledge as debated between the modern and the postmodern. Let me very briefly discuss the issue here. The Modern is synonymous with Science and Science with Physics, and Physics with Newton's *Principia*. Newton's *Principia* represents fundamental knowledge about the knowable in the universe, and fundamental knowledge as knowledge about the underlying principles or laws behind the natural phenomena. Knowledge of fundamental principles/foundational laws is the ultimate knowledge and science. Science thus became logo-centric knowledge of authority, authenticity, openness, transparency, finality, certainty and universal credibility. Fundamental knowledge is teleological, all encompassing, unified and hence grand-theoretical. It is this accomplished knowledge of Renaissance versatility that the Modern embodies.

Limitations of modernity are the same as what post-Einsteinian science has identified and put forward as the limitations of Newtonian – Einsteinian science, as explicit in the epistemological shift of Science to New Science, which began with Max Plank, whose Quantum physics shattered certainty and predictability of science by proving that both 'position' and 'velocity' cannot be measured at the same time with same accuracy. Heisenberg's Principle of Uncertainty turning scientific knowledge into 'no theory of certainty' exposed a major limitation of scientific knowledge and thereby deprived the knowledge in 'Modernity' of its foundation. Bohr's Complementarity Principle and Godel's thesis of 'Undecidability,' turning scientific knowledge further uncertain and tentative, made the stability claim of the knowledge in 'Modernity' a myth. Feynman acknowledging imprecision as an inevitable aspect of scientific communication disproved the belief of societies in 'Modernity' that language can be rational and transparent representing a firm and objective connection between the objects of perception and language of communication. With Heisenberg, Bohr, Godel and Feynman showing scientific knowledge has limitations such as 'uncertainty,' 'imprecision' and 'unknowability', the claim of knowledge in societies of 'Modernity' to be free of limitations became false.

Heisenberg confirming that the action of measuring affects the accuracy of the measurement and Schrodinger concluding that object-subject split a figment of the imagination, made the objectivity claim of knowledge in 'Modernity' unfounded. In short, Post-Einsteinian science depriving scientific knowledge of its finality, certainty, precision, linearity, objectivity and stability made claims of knowledge in 'Modernity' hollow. Obviously under the intellectual influence of New Science and epistemological insights of constructivism, production of knowledge beyond modernism encountered limitations of grand theorisation, totalisation, logo-centrism, linearity, finality, certainty, objectivity and stability based on context-free laws of universality. This awareness of limitations turning to an intellectual predicament in knowledge production is called post-modern condition. Postmodernism is, therefore, the critique of grand narratives, totalisation, logo-centrism, linearity, finality, certainty, objectivity and stability. It is the awareness that grand narratives serve to mask the contradictions and instabilities that are inherent in scientific knowledge production based on context-free laws of universality. Postmodernism, in rejecting grand narratives, favours "mini-narratives" that explain small practices, context-specific particulars, or local events, rather than large-scale universal or global concepts. Post-modern "mini-narratives" are always situational, provisional, contingent, and temporary, making no claim to universality, truth, reason, or stability. In Postmodernism, there are only signifiers without the signified, surfaces without depth and copies without the original. The idea of the stable or permanent reality disappears. Knowledge is tentative and incomplete. It is functional, produced not just to know, but to use. Language is a game and communication a trial.

Postmodernism is concerned about questions of the organisation of knowledge rather than about its finality or completeness. In Postmodern societies Knowledge is produced, arranged, stored, distributed and consumed with a revolutionary difference in technologies and modes. In Postmodern societies, knowledge, not recognisable and storable by a computer i.e., not suitable to be digitalised ceases to be knowledge. Postmodernism's core is a reflexive particular self that is aware of the tentativeness, the slipperiness, the ambiguity and the complex interrelations of texts and meanings. Postmodernism is marked by a rejection of

totalising, essentialist, foundationalist concepts. Postmodernism sees 'reality' as being much more fragmented, diverse, tenuous and culture-specific. Postmodernism pays greater attention to specific histories, to the details and local contextualisation of concrete instances. Postmodernism puts greater emphasis on the body, the actual insertion of the human into the texture of time and history. Postmodernism pays greater attention to the specifics of cultural working, to the arenas of discourse and cultural practice. Postmodernism pays greater attention to the role of language and textuality in our construction of reality and identity, i.e., knowledge production

Lyotard in his *Postmodern Condition* says that the important question for postmodern societies is, who decides what knowledge is, and who knows what needs to be decided. Such decisions about knowledge does not involve the old modern/humanist qualifications, to assess knowledge as truth (its technical quality), or as goodness or justice (its ethical quality) or as beauty (its aesthetic quality). Lyotard argues, knowledge follows the paradigm of a language game, as laid out by Wittgenstein. By discarding "grand narratives" (like the liberation of the entire working class) and focusing on specific local goals (such as improved day care centres for working mothers in your own community), postmodernist politics offers a way to theorise local situations as fluid and unpredictable, though influenced by global trends. Hence the motto for post-modern politics might well be "think globally, act locally“ and stop worrying about grand schemes or master plans.

4. Critical consciousness

Intimate learning is essential for the learner to access deeper levels of knowledge, acquire its subversive potential, be clear about its relation to social/national development and, grow critical. Critical consciousness is an indispensable aspect of faculty that a researcher should develop for enabling serious and involved research leading to the production of new knowledge. A teacher who knows the politics of her/his specialisation lets her/his students turn critically conscious about social reality and be committed to social justice. This should be of top priority in University teaching and research,

for that alone can ensure the making of good citizens capable of public policy debates and collective operation seeking social transformation. Critical consciousness triggers rigorous research and production of strikingly new knowledge distinct for intellectual depth.

A teacher should have critical consciousness rooted in ethics. Value postulates are integral to social researches heading for the production of deeper knowledge that is inherently subversive and critical, for it unveils the hidden contradictions and unethical practices in human affairs and social processes. A researcher with poor knowledge base is not only shallow but also unethical, though inadvertently. Deeper knowledge produced across disciplines is innately linked to questions of social equity and environmental sustainability, and hence critical of capitalism from the point of view of its recklessly extravagant exploitation of natural and human resources. Scientists, social scientists, linguists, artists, literary critics and creative writers alike articulate protests against the dehumanising and anti-environmental aspects of capitalism. This is made possible by the politics of knowledge. It is essential for teachers and researchers in sciences, social sciences and humanities to know the critique of globalisation process to be insightful in their pursuits of knowledge. There is convergence of both modernity and post-modernity in this critical consciousness, distinct for the awareness of the limitations of modernity. It may be called critical modernity.

5. Conclusion

Interdisciplinary research and teaching is inherently inclined to extension of knowledge for social development. It is a fact that interdisciplinary knowledge production is path-breaking, far reaching and non-linear in its effects compared to what its counterpart does within the confines of the discipline. Knowledge generated beyond disciplines and across their interfaces is strikingly fresh, regenerative and converging. Convergence, however fast the process may be, is yet to articulate at sufficient extent its sources of infrastructural growth, institutions of transaction, and channels of communication appropriate to meet the needs of the academia. Many scholars are producing eminently

non-conventional knowledge in the interface of conventional disciplines, which is seldom promoted in departments of disciplinary identity for obvious reasons. Convergence cuts across not only disciplinary barriers but also faculty differentiation between the natural and social sciences as exemplified by environmental sciences or women studies. It is inherently deeper, critical, subversive, people centred and empowerment oriented.

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